LIGAND PHARMACEUTICALS INC
Form 10-K
February 28, 2019
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UNITED STATES
SECURITIES AND EXCHANGE COMMISSION

Washington, D.C. 20549

FORM 10-K

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

For the Fiscal Year Ended December 31, 2018

OR

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

For the transition period from to .

Commission File No. 001-33093

LIGAND PHARMACEUTICALS INCORPORATED

(Exact name of registrant as specified in its charter)

Delaware	**77-0160744**
(State or other jurisdiction of incorporation or organization)	**(IRS Employer Identification No.)**
3911 Sorrento Valley Boulevard,	**92121**

Suite 110
San Diego, CA

(Address of Principal Executive Offices) **(Zip Code)**

Registrant's telephone number, including area code: (858) 550-7500
Securities registered pursuant to Section 12(b) of the Act:

Title of Each Class	**Name of Each Exchange on Which Registered**
Common Stock, par value $.001 per share	The Nasdaq Global Market of The Nasdaq Stock Market LLC

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 x No o
Indicate by check mark if the registrant is not required to file reports pursuant to Section 13 or Section 15(d) of the Securities Exchange Act of 1934. Yes o No x
Indicate by check mark whether the registrant: (1) has filed all reports required to be filed by Section 13 or 15(d) of the Securities Exchange Act of 1934 during the preceding 12 months (or for such shorter period that the registrant was required to file such reports), and (2) has been subject to such filing requirements for the past 90 days. Yes x No o
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 x No o
Indicate by check mark if disclosure of delinquent filers pursuant to Item 405 of Regulation S-K is not contained herein, and will not be contained, to the best of registrant's knowledge, in definitive proxy or information statements incorporated by reference in Part III of this Form 10-K or any amendment to this Form 10-K. o
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 definition of "large accelerated filer," "accelerated filer," "smaller reporting company" and "emerging growth company" in Rule 12b-2 of the Exchange Act.

Large Accelerated Filer x	Accelerated Filer o	Non-accelerated Filer o	Smaller reporting company o	Emerging growth company o

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. o

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

The aggregate market value of the Registrant's voting and non-voting stock held by non-affiliates was approximately $3.6 billion based on the last sales price of the Registrant's Common Stock on the Nasdaq Global Market of the Nasdaq Stock Market LLC on June 29, 2018. For purposes of this calculation, shares of Common Stock held by directors, officers and 10% stockholders known to the Registrant have been deemed to be owned by affiliates which should not be construed to indicate that any such person possesses the power, direct or indirect, to direct or cause the direction of the management or policies of the Registrant or that such person is controlled by or under common control with the Registrant.

As of February 25, 2019, the Registrant had 20,445,407 shares of Common Stock outstanding.

DOCUMENTS INCORPORATED BY REFERENCE

Portions of the Proxy Statement for the Registrant's 2019 Annual Meeting of Stockholders to be filed with the Commission within 120 days of December 31, 2018 are incorporated by reference in Part III of this Annual Report on Form 10-K. With the exception of those portions that are specifically incorporated by reference in this Annual Report on Form 10-K, such Proxy Statement shall not be deemed filed as part of this Report or incorporated by reference herein.

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GLOSSARY OF TERMS AND ABBREVIATIONS

Abbreviation	Definition
2019 Notes	$245.0 million aggregate principal amount of convertible senior unsecured notes due 2019
2023 Notes	$750.0 million aggregate principal amount of convertible senior unsecured notes due 2023
AACR	American Association for Cancer Research
ADHF	Acute decompensated heart failure
Amended Interest Purchase Agreement	Amended and Restated Interest Purchase Agreement, dated May 31, 2017, between the Company and CorMatrix Cardiovascular, Inc.
Aldeyra	Aldeyra Therapeutics, Inc.
AMD	Age-related macular degeneration
Amgen	Amgen, Inc.
ANDA	Abbreviated New Drug Application
API	Active pharmaceutical ingredient
Apricus	Apricus Biosciences, Inc.
Aptevo	Aptevo Therapeutics
Arcus	Arcus Biosciences, Inc.
ASC	Accounting Standards Codification
ASCO	American Society of Clinical Oncology
ASCT	

	Autologous Stem Cell Transplantation
ASH	American Society of Hematology
ASU	Accounting Standards Update
Aziyo	Aziyo Med, LLC
Azure	Azure Biotech, Inc.
Baxter	Baxter International, Inc.
BiTE	Bispecific T cell engager
BMS	Bristol Myers Squibb
C-Stone	CStone Pharmaceuticals Co., Ltd.
CASI	CASI Pharmaceuticals, Inc.
Cardioxyl	Cardioxyl Pharmaceuticals, Inc.
Code of Conduct	Code of Conduct and Ethics Policy
Coherus	Coherus Biosciences, Inc.
CoM	Composition of Matter
Company	Ligand Pharmaceuticals Incorporated, including subsidiaries
Convertible Note	Senior Convertible Promissory Note
COPD	Chronic obstructive pulmonary disease
Cormatrix	Cormatrix Cardiovascular Inc.
Cormatrix Asset Sale	Asset sale from CorMatrix to Aziyo
Corvus	Corvus Pharmaceuticals, Inc.
COSO	Committee of Sponsoring Organizations of the Treadway Commission
CRO	

	Contract Research Organization
Crystal	Crystal Bioscience, Inc.
CStone	CStone Pharmaceuticals
CURx	CURx Pharmaceuticals, Inc.
CVR	Contingent value right
CyDex	CyDex Pharmaceuticals, Inc.
Daiichi Sankyo	Daiichi Sankyo Company, LTD

Dianomi	Dianomi Therapeutics
DMF	Drug Master File
Eisai	Eisai Inc.
Eli Lilly	Eli Lilly and Company
EMC	Extracellular matrix
EPOR	Erythropoietin receptor
ESPP	Employee Stock Purchase Plan, as amended and restated
EU	European Union
Exelixis	Exelixis, Inc.
FASB	Financial Accounting Standards Board
FDA	Food and Drug Administration
Fred Hutch	The Fred Hutchinson Cancer Research Center
FSGS	Focal segmental glomerulosclerosis
GAAP	Generally accepted accounting principles in the United States
GCSF	Granulocyte-colony stimulating factor
GRA	Glucagon receptor antagonist
HanAll	HanAll Biopharma Co., Ltd.
Harbour	Harbour BioMed
HCO	Heavy-chain-only
HNO	Nitroxyl
Hovione	Hovione FarmCiencia
IPR&D	In-Process Research and Development
IRAK4	Interleukin-1 Receptor Associated Kinase-4
IRS	Internal Revenue Service
ITP	Chronic immune (idiopathic) thrombocytopenic purpura
IV	Intravenous
iMBP	iMetabolic Biopharma Corporation

Immunovant	Immunovant Sciences GmbH
IND	Investigational New Drug
Original Interest Purchase Agreement	Interest Purchase Agreement, dated May 3, 2016, between the Company and CorMatrix Cardiovascular, Inc.
KSQ Therapeutics	KSQ Therapeutics, Inc.
Ligand	Ligand Pharmaceuticals Incorporated, including subsidiaries
Loan and Security Agreement	Loan and Security Agreement, dated May 21, 2014, between the Company and Viking, as amended by the First Amendment to Loan and Security Agreement, dated April 8, 2015, and the Second Amendment to Loan and Security Agreement, dated January 22, 2016
LTP	Liver-targeted prodrug
Lundbeck	Lundbeck A/S
Marinus	Marinus Pharmaceuticals, Inc.
MCM	Mineral Coated Microparticle
MDS	Myelodysplastic syndromes
Melinta	Melinta Therapeutics, Inc.
Merck	Merck & Co., Inc.
Merrimack	Merrimack Pharmaceuticals, Inc.
Metabasis	Metabasis Therapeutics, Inc.
Metavant	Metavant Sciences
MLA	Master License Agreement
MRSA	Methicillin-resistant Staphylococcus aureu

NASH	Non-alcoholic steatohepatitis
NDA	New Drug Application
NOLs	Net Operating Losses
Novartis	Novartis AG
OMT	Open Monoclonal Technology, Inc.
Omthera	Omthera Pharmaceuticals, Inc.
Ono	Ono Pharmaceutical Co., Ltd.
Orange Book	Publication identifying drug products approved by the FDA based on safety and effectiveness
Palvella	Palvella Therapeutics, Inc.
Par	Par Pharmaceutical, Inc.
PDUFA	Prescription Drug User Fee Act
Pfizer	Pfizer Inc.
Pharmacopeia	Pharmacopeia, Inc.
Phoenix Tissue	Phoenix Tissue Repair
PPD	Post-Partum Depression
PSU	Performance stock unit
Retrophin	Retrophin Inc.
Roivant	Roivant Sciences GMBH
RSU	Restricted stock unit
SAA	Severe Aplastic Anemia
SAGE	Sage Therapeutics, Inc.
SARM	Selective Androgen Receptor Modulator
SEC	Securities and Exchange Commission
Sedor	Sedor Pharmaceuticals, Inc., or RODES, Inc.
Seelos	Seelos Therapeutics, Inc.
Selexis	Selexis, SA
Sermonix	Sermonix Pharmaceuticals, LLC
Spectrum	Spectrum Pharmaceuticals, Inc.
Sunshine Lake Pharma	Sunshine Lake Pharma Co., Ltd.
Syros	Syros Pharmaceuticals, Inc.
Takeda	Takeda Pharmaceuticals Company Limited
Tax Act	

	The Tax Cuts and Jobs Act
Teva	Teva Pharmaceuticals USA, Inc., Teva Pharmaceutical Industries Ltd. and Actavis, LLC
TG Therapeutics	TG Therapeutics, Inc.
TPE	Third-party evidence
TR-Beta	Thyroid hormone receptor beta
VDP	Vernalis Design Platform
VentiRx	VentiRx Pharmaceuticals Inc.
Vernalis	Vernalis plc
Verona	Verona Pharma plc
Viking	Viking Therapeutics
Vireo	Vireo Health
WuXi	WuXi Biologics Ireland Limited
WuXi Agreement	The Platform License Agreement, dated March 23, 2015, by and between Ligand and WuXi, as amended
X-ALD	X-linked adrenoleukodystrophy
Zydus Cadila	Zydus Cadila Healthcare Ltd

PART I

Cautionary Note Regarding Forward-Looking Statements:
You should read the following report together with the more detailed information regarding our company, our common stock and our financial statements and notes to those statements appearing elsewhere in this document.

This report contains forward-looking statements that involve a number of risks and uncertainties. Although our forward-looking statements reflect the good faith judgment of our management, these statements can only be based on facts and factors currently known by us. Consequently, these forward-looking statements are inherently subject to risks and uncertainties, and actual results and outcomes may differ materially from results and outcomes discussed in the forward-looking statements.

Forward-looking statements can be identified by the use of forward-looking words such as "believes," "expects," "may," "will," "plan," "intends," "estimates," "would," "continue," "seeks," "pro forma," or "anticipates," or other similar words (including their use in the negative), or by discussions of future matters such as those related to our future results of operations and financial position, royalties and milestones under license agreements, Capitsol material sales, product development, and product regulatory filings and approvals, and the timing thereof, as well as other statements that are not historical. You should be aware that the occurrence of any of the events discussed under the caption "Risk Factors" could negatively affect our results of operations and financial condition and the trading price of our stock.

The cautionary statements made in this report are intended to be applicable to all related forward-looking statements wherever they may appear in this report. We urge you not to place undue reliance on these forward-looking statements, which speak only as of the date of this report. Except as required by law, we assume no obligation to update our forward-looking statements, even if new information becomes available in the future. This caution is made under the safe harbor provisions of Section 21E of the Securities Exchange Act of 1934, as amended.

References to "Ligand Pharmaceuticals Incorporated," "Ligand," the "Company," "we," "our" and "us" include Ligand Pharmaceuticals Incorporated and our wholly-owned subsidiaries.

Partner Information

Information regarding partnered products and programs comes from information publicly released by our partners and licensees.

Trademarks

Our trademarks, trade names and service marks referenced herein include Ligand®, Captisol®, Captisol-enabled™, LTP technology™, OmniAb®, OmniMouse®, OmniRat®, OmniFlic® and OmniChickenTM which are protected under applicable intellectual property laws and are our property. All other trademarks, trade names and service marks including BaxdelaTM, CarnexivTM, Conbriza®, Duavee®, Evomela®,Kyprolis®, Promacta®, Revolade®, SUREtechnology Platform™, Viviant®, Vivitra®, Bryxta®, and Exemptia® are the property of their respective owners. Solely for convenience, trademarks, trade names and service marks referred to in this report may appear without the ®, ™ or SM symbols, but such references are not intended to indicate, in any way, that we will not assert, to the fullest extent under applicable law, our rights or the right of the applicable licensor to such trademarks, trade names and service marks. Use or display by us of other parties' trademarks, trade dress or products is not intended to and does not imply a relationship with, or endorsement or sponsorship of, us by the trademark or trade dress owners.

Item 1. Business

Overview

We are a biopharmaceutical company focused on developing and acquiring technologies that help pharmaceutical companies discover and develop medicines. Over our more than 30 year history, we have employed research technologies such as nuclear receptor assays, high throughput computer screening, formulation science, liver targeted pro-drug technologies and antibody discovery technologies to assist companies in their work toward securing prescription drug approvals. We currently have partnerships and license agreements with over 110 pharmaceutical and biotechnology companies. Over 200 different programs under license with us are currently in various stages of commercialization and development. We have contributed novel research and technologies for approved medicines that treat cancer, osteoporosis, fungal infections and low blood platelets, among others. Our partners have programs currently in clinical development targeting seizure, coma, cancer, diabetes, cardiovascular disease, muscle wasting, liver disease, and kidney disease, among others. We have over 1,200 issued patents worldwide.

We have assembled our large portfolio of fully-funded programs either by licensing our own proprietary drug development programs, licensing our platform technologies such as Captisol or OmniAb to partners for use with their proprietary programs, or acquiring existing partnered programs from other companies. Fully-funded programs, which we refer to as "shots on goal," are those for which our partners pay all of the development and commercialization costs. For our internal programs, we generally plan to advance drug candidates through early-stage drug development or clinical proof-of-concept and then seek partners to continue development and potential commercialization.

Our business model creates value for stockholders by providing a diversified portfolio of biotech and pharmaceutical product revenue streams that are supported by an efficient and low corporate cost structure. Our goal is to offer investors an opportunity to participate in the promise of the biotech industry in a profitable, diversified and lower-risk business than a typical biotech company. Our business model is based on doing what we do best: drug discovery, early-stage drug development, product reformulation and partnering. We partner with other pharmaceutical companies to leverage what they do best (late-stage development, regulatory management and commercialization) to ultimately generate our revenue. We believe that focusing on discovery and early-stage drug development while benefiting from our partners' development and commercialization expertise will reduce our internal expenses and allow us to have a larger number of drug candidates progress to later stages of drug development.

Our revenue consists of three primary elements: royalties from commercialized products, license and milestone payments and sale of Captisol material. In addition to discovering and developing our own proprietary drugs, we selectively pursue acquisitions to bring in new assets, pipelines, and technologies to aid in generating additional potential new revenue streams.

2018 and Recent Major Business Highlights

Acquisitions and Other Business Development

•In October 2018, we acquired Vernalis, a structure-based drug discovery biotechnology company with a broad pipeline of partnered programs and ongoing collaborations for $43 million in cash. The acquisition of Vernalis provided us with more than eight fully-funded shots on goal, a 70-person research and development team based in Cambridge, England working on a portfolio of collaborations that have the potential to create additional shots on goal, a compound library of unpartnered programs for potential development and out-licensing, and England-based operations that provide a platform to help efficiently pursue investment and acquisition activities in Europe and the United Kingdom.

•In December 2018, we announced the acquisition of economic rights to PTX-022 from Palvella for $10 million in cash. We will receive a tiered net sales royalty in the mid-to-upper single digits on any net sales of PTX-022, as well as regulatory and financing milestones. PTX-022 is a novel, orphan-indicated, topical formulation of rapamycin in Phase 2/3 development for the treatment of pachyonychia congenita, a rare skin disorder with no FDA-approved treatment.

•In January 2019, we announced an investment in Dianomi, paying a total of $3 million in exchange for a tiered royalty of 2%-3% based on net sales for the first five products to be approved using Dianomi's patented MCM technology and a loan convertible into $1 million of equity at Dianomi's next qualified financing.
•In March 2018, we announced the signing of a license agreement granting Roivant exclusive global rights to develop and commercialize LGD-6972 (now named RVT-1502), the GRA which we developed through a successful Phase 2 clinical trial. Under the terms of the agreement, we received a $20 million upfront license fee, and are eligible to receive up to an additional $528.8 million of milestone payments and tiered royalties ranging from low double digits to the mid-teens, with the top tier applying to annual net sales above $3 billion. Roivant is responsible for all costs related to the program.

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•We expanded the distribution capacity on Captisol. In addition to shipping commercial and clinical material out of our contract manufacturing sites in both Portugal and Ireland last year, we also established a new distribution capability in Ireland in 2018.

Selected Late-Stage Clinical Developments

•Retrophin announced that the first patient was dosed in a global, pivotal Phase 3 clinical trial evaluating the long-term nephroprotective potential of sparsentan for the treatment of IgA nephropathy.
•Retrophin presented new data examining the long-term effects of sparsentan in FSGS at the American Society of Nephrology Kidney Week 2018, and announced that the Journal of the American Society of Nephrology published online the positive results from Retrophin's Phase 2 DUET study of sparsentan for the treatment of FSGS.
•Retrophin announced that the United States Patent and Trademark Office issued a new patent providing coverage for the use of sparsentan in the treatment of IgAN and broadening the existing coverage to include all doses of sparsentan between 200 and 800 mg/day. The patent has a stated expiration date of March 30, 2030.
•Melinta Therapeutics announced positive topline results from its Phase 3 trial of Baxdela™ for the treatment of adult patients with community-acquired bacterial pneumonia.
•Viking presented positive results from a 12-week Phase 2 study of VK2809 in patients with non-alcoholic fatty liver disease in an oral late-breaker presentation at the AASLD's annual meeting in San Francisco, CA.
•Viking presented positive results from its Phase 2 study of VK5211 in patients recovering from hip fracture at the American Society for Bone and Mineral Research 2018 annual meeting.
•Aldeyra announced enrollment of the first patient in a Phase 3 clinical trial of topical ocular reproxalap for the treatment of allergic conjunctivitis.
•Aldeyra also announced that the last patient has been dosed in a Phase 2b clinical trial of topical ocular reproxalap in dry eye disease.
•Sermonix announced FDA acceptance of its IND application and the initiation of a 100-patient Phase 2 trial of oral lasofoxifene for the treatment of metastatic breast cancer. Sermonix also announced the presentation of three posters for oral lasofoxifene in metastatic breast cancer at the 2018 San Antonio Breast Cancer Symposium.
•Verona announced enrollment of the last patient in its Phase 2 clinical trial evaluating the effect of nebulized ensifentrine (RPL554) as an add-on to dual therapy using long-acting anti-muscarinic / long-acting beta2-agonists and triple therapy in the maintenance treatment of patients with moderate to severe COPD.
•Verona announced initiation of a Phase 2 clinical trial to evaluate the pharmacokinetic profile, efficacy and safety of a dry powder inhaler formulation of ensifentrine in patients with moderate-to-severe COPD.
•Merrimack announced a poster presentation related to seribantumab at the 2018 ASCO Annual Meeting.
•Marinus announced positive results from its Phase 2 clinical trial evaluating ganaxolone IV in women with postpartum depression.
•Opthea reported that the last patient was enrolled in its ongoing Phase 2b trial of OPT-302 for wet age-related macular degeneration.

Selected Regulatory Developments

•Novartis announced that the FDA expanded the label for Promacta (eltrombopag) to include first-line treatment for adults and pediatric patients two years and older with SAA in combination with standard immunosuppressive therapy.
•Novartis announced results of a retrospective, real-world evidence study in patients with ITP treated with Promacta/Revolade (eltrombopag), compared with other second-line therapies, demonstrating that patients experienced better clinical outcomes with Promacta in terms of fewer bleeding episodes.
•On October 1, 2018, Amgen announced that the FDA approved the supplemental NDA to expand the prescribing information for Kyprolis to include a once-weekly dosing option in combination with dexamethasone for patients with relapsed or refractory multiple myeloma.

•CASI Pharmaceuticals announced that it received National Medical Products Administration (formerly, the China FDA) approval of EVOMELA for use as a high-dose conditioning treatment prior to hematopoietic progenitor (stem) cell transplantation in patients with multiple myeloma, and the palliative treatment of patients with multiple myeloma for whom oral therapy is not appropriate.
•Daiichi Sankyo announced receipt of marketing approval in Japan for MINNEBRO (esaxerenone) for the treatment of hypertension.
•SAGE announced that the FDA Psychopharmacologic Drugs Advisory Committee and Drug Safety and Risk Management Advisory Committee jointly voted that data support the favorable benefit-risk profile of Zulresso injection for the treatment of postpartum depression. SAGE also announced on November 20, 2018 that the PDUFA action date for the NDA for ZULRESSO is March 19, 2019.

Disclosed Licensing Deals Entered into or Expanded

OmniAb Technology

•We announced receipt of a $47 million payment as a result of signing an amendment related to our OmniAb platform license agreement with WuXi. Under the amended agreement, we will continue to be eligible to earn royalties at the same rate and terms as the previous agreement and the predefined contract payments have been eliminated. With this new business relationship, WuXi believes it will be able to increase the number of OmniAb antibodies it discovers for its clients in China and around the world.
•Worldwide license agreements with venBio Partners, Ferring Pharmaceuticals and Glenmark Pharmaceuticals to use the OmniAb platform technologies to discover fully human antibodies. The agreement with venBio permits the venture capital firm's portfolio companies to enter into worldwide OmniAb platform agreements under previously agreed-upon terms. We are eligible to receive annual access payments, milestone payments and royalties on future net sales of any antibodies discovered under these licenses.
•We entered into OmniChicken license expansions with FivePrime and Amgen, allowing the companies to use the OmniChicken technology.
•Worldwide license agreement with iMBP to use the OmniAb platform technologies to discover fully human antibodies. iMBP is an early-stage company with experienced leadership and proprietary research based on functional preservation of key natural enzymes responsible for lipid metabolism. Their discovery-stage programs target obesity and related diseases, with a primary focus on hyperlipidemia. We are eligible to receive a tiered royalty on future sales of up to 6%. As part of the agreement, we will fund and facilitate select early antibody discovery activities, and in return will receive an equity ownership position in iMBP.
•OmniAb platform license agreement with Fred Hutch to use the OmniAb rodent platform technologies to discover fully human antibodies. We are eligible to receive a defined share of revenue received by Fred Hutch from companies that commercialize products incorporating any such OmniAb-derived antibody.
•Research and development agreement with Janssen Pharmaceuticals for the development by Ligand of a HCO version of OmniChicken, for which we are eligible to earn defined milestone payments. Upon completion of the project, we will be able to make the HCO OmniChicken available to other commercial partners.

Captisol Technology

•Captisol clinical use license agreements with Sunshine Lake Pharmaceuticals, Merck KGaA and reVision Therapeutics.

Additional Pipeline and Partner Developments

•CStone announced two pivotal Phase 2 studies exploring the efficacy and safety of OmniAb-derived CS1001 in patients with natural killer cell/T-cell lymphoma and classical Hodgkin's lymphoma have been initiated and have each enrolled and dosed the first patient.
•CStone announced a collaboration agreement with Blueprint Medicines to initiate a proof-of-concept clinical trial in China evaluating BLU-554 in combination with OmniAb-derived CS1001.
•CStone also announced the completion of a $260 million series B financing that will primarily fund clinical development of OmniAb-derived CS1001.
•Aptevo announced that the first patient was dosed in a Phase 1/1b clinical trial of APVO436, a novel anti-CD123 by anti-CD3 bispecific antibody, which is being developed for the treatment of patients with acute myeloid leukemia and high-grade myelodysplastic syndrome.
•Aptevo presented new data for APVO436 at the AACR 2018 Annual Meeting.
•Corvus announced updated clinical and biomarker data from its ongoing Phase 1/1b study of CPI-444 in patients with treatment-refractory renal cell carcinoma, which demonstrated an overall survival of 88% at more than 20 months follow-up with CPI-444 administered in combination with atezolizumab.

•Corvus announced the publication of results of preclinical studies of CPI-444 demonstrating that it induces dose-dependent antitumor responses as a monotherapy and in combination with anti-PD-1, anti-PD-L1 and anti-CTLA-4 therapies.
•On December 3, 2018, Amgen announced the first clinical results from a study evaluating investigational novel BiTE immunotherapy AMG 330. In a Phase 1 dose-escalation study, AMG 330, which targets CD33, provided early evidence of tolerability and anti-tumor activity in patients with relapsed and/or refractory multiple myeloma and relapsed or refractory acute myeloid leukemia.
•Seelos closed a reverse merger with Apricus Biosciences and is now publicly traded on the Nasdaq Capital Market under the trading symbol “SEEL”. In conjunction with the reverse merger transaction, Seelos raised gross proceeds of $18 million in a private financing.

•OmniAb-derived RVT-1401 (previously HL 161) have formed the foundation of a new company called Immunovant during 2018.
•Nucorion Pharmaceuticals presented preclinical data for its novel liver-targeting prodrug technology program, CO1010, for the treatment of hepatitis B at the European Association for the Study of the Liver's International Liver Congress.
•Syros Pharmaceuticals announced new preclinical data on SY-1365, its first-in-class selective CDK7 inhibitor, showing that it inhibits tumor cell growth in HR-positive breast cancer cell lines that are resistant to treatment with CDK4/6 inhibitors and that it has synergistic activity in combination with fulvestrant in these treatment-resistant cells.
•OmniAb partner Arcus announced that abstracts relating to its portfolio were presented at the Society for Immunotherapy of Cancer Annual Meeting.
•Arcus announced that the FDA cleared the IND application for OmniAb-derived AB122 and the company presented a poster on AB122 at the AACR 2018 Annual Meeting.
•Arcus also announced a collaboration agreement with Infinity Pharmaceuticals to evaluate AB122 with IPI549, an immuno-oncology candidate that selectively inhibits PI3K-gamma.
•MEI Pharma announced a poster presentation related to ME-344 at the 2018 ASCO Annual Meeting.

Internal Pipeline Highlights

•We have continued to make progress on our Captisol-enabled (CE) iohexol program, including deepening the preclinical dataset significantly, which is designed to further illustrate the differentiating features of our product. We are in final preparations for making our Clinical Trial Application submission to the health authorities in Canada where our first in-human trial will be run this year. We've manufactured our clinical batches of CE-iohexol and are expecting to initiate the clinical trial this quarter and we plan to have Phase 1 bioavailability data on CE-iohexol in the third quarter of 2019.
•We now have five internal antibody-related programs that we initiated in 2018. The programs are focused on targets for which biology is known, centered in the oncology and inflammation therapy areas.

Technologies

A variety of technology platforms that enable elements of drug discovery or development form the basis of our portfolio of fully-funded shots on goal. Platform technologies or individual drugs discovered by Ligand are related to a broad estate of intellectual property that includes over 1,200 patents issued worldwide.

OmniAb Technologies

Our OmniAb technology includes our OmniRat, OmniMouse, OmniFlic and OmniChicken technology platforms for use in discovering fully human antibodies. The OmniRat, OmniMouse, and OmniFlic platforms consist of genetically-engineered transgenic animals that produce a broadly diversified repertoire of antibodies and enable novel fully-human antibody drug discovery and development by our OmniAb partners. Fully-human OmniAb antibodies provide advantages to our partners in that fully-human antibodies have reduced immunogenicity, streamlined development timelines and costs, and accelerated novel antibody discovery. The OmniChicken platform consists of genetically-engineered transgenic chickens which enable the generation of novel antibodies against targets that are not immunogenic in mammals like mice and rats. Currently, more than 40 partners are utilizing OmniAb animals in their drug discovery and development efforts. We acquired these technologies through the acquisition of OMT in January 2016 and Crystal in October 2017.

Vernalis Design Platform (VDP)

The VDP technology leverages our leadership in structure-guided drug discovery in which protein structure, drug fragment screening and modeling are integrated with medicinal chemistry to enable the rapid discovery of novel drugs. The VDP approach establishes structural information via x-ray crystallography and NMR methods and develops reliable assay systems to test biophysical, functional and cellular properties. The VDP has proven success with highly-challenging pharmaceutical targets and has generated a broad portfolio, with over 5,000 novel drug/target complexes determined and over 400 granted and pending patents. We acquired the VDP technology through our acquisition of Vernalis in October of 2018, and maintain state-of-the-art laboratories in Cambridge, UK.

Captisol Technology

Captisol is our patented, uniquely-modified cyclodextrin that is specifically designed to maximize safety, while improving the solubility, stability and bioavailability of APIs. Captisol can enable faster and more efficient development paths for our partners, given its known regulatory acceptance. We maintain both Type IV and Type V DMFs with the FDA. These DMFs contain manufacturing and safety information relating to Captisol that our licensees can reference when developing

Captisol-enabled drugs. We also filed a DMF in Japan in 2015. Captisol-enabled drugs are marketed in more than 60 countries, and over 40 partners have Captisol-enabled drugs in development.

LTP Technology Platform

The LTP Technology platform is a novel prodrug technology designed to selectively deliver a broad range of pharmaceutical agents to the liver. A prodrug is a biologically inactive compound that can be metabolized in the body to produce an active drug. The LTP Technology works by chemically modifying biologically active molecules into an inactive prodrug, which will be administered to a patient and later activated by specific enzymes in the liver. The technology can be used to improve the safety and/or activity of existing drugs, develop new agents to treat certain liver-related diseases, and treat diseases caused by imbalances of circulating molecules that are controlled by the liver. The technology is especially applicable to metabolic and cardiovascular indications, among others. Currently 3 programs are utilizing the LTP Technology or related platform(s).

SUREtechnology Platform (owned by Selexis)

We acquired economic rights to over 30 SURE*technology* Platform programs from Selexis in two separate transactions in 2013 and 2015, granting us rights to downstream economics on novel biologics and biosimilars programs. The SURE*technology* Platform, developed and owned by Selexis, is a novel technology that improves the way that cells are utilized in the development and manufacturing of recombinant proteins and drugs. The technology is based on novel DNA-based elements that control the dynamic organization of chromatin within mammalian cells and allow for higher and more stable expression of recombinant proteins. The technology creates advantages over traditional approaches including accelerated development and manufacturing times, high yields and increased compound stability.

Partners and Licensees

We currently have partnerships and license agreements with over 110 pharmaceutical and biotechnology companies. In addition to the table below, we also have more than 10 undisclosed partners and licensees.

Big Pharma	**Ticker**	**Generics**	**Ticker**	**Biotech, continued**	**Ticker**
AbbVie	ABBV	Alvogen	Private	Immunovant	Private
AstraZeneca	AZN	Avion	Private	J-Pharma	Private
Baxter	BAX	BioCad	Private	Marinus	MRNS
Boehringer Ingelheim	Private	Coherus	CHRS	MEI	MEIP
BMS	BMY	Gedeon Richter	GEDSF	Melinta	MLNT
Daiichi Sankyo	DSKY	Zydus Cadila	CADILAHC	Menarini	Private
Eli Lilly	LLY			Meridian Labs	Private
Eisai	4523			Metavant	Private
GSK	GSK	**Biotech**	**Ticker**	Merrimack	MACK
Janssen	JNJ	ABBA	Private	Novogen	NVGN
Merck	MRK	AiCuris	Private	Nucorion	Private
Merck KGaA	MRK	Aldeyra	ALDX	Opthea	OPT
Novartis	NVS	Amgen	AMGN	Outlook	OTLK
Ono	4528	Arcus	RCUS	Palvella	Private
Otsuka	4768	ARMO	Private	Phoenix Tissue	Private
Pfizer	PFE	Asahi Kasei	3407	Precision Biologics	Private
Sanofi	SNY	Azure	Private	Retrophin	RTRX
Takeda	4502	bluebird bio	BLUE	Revision Therapeutics	Private
		Cantex	Private	SAGE	SAGE
		Celgene	CELG	Seattle Genetics	SGEN
Specialty Pharma	**Ticker**	Corvus	CRVS	Seelos	SEEL
Achaogen	AKAO	C-Stone	2616.HK	Servier	Private
Aytu Bioscience	AYTU	CURx	Private	Sunshine Lake	Private
Aziyo	Private	Aptevo	APVO	Symphogen	Private
Beloteca	Private	Exelixis	EXEL	Teneobio	Private
CorMatrix	Private	Five Prime	FRPX	TG Therapeutics	TGTX
CTI Biopharma	CTIC	F-Star	Private	Tizona	Private

Cuda	Private	Genmab	GEN	Vaxxas	Private
Ferring	Private	Genagon	Private	Vega	Private
Gloria	2437	Genekey Biotech	Private	VentiRx	Private
Lundbeck	LUN	Glenmark	GLENMARK	Verona	VRNA
Sedor	Private	Gilead Sciences	GILD	Vertex	VRTX
Sermonix	Private	HanAll	9420	Viking	VKTX
Shire	SHPG	Harbour	Private	Xi'an Xintong	Private
Spectrum	SPPI	iMetabolic	Private	XTL Bio	XTLB
Teijin	TINLF			WuXi	Private
Vireo Health	Private				
Upsher-Smith	Private				

Portfolio

We have a large portfolio of current and future potential revenue-generating programs, including over 200 fully-funded by our partners. In addition to the table below, we also have more than 60 undisclosed programs.

Approved

	Cardiovascular			
Baxter	Nexterone			
Exelixis/Daiichi Sankyo	Minnelide			
				Medical Device/Cardiology
		Aziyo Base Business	Aziyo	
				Inflammatory/Metabolic
		Biocad	Interferon beta-1a	
		Pfizer	Viviant/Conbriza	
		Pfizer	Duavee	
		Zydus Cadila	Exemptia	

Phase 3 or Regulatory Submission Stage

	Severe and Rare			Inflammatory/Metabolic
Retrophin	Sparsentan	Coherus	CHS-0214	

Other / Undisclosed

Aldeyra Therapeutics Reproxalap

Phase 2

Cardiovascular		Other / Undisclosed			Severe and Rare
Cardioxyl / BMS	BMS986231	Opthea Ltd	OPT-302	Palvella	PTX-022
				XTL Bio	hCDR1
Inflammatory and Metabolic					
Azurea	Lasofoxifene	Verona	Ensifentrine		
Metavant	RTA 1502	Viking	VK5211		
Novartis	EGF843	Viking	VK2809/VK0214		
Sedoco	CE-Budesonide	Viking	VK0612		

Phase 1

		Severe and Rare			Other / Undisclosed
	IBC Generium	GNR-008	Phoenix Tissue	PTR-01	
		Takeda	TAK-925		
Inflammatory and Metabolic					
Gedeon Richter	RGB-03	HanAll/Harbour	HL161		
Genekey Biotech	PCSK-9	Immunovant	RVT-1401		
		Takeda	TAK-020		

Pre-Clinical

Other / Undisclosed					
ABBA	OmniAb	Electra	OmniAb	Ono Pharmaceuticals	OmniAb
AbbVie	OmniAb	F-Star	OmniAb	Pfizer	OmniAb
Achaogen	OmniAb	Ferring	OmniAb	Revision Therapeutics	CvZ001
Amgen	OmniAb	Fred Hutchinson	OmniAb	Seattle Genetics	OmniAb
ARMO Biosciences	OmniAb	Genmab	OmniAb	Symphogen	OmniAb
Avion	CE programs	Gilead	CE-program	Teneobio	OmniAb
Beloteca	CE-Ziprasidone	Glenmark	OmniAb	Teva	OmniAb
Boehringer Ingelheim	OmniAb	HanAll	OmniAb	Tizona	OmniAb
Celgene	OmniAb	iMetabolic	OmniAb	Vega	OmniAb
Celgene	Vipadenant	Janssen	OmniAb	VenBio	OmniAb
Covagen	OmniAb	KSQ Therapeutics	OmniAb	Wuxi	OmniAb
Five Prime	OmniAb	Merck KGaA	OmniAb		
Inflammatory and Metabolic					
Sedor	CE-Meloxicam	Seelos	SLS-010	Vireo Health	CE-Cannabinoids
Seelos	SLS-008	Viking	DGAT-1 Inhibitor		

		Medical Device/Cardiology
CorMatrix	CorMatrix Pipeline	

Selected Commercial Programs

We have multiple programs under license with other companies that have products that are already being commercialized. The following programs represent components of our current portfolio of revenue-generating assets and potential for near-term growth in royalty and other revenue. For information about the royalties owed to us for these programs, see “Royalties” later in this business section.

Promacta (Novartis)

We are party to a license agreement with Novartis related to Promacta, which is an oral medicine that increases the number of platelets in the blood. Platelets are one of the three components of blood and facilitate clotting in the blood. Individuals with low platelets can be at significant risk of bleeding or death. Because of the importance of having a sufficient number of platelets, Promacta has broad potential applicability to a number of medical situations where low platelets exist.

Promacta is currently approved for four indications: (1) the treatment of thrombocytopenia in adult and pediatric patients 1 year and older with ITP who have had an insufficient response to corticosteroids, immunoglobulins or splenectomy; (2) thrombocytopenia in patients with chronic hepatitis C to allow the initiation and maintenance of interferon-based therapy; (3) in combination with standard immunosuppressive therapy for the first-line treatment of adult and pediatric patients 2 years and older with SAA; and (4) patients with SAA who have had an insufficient response to immunosuppressive therapy. Promacta was initially approved in 2008, and the product has been generating royalty revenue for Ligand since 2009. Promacta is known as Revolade in the EU and other non-US markets.

Novartis has been and continues to pursue globalization of the brand and currently markets Promacta in multiple countries for the approved indications. Specifically, Promacta is currently approved for ITP in more than 100 countries, for the Hepatitis C-related indication in more than 50 countries, and for post-immunosuppressive therapy SAA indication in more than 45 counties. Approval of Promacta in the U.S. for the first-line treatment of SAA was obtained in November of 2018.

Beyond the currently-approved indications, Novartis has also disclosed that is performing or supporting development activities to expand the brand into new indications, including as a counter measure for the hematopoietic effects of acute

Promacta (Novartis)	
< $100 million	4.7%
$100 to $200 million	6.6%
$200 to $400 million	7.5%
$400 million to $1.5	9.4%

	radiation syndrome (H-ARS), and has been granted FDA Breakthrough Therapy designation. As of January 2019, there are 46 open clinical trials related to Promacta (listed as recruiting or open, and not yet recruiting) on the clinicaltrials.gov website.	
	We are entitled to receive royalties related to Promacta during the life of the relevant patents or following patent expiry, at a reduced rate for ten years from the first commercial sale, whichever is longer, on a country-by-country basis. Novartis has listed a patent in the FDA's Orange Book for Promacta with an expiration date in 2028, and absent early termination for bankruptcy or material breach, the term of the agreement expires upon expiration of the obligation to pay royalties. There are no remaining milestones to be paid under the agreement.	
		billion
		>$1.5 billion 9.3%

Kyprolis (Amgen)

Ligand supplies Captisol to Amgen for use with Kyprolis, and granted Amgen an exclusive product-specific license under our patent rights with respect to Captisol. Kyprolis is formulated with Ligand's Captisol technology and is approved in the United States for the following:

•In combination with dexamethasone or combination with lenalidomide plus dexamethasone for the treatment of patients with relapsed or refractory multiple myeloma who have received one to three lines of therapy.
•As a single agent for the treatment of patients with relapsed or refractory multiple myeloma who have received one or more lines of therapy.

Kyprolis is also approved in multiple countries outside the U.S. and Amgen continues to invest significantly in Kyprolis to further expand its label and geography. Amgen's obligation to pay royalties does not expire until four years after the expiration of the last-to-expire patent covering Captisol. Our patents and applications relating to the Captisol component of Kyprolis are not expected to expire until 2033.

Kyprolis (Amgen)	
< $250 million	1.5%
$250 to $500 million	2.0%
$500 to $750 million	2.5%
>$750 million	3.0%

Our agreement with Amgen may be terminated by either party in the event of material breach or bankruptcy, or unilaterally by Amgen with prior written notice, subject to certain surviving obligations. Absent early termination, the agreement will terminate upon expiration of the obligation to pay royalties. Under this agreement, we are entitled to receive remaining milestones of up to $1 million, revenue from clinical and commercial Captisol material sales and royalties on annual net sales of Kyprolis.

Evomela (Spectrum and CASI)

Ligand supplies Captisol to Spectrum for use with Evomela, which is a Captisol-enabled melphalan IV formulation. The FDA approved Evomela for use in two indications:
•A high-dose conditioning treatment prior to ASCT in patients with multiple myeloma.
•For the palliative treatment of patients with multiple myeloma for whom oral therapy is not appropriate.

Evomela has been granted Orphan Designation by the FDA for use as a high-dose conditioning regimen for patients with multiple myeloma undergoing ASCT. The Evomela formulation avoids the use of propylene glycol, which has been reported to cause renal and cardiac side-effects that limit the ability to deliver higher quantities of therapeutic compounds. The use of the Captisol technology to reformulate melphalan is anticipated to allow for longer administration durations and slower infusion rates, potentially enabling clinicians to safely achieve a higher dose intensity of pre-transplant chemotherapy.

Under the terms of the license agreement, we granted an exclusive license to Spectrum under our patent rights to Captisol relating to the product. We are eligible to receive over $50 million in potential milestone payments under this agreement and royalties on global net sales of the Captisol-enabled melphalan product. Spectrum's obligation to pay royalties will expire at the end of the life of the relevant patents or when a competing product is launched, whichever is earlier, but in no event within ten years of the commercial launch. Our patents and applications relating to the Captisol component of melphalan are not expected to expire until 2033. Absent early termination, the agreement will terminate upon expiration of the obligation to pay royalties. The agreement may be terminated by either party for an uncured material breach or unilaterally by Spectrum by prior written notice.

Spectrum sub-licensed Evomela rights for Greater China to CASI in 2014. In December 2018, CASI announced China marketing approval of Evomela and a plan to launch the drug in China in 2019.

On January 17, 2019, Spectrum announced that they entered into a definitive agreement to sell its portfolio of seven FDA-approved hematology/oncology products including Evomela to Arotech Biopharma L.L.C..

Baxdela IV (Melinta)

Melinta's Baxdela IV is a Captisol-enabled delafloxacin-IV that was approved by the FDA in June 2017 for the treatment of acute bacterial skin and skin structure infections. Delafloxacin is a novel hospital-focused fluoroquinolone antibiotic with activity against a variety of disease-causing bacteria-gram-positives, gram-negatives, atypicals and anaerobes, including quinolone-resistant MRSA. Under the terms of the agreement, we may be entitled to regulatory milestones, as well as a royalty on potential future sales by Melinta, and revenue from Captisol material sales.

Nexterone (Baxter)

We have a license agreement with Baxter, related to Baxter's Nexterone, a Captisol-enabled formulation of amiodarone, which is marketed in the United States and Canada. We supply Captisol to Baxter for use in accordance with the terms of the license agreement under a separate supply agreement. Under the terms of the license agreement we will continue to earn milestone payments, royalties, and revenue from Captisol material sales. We are entitled to earn royalties on sales of Nexterone through early 2033.

Noxafil-IV (Merck)

We have a supply agreement with Merck related to Merck’s NOXAFIL-IV, a Captisol-enabled formulation of posaconazole for IV use. NOXAFIL-IV is marketed in the United States, EU and Canada. We receive our commercial compensation for this program through the sale of Captisol, and we do not receive a royalty on this program.

Duavee or Duavive (bazedoxifene/conjugated estrogens) and Viviant/Conbriza (Pfizer)

Pfizer is marketing bazedoxifene under the brand names Viviant and Conbriza in various territories for the treatment of postmenopausal osteoporosis. Pfizer is responsible for the marketing of bazedoxifene, a synthetic drug specifically designed to reduce the risk of osteoporotic fractures while also protecting uterine tissue. Pfizer has combined bazedoxifene with the active ingredient in Premarin to create a combination therapy for the treatment of post-menopausal symptoms in women. Pfizer is marketing the combination treatment under the brand names Duavee and Duavive in various territories. Net royalties on annual net sales of Viviant/Conbriza and Duavee/Duavive are each payable to us through the life of the relevant patents or ten years from the first commercial sale, whichever is longer, on a country by country basis.

Aziyo Portfolio (Aziyo)

We receive a share of revenue from the currently marketed Aziyo portfolio of commercial pericardial repair and CanGaroo® Envelope ECM products. In addition, Ligand has the potential to receive a share of revenue and potential milestones from the currently marketed CanGaroo® ECM Envelope for cardiac implantable electronic devices. Aziyo’s products are medical devices that are designed to permit the development and regrowth of human tissue.

Exemptia, Vivitra and Bryxta (Zydus Cadila)

Zydus Cadila’s Exemptia (adalimumab biosimilar) is marketed in India for autoimmune diseases. Zydus Cadila uses the Selexis technology platform for Exemptia. We are entitled to earn royalties on sales by Zydus Cadila for ten years following the first commercial sale.

Zydus Cadila’s Vivitra (trastuzumab biosimilar) is marketed in India for breast cancer. Zydus Cadila uses the Selexis technology platform for Vivitra. We are entitled to earn royalties on sales by Zydus Cadila for ten years following the first commercial sale.

Zydus Cadila’s Bryxta (bevacizumab biosimilar) is marketed in India for non-small cell lung cancer. Zydus Cadila uses the Selexis technology platform for Bryxta. We are entitled to earn royalties on sales by Zydus Cadila for ten years following the first commercial sale.

Minnebro (Exelixis)

Daiichi Sankyo announced on January 8, 2019 the receipt of marketing approval in Japan for MINNEBRO Tablets (esaxerenone) for the treatment of hypertension. Our partner, Exelixis, entered into a collaboration agreement with Daiichi Sankyo for the development of esaxerenone, a mineralocorticoid receptor antagonist. Under the terms of the agreement with Exelixis, we are entitled to receive a royalty on future sales.

Summary of Selected Development Stage Programs

We have multiple fully-funded partnered programs that are either in or nearing the regulatory approval process, or given the area of research or value of the license terms we consider particularly noteworthy. We are eligible to receive milestone payments and royalties on these programs. This list does not include all of our partnered programs. For information about the royalties owed to Ligand for these programs, see “Royalties” later in this business section. In the case of Captisol-related programs, we are also eligible to receive revenue for the sale of Captisol material supply.

Zulresso-SAGE-547 (SAGE)

Our partner, SAGE, is developing novel medicines to treat life altering central nervous system disorders. SAGE filed an NDA with the FDA in 2018, seeking approval to market and sell Zulresso for the treatment of postpartum depression, or PPD. The NDA is currently under FDA review with a PDUFA date of March 19, 2019. We have the potential to receive milestone payments, royalties and revenue from Captisol material sales for Captisol-enabled programs. SAGE is responsible for all development costs related to the program.

Sparsentan (Retrophin)

Our partner, Retrophin, is developing sparsentan for orphan indications of severe kidney diseases, and has initiated a global pivotal Phase 3 clinical trial to enable an NDA filing for sparsentan for the treatment of FSGS. Additionally, Retrophin initiated a global pivotal Phase 3 clinical trial evaluating the long-term nephroprotective potential of sparsentan for the treatment of IgA nephropathy, a rare, immune complex mediated chronic glomerular disease. Certain patient groups with severely compromised renal function, including those with FSGS and IgA nephropathy, exhibit extreme proteinuria resulting in progression to dialysis and a high mortality rate. Sparsentan, with its unique dual blockade of angiotensin and endothelin receptors, is expected to provide meaningful clinical benefits in mitigating proteinuria in indications where there are no approved therapies.

Under our license agreement with Retrophin, we are entitled to receive potential net milestones of over $70 million and net royalties on future worldwide sales by Retrophin. The royalty term is expected to be 10 years following the first commercial sale. Retrophin is responsible for all development costs related to the program.

Prexasertib- LY2606368 (Eli Lilly)

Our partner, Eli Lilly is conducting Phase 2 clinical trials for prexasertib (Captisol-enabled LY2606368), a checkpoint kinase 1/2, or Chk 1/2, inhibitor for the treatment of solid tumors. Under the terms of the agreement, we may be entitled to regulatory milestones, royalties on potential future sales by Eli Lilly and revenue from Captisol material sales.

BMS-986231 (formerly CXL-1427) (BMS)

Our partner, BMS, is conducting Phase 2 clinical trials for a Captisol-enabled second-generation prodrug that chemically breaks down to produce HNO and an inactive byproduct. HNO is thought to have a dual mode of action, by improving cardiac function and acting as a vasodilator for treating ADHF. Under the terms of the agreement, we may be entitled to development and regulatory milestones, and royalties on potential future sales by BMS and revenue from Captisol material sales.

RVT-1502 (formerly LGD-6972) (Metavant)

Our partner, Metavant, an affiliate of Roivant, is developing RVT-1502, a GRA, which we licensed to Roivant in March 2018. In September 2017, we announced positive results from a Phase 2 clinical study evaluating the efficacy and safety of the compound (formerly known as LGD-6972), as an adjunct to diet and exercise, in subjects with type 2 diabetes mellitis inadequately controlled on metformin monotherapy. Roivant formed Metavant to pursue the development of RVT-1502 and other treatments for cardiometabolic diseases. We are entitled to potential development and regulatory milestones and royalties on potential future sales.

RVT-1401/HL161 (Immunovant, HanAll and Harbour)

Our partner, HanAll has granted Immunovant an exclusive license for the development, manufacture and marketing of RVT-1401 (HL161, an anti-FcRn antibody) for the treatment of pathogenic IgG-mediated autoimmune diseases in the U.S., Canada, Mexico, the EU, the United Kingdom, Switzerland, Latin America, the Middle East and North Africa. Immunovant is currently conducting a Phase 1 clinical trial in healthy volunteers with plans to initiate Phase 2 studies in early 2019 in myasthenia gravis and other inflammatory diseases. Additionally, HanAll and Harbour BioMed, are collaborating to develop HL161 for similar treatment in China and Korea. HanAll retains the rights to HL161 in Korea and Harbour will control the marketing in China. As part of our agreement with HanAll, we are entitled to development and regulatory milestones and royalties on potential future sales from HanAll and sublicense revenues from Immunovant and Harbour based on amounts received by HanAll.

TR-Beta - VK2809 and VK0214 (Viking)

Viking is developing VK2809, a novel selective TR-Beta agonist with potential in multiple indications, including hypercholesterolemia, dyslipidemia and NASH. Viking announced positive results from its Phase 2 trial for VK2809 in hypercholesterolemia and fatty liver disease. Viking has also been granted orphan drug status by the FDA for the development of VK0214 for treatment of X-ALD. Under the terms of the agreement with Viking, we may be entitled to up to $375 million of development, regulatory and commercial milestones and tiered royalties on potential future sales. Our TR Beta programs partnered with Viking are subject to CVR sharing and a portion of the cash received will be paid out to CVR holders.	***TR-Beta - VK2809 and VK0214 (Viking)***	< $500 million	3.5%
		$500 to $750 million	5.5%
		>$750 million	7.5%

SARM - VK5211 (Viking)

Our partner, Viking, is developing VK5211, a novel, potentially best-in-class SARM for patients recovering from	**SARM - VK5211 (Viking)**	< $500 million	7.25%
		$500 to $750 million	8.25%
		>$750 million	9.25%

hip-fracture. SARMs retain the beneficial properties of androgens without undesired side-effects of steroids or other less selective androgens. Viking announced positive results from its Phase 2 trial in patients who suffered hip fracture in the fourth quarter of 2017. Under the terms of the agreement with Viking, we may be entitled to up to $270 million of development, regulatory and commercial milestones as well as tiered royalties on potential future sales.

Lasofoxifene (Sermonix and Azure)

Lasofoxifene is a selective estrogen receptor modulator for osteoporosis treatment and other diseases, discovered through the research collaboration between us and Pfizer. Under the terms of the license agreement with Azure, we retained the rights to the oral formulation of lasofoxifene originally developed by Pfizer.

Our partner, Sermonix has a license for the development of oral lasofoxifene for the United States and additional territories. Under the terms of the agreement, we are entitled to receive over $45 million in potential regulatory and commercial milestone payments as well as royalties on future net sales.

Our partner Azure is developing a novel formulation of lasofoxifene targeting an underserved market in women's health. Under the terms of our agreement with Azure, we are entitled to receive up to $2.6 million in potential development and regulatory milestones as well as royalties on future net sales through the later of the life of the relevant patents (currently expected to be at least until 2027) or 10 years after regulatory approval. Azure may terminate the license agreement at any time upon six months' prior notice.

Merestinib- LY2801653 (Eli Lilly)

Our partner, Eli Lilly is conducting Phase 2 clinical trials for Captisol-enabled merestinib (formerly known as LY2801653), a c-Met inhibitor for treatment of cancer. Under the terms of the agreement, we may be entitled to regulatory milestones, royalties on potential future sales by Eli Lilly and revenue from Captisol material sales.

Pevonedistat - TAK-924 (Millennium/Takeda)

Our partner, Millennium/Takeda is currently conducting Phase 3 trials for the development of pevonedistat for the treatment of hematological malignancies and solid tumors. Pevonedistat is a Captisol-enabled Nedd8-Activating Enzyme Inhibitor. Under the terms of the clinical-stage agreement, we may be entitled to development milestones from Millennium/Takeda and revenue from Captisol material sales.

JNJ64007957 (Janssen)

Our partner, Janssen, is developing JNJ64007957, a BCMAxCD3 bispecific antibody discovered in part with the OmniAb platform technology. Janssen is currently conducting a Phase I trial for cancer therapy. We are entitled to earn milestones based on the development of JNJ64007957.

AMG-330 (Amgen)

Our licensee, Amgen, is developing AMG 330, a bispecific T-cell engager (BiTE) antibody targeting CD33 and CD3, for use in humans for a wide variety of therapeutic indications. Under the terms of the agreement, we are entitled to milestones and royalties on future sales of AMG 330 formulated with Captisol.

Ganaxalone IV (Marinus)

Our partner, Marinus, is conducting Phase 2 clinical trials with Captisol-enabled ganaxolone IV in patients with PPD and refractory status epilepticus. Marinus has exclusive worldwide rights to Captisol-enabled ganaxolone, a GABAA receptor modulator, for use in humans. We are entitled to development and regulatory milestones, royalties on potential future sales and revenue from Captisol material sales.

APVO436 (Aptevo)

Our partner, Aptevo, is currently conducting a Phase 1 trial of APVO436 for the treatment of acute myeloid leukemia. There is a high unmet medical need for targeted immunotherapies such as APVO436, that can potentially treat patients with relapsed or refractory disease, or patients who cannot tolerate traditional chemotherapy. Under the terms of the agreement with Aptevo, we are entitled to milestones and royalties on future sales.

WuXi Partnership

Pursuant to the WuXi Agreement, we have granted WuXi a non-exclusive license to use our OmniRat, OmniMouse and OmniFlic platforms solely to research, develop and make antibodies, and we have agreed to use commercially reasonable efforts to deliver to WuXi animals from such platforms on a purchase order basis to support WuXi's licensing rights under the WuXi Agreement. Further, WuXi has the right to out-license antibodies it discovers (whether for itself or at the direction of out-licensees) under the WuXi Agreement to out-licensees worldwide. We are entitled to royalties in the low single digits on net sales of products. Unless earlier terminated, the term of the WuXi Agreement shall continue indefinitely. Either party may terminate the WuXi Agreement upon specified notice of the other party's uncured material breach of the WuXi Agreement. In addition, we have the right to terminate the WuXi Agreement if WuXi or one of its out-licensees challenges the validity of one of our patents covering the platform and WuXi has the right to terminate the WuXi Agreement for convenience following a specified period after notice of termination.

In addition to other earlier stage programs, the following programs have been licensed pursuant to the WuXi Agreement:

AB122/GLS010 (Arcus and Gloria)

Our partner, WuXi, has outlicensed the rights to certain programs using the OmniAb technology to Arcus and Gloria. Arcus, is currently conducting a Phase 1 trial to evaluate the safety and tolerability of AB122 in subjects with advanced solid tumors. Additionally, Gloria, is conducting a Phase 2 trial in China to evaluate the efficacy and safety of GLS-010 injection in the treatment of recurrent or refractory classical Hodgkin's lymphoma. Under the terms of our agreement with WuXi, we are entitled to royalties on potential future sales.

CS1001 (C-Stone)

Our partner, WuXi, has outlicensed the rights to certain programs using the OmniAb technology to C-Stone. C-Stone, is currently conducting a Phase 2 trial to evaluate the efficacy and safety of CS1001 to treat patients with natural killer cell/T-cell lymphoma and classical Hodgkin's lymphoma. Under the terms of our agreement with WuXi, we are entitled to royalties on potential future sales.

CPI-444 (Corvus)

Our partner, Corvus, is currently conducting a Phase 1b/2 clinical trial in patients with renal cell carcinoma to evaluate CPI-444, an antagonist of adenosine A2A, in combination with the immunotherapy drug atezolizumab. CPI-444 is also being evaluated in a Phase 1b/2 trial in combination with atezolizumab in patients with non-small cell lung cancer who have failed no more than two prior regimens. Under the terms of our agreement with Corvus, we are entitled to development and regulatory milestones and tiered royalties on potential future sales. The aggregate potential milestone payments from Corvus are approximately $220 million for all indications.

Ensifentrine – RPL554 (Verona)

Our partner, Verona, is currently conducting a comprehensive Phase 2 clinical trial for the development of ensifentrine as a maintenance treatment of COPD with nebulized and inhaled formulations. Verona has also completed a positive Phase 2a study evaluating ensifentrine as a treatment for cystic fibrosis. Under the terms of our agreement with Verona, we are entitled to development and regulatory milestones, including a £5.0 million payment upon the first approval of any regulatory authority, and royalties on potential future sales.

ECF843 (Novartis)

Novartis is developing ECF843 for the treatment of dry-eye and other ophthalmic indications. ECF843 has been tested in a Phase 2 trial demonstrating the primary endpoint was met. Novartis uses the Selexis technology platform for ECF843. Under the terms of our agreement with Novartis, we are entitled to development and regulatory milestones and royalties on potential future sales.

Royalties

We have multiple programs under license with other companies that have products that are already being commercialized. In addition to the table below, we have generally described a typical Captisol and OmniAb royalty arrangement as low- to mid-single digit royalties. The following table represents substantially all of the disclosed information about our royalty arrangements:

Royalty Table

Ligand Licenses With Tiered Royalties*

Program	Licensee	Royalty Rate
Duavee	Pfizer	0.5% - 2.5%
Viviant/Conbriza	Pfizer	0.5% - 2.5%
CE-Lamotrigine	GlaxoSmithKline	4.0% - 7.0%
CE-Topiramate	GlaxoSmithKline	6.0% - 7.5%
CE-Budesonide	Sandoz	8.0% - 10.0%
CE-Meloxicam	Sandoz	8.0% - 10.0%
IRAK4	TG Therapeutics	6.0% - 9.5%
Lasofoxifene	Sermonix	6.0% - 10.0%
FBPase Inhibitor (VK0612)	Viking	7.5% - 9.5%
SARM (VK5211)	Viking	7.25% - 9.25%
TR Beta (VK2809	Viking	3.5% - 7.5%

and VK0214)		
Oral EPO	Viking	4.5% - 8.5%
DGAT-1	Viking	3.0% - 7.0%
Various	Nucorion	4.0% - 9.0%
Various	Seelos	4.0% - 10.0%
OmniAb-iMetabolic	Metabolic	<6%
OmniAb-Gemagon	Gemagon	4.0% - 6.0%
Mineral Coated Microparticle technology	Dianomi	2.0% - 3.0%
PTX-022	Palvella	5.0% - 9.8%
RVT-1502	Metavant	Low double digit to mid-teen royalty
CPI-444	Corvus	Mid single digit to low-teen royalty
Ensifentrine (RPL554)	Verona	Low to mid-single digit royalty

Ligand Licenses With Fixed Royalties*

Program	Licensee	Royalty Rate
Evomela	Spectrum Pharma	20%
Bavencio	Merck	2.5%
Brexalalone (SAGE-547)	SAGE	3%
Spiriva	Boehringer	9%
CE-Fos	E-Fosphenytoin	11%
Pradaxa	Xi'an Xintong	9%
MK0731	Xi'an Xintong	6%
KM465	Novartis	14.5% (6.5% in year one)
Topical lasofoxifene	Azure Biotech	5%
MM-121	Merrimack Pharma	<1.0%
MM-141	Merrimack Pharma	<1.0%
MEDI4	MedImmune Pharma	Low single digit royalty
MEDI4	MedImmune Pharma	Low single digit royalty
Reproxalap	Aldeyra Therapeutics	Low single digit royalty
PCSK9	Merck	Low single digit royalty
CS-1001	Celgene	Low single digit royalty
Various	Various	Low single

		digit royalty
4-1BB	Zhilkang Hongyi	Low single digit royalty
ADC	Biocytogen	Low single digit royalty
Omnichem	KSQ Therapeutics	Single digit royalty

**Royalty rates are shown net of sublicense payments. Royalty tier references for specific rates notated in the table are for up to and including the dollar amount referenced. Higher tiers are only applicable for the dollar ranges specified in the table.*

Contract Payments (Milestones)

Many of our programs under license with our partners will generate contract payments to us if our partners reach certain development, regulatory and commercial milestones. The following table represents the potential maximum value of our contract payment pipeline on milestones by development stage, technology and partner (in thousands):

Technology*		**Stage***		**Partner***	
OmniAb	> $825,000	Preclinical	> $40,000	Viking	$1,500,000
Captisol	> $175,000	Clinical	> $500,000	Metavant	$528,750
Vernalis	> $250,000	Regulatory	> $1,000,000	Janssen	$245,400
LTP/Hep Direct	> $250,000	Commercial	> $1,660,000	Seelos	$141,800
NCE/Other	> $2,000,000	Other	> $300,000	Retrophin	$100,750
Total	> $3,500,000	Total	> $3,500,000	Corvus (Oncology)	$91,500
				Xi'an Xintong	$43,125
				Other	> $848,675
				Total	> $3,500,000

**All tables exclude our annual access fees and collaboration revenue for development work.*

Internal Development Programs

We have a number of internal development programs focused on a wide-range of indications. Our primary research and development efforts are led by our teams in Emeryville, California and Cambridge, England. The following table represents internal programs eligible for further development or partnership:

Program	Development Stage	Indication
Luminespib/Hsp90 Inhibitor	Phase 2	Oncology
FAAH Inhibitor	Phase 1	Pain
CE-Sertraline, Oral Concentrate	Phase 1	Depression
CE-Iohexol	Phase 1	Diagnostics
CCR1 Antagonist	Preclinical	Oncology
CE-Busulfan	Preclinical	Oncology
CE-Cetirizine Injection	Preclinical	Allergy
CE-Silymarin for Topical formulation	Preclinical	Sun damage
FLT3 Kinase Inhibitors	Preclinical	Oncology
GCSF Receptor Agonist	Preclinical	Blood disorders
Liver Specific Glucokinase Activator	Preclinical	Diabetes
Omnichicken derived antibodies (5 programs)	Discovery	Multiple
Chk1 Inhibitor	Preclinical	Oncology

Manufacturing

We contract with a third party manufacturer, Hovione, for Captisol production. Hovione is a global supplier with over 50 years of experience in the development and manufacture of APIs and Drug Product Intermediates. Hovione operates FDA-inspected sites in the United States, Macau, Ireland and Portugal. Manufacturing operations for Captisol are currently performed at two sites, in both of Hovione's Portugal and Ireland facilities with distribution operations also performed from Hovione's Portugal and Ireland sites. Additionally, we also store and distribute Captisol from a subterranean warehouse controlled by us and located in Kansas. We believe we maintain adequate inventory of Captisol to meet our current and future partner needs.

In the event of a Captisol supply interruption, we are permitted to designate and, with Hovione’s assistance, qualify one or more alternate suppliers. If the supply interruption continues beyond a designated period, we may terminate the agreement. In addition, if Hovione cannot supply our requirements of Captisol due to an uncured force majeure event, we may also obtain Captisol from a third party and have previously identified such parties.

The current term of the agreement with Hovione is through December 2024. The agreement will automatically renew for successive two year renewal terms unless either party gives written notice of its intention to terminate the agreement no less than two years prior to the expiration of the initial term or renewal term. In addition, either party may terminate the agreement for the uncured material breach or bankruptcy of the other party or an extended force majeure event. We may terminate the agreement for extended supply interruption, regulatory action related to Captisol or other specified events. We have ongoing minimum purchase commitments under the agreement.

For further discussion of these items, see below under *“Item 7. Management’s Discussion and Analysis of Financial Condition and Results of Operations.”*

Competition

Some of the drugs we and our licensees and partners are developing may compete with existing therapies or other drugs in development by other companies. Furthermore, academic institutions, government agencies and other public and private organizations conducting research may seek patent protection with respect to potentially competing products or technologies and may establish collaborative arrangements with our competitors.

Our Captisol business may face competition from other suppliers of similar cyclodextrin excipients or other technologies that are aimed to increase solubility or stability of APIs. Our OmniAb antibody technology faces competition from suppliers of other transgenic animal systems that are also available for antibody drug discovery. Our competitive position also depends upon our ability to obtain patent protection or otherwise develop proprietary products or processes. For a discussion of the risks associated with competition, see below under *"Item 1A. Risk Factors."*

Government Regulation

The research and development, manufacturing and marketing of pharmaceutical products are subject to regulation by numerous governmental authorities in the United States and other countries. We and our partners, depending on specific activities performed, are subject to these regulations. In the United States, pharmaceuticals are subject to regulation by both federal and various state authorities, including the FDA. The Federal Food, Drug and Cosmetic Act and the Public Health Service Act govern the testing, manufacture, safety, efficacy, labeling, storage, record keeping, approval, advertising and promotion of pharmaceutical products and there are often comparable regulations that apply at the state level. There are similar regulations in other countries as well. For both currently marketed and products in development, failure to comply with applicable regulatory requirements can, among other things, result in delays, the suspension of regulatory approvals, as well as possible civil and criminal sanctions. In addition, changes in existing regulations could have a material adverse effect on us or our partners. For a discussion of the risks associated with government regulations, see below under "*Item 1A. Risk Factors.*"

Patents and Proprietary Rights

We believe that patents and other proprietary rights are important to our business. Our policy is to file patent applications to protect technology, inventions and improvements to our inventions that are considered important to the development of our business. We also rely upon trade secrets, know-how, continuing technological innovations and licensing opportunities to develop and maintain our competitive position.

Patents are issued or pending for the following key products or product families. The scope and type of patent protection provided by each patent family is defined by the claims in the various patents. The nominal patent expiration dates have been provided. The actual patent term may vary by jurisdiction and depend on a number of factors including potential patent term adjustments, patent term extensions, and terminal disclaimers. For each product or product family, the patents and/or applications referred to are in force in at least the United States, and for most products and product families, the patents and/or applications are also in force in European jurisdictions, Japan and other jurisdictions.

Promacta

Patents covering Promacta are owned by Novartis. The United States patent listed in the FDA's Orange Book relating to Promacta with the latest expiration date is not expected to expire until 2027. Six months of additional exclusivity to each of the U.S. expiration dates listed in the table has been granted due to pediatric studies conducted by GlaxoSmithKline plc (NYSE:GSK), thereby taking the latest expiration date into 2028. The type of patent protection (*e.g.*, composition of matter or use) and the expiration date for each unexpired patent listed in the Orange Book are provided in the following table. In addition, certain related patents in the commercially important jurisdictions of Europe and Japan are identified in the following table.

Promacta

United States		Corresponding Foreign				
Type of Protection	U.S. Patent No.	U.S. Expiration Date	Jurisdiction	Patent Number	Expiration Date‡	
			EU	1,864,981	5/24/2021	
CoM / Use	7,160,870	11/20/2022			EU	1,889,838	5/24/2021
					EU	1,294,378	3/14/2025*
					Japan	3,813,875	5/24/2021
					Japan	4,546,919	5/24/2021
			EU	1,294,378	3/14/2025*		
Use	7,332,481	5/24/2021					

					EU	1,864,981	5/24/2021
					EU	1,889,838	5/24/2021
					Japan	3,813,875	5/24/2021
					Japan	4,546,919	5/24/2021
CoM			EU	1,864,981	5/24/2021		
/ Use	7,452,874	5/24/2021					
					EU	1,889,838	5/24/2021
					Japan	3,813,875	5/24/2021
					Japan	4,546,919	5/24/2021

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			EU	1,864,981	5/24/2021			
CoM / Use	7,473,686	5/24/2021				EU	1,294,378	3/14/2025*
						EU	1,889,838	5/24/2021
						Japan	3,813,875	5/24/2021
						Japan	4,546,919	5/24/2021
CoM / Use	7,547,719	7/13/2025	EU	1,534,390	5/21/2023			
						Japan	4,612,414	5/21/2023
			EU	1,294,378	3/14/2025*			
Use	7,790,704	5/24/2021				EU	1,864,981	5/24/2021
						EU	1,889,838	5/24/2021
						Japan	3,813,875	5/24/2021
						Japan	4,546,919	5/24/2021
Use	7,795,293	5/21/2023	EU	1,534,390	5/21/2023			
						Japan	4,612,414	5/21/2023
			EU	2,152,237	8/1/2027			
CoM / Use	8,052,993	8/1/2027				Japan	5,419,866	8/1/2027
						Japan	5,735,078	8/1/2027
						Japan	6,144,713	8/1/2027
			EU	2,152,237	8/1/2027			
CoM / Use	8,052,994	8/1/2027				Japan	5,419,866	8/1/2027
						Japan	5,735,078	8/1/2027
						Japan	6,144,713	8/1/2027
			EU	2,152,237	8/1/2027			
CoM / Use	8,052,995	8/1/2027				Japan	5,419,866	8/1/2027
						Japan	5,735,078	8/1/2027
						Japan	6,144,713	8/1/2027
			EU	2,152,237	8/1/2027			
CoM / Use	8,062,665	8/1/2027				Japan	5,419,866	8/1/2027
						Japan	5,735,078	8/1/2027
						Japan	6,144,713	8/1/2027
			EU	2,152,237	8/1/2027			
CoM / Use	8,071,129	8/1/2027				Japan	5,419,866	8/1/2027
						Japan	5,735,078	8/1/2027
						Japan	6,144,713	8/1/2027
			EU	2,152,237	8/1/2027			
CoM / Use	8,828,430	8/1/2027				Japan	5,419,866	8/1/2027
						Japan	5,735,078	8/1/2027
						Japan	6,144,713	8/1/2027

‡Expiration dates of European and Japanese patents are calculated as 20 years from the earliest nonprovisional filing date to which priority is claimed, and may not take into account extensions that are or may be available in these jurisdictions.
Includes extension of term through Supplementary Protection Certificate (SPC)
Revoked; on appeal

Kyprolis

Patents protecting Kyprolis include those owned by Amgen and those owned by us. The United States patent listed in the Orange Book relating to Kyprolis with the latest expiration date is not expected to expire until 2029. Patents and applications owned by Ligand relating to the Captisol component of Kyprolis are not expected to expire until 2033.

Amgen has filed suit against several generic drug companies over their applications to make generic versions of Kyprolis, with a trial scheduled for May 2019. The type of patent protection (*e.g.*, composition of matter or use) for each patent listed in the Orange Book and the expiration dates for each patent listed in the Orange Book are provided in the following table. In addition, certain related patents in the commercially important jurisdictions of Europe and Japan are identified in the following table.

Kyprolis

United States				Corresponding Foreign			
Type of Protection	U.S. Patent No.	U.S. Expiration Date	Jurisdiction	Patent Number	Expiration Date‡		
			EU	1,745,064	4/14/2025		
						EU	1,781,688	8/8/2025
						EU	2,266,999	8/8/2025
CoM	7,232,818	4/14/2025				EU	2,270,026	8/8/2025
						EU	3,101,026	8/8/2025
						Japan	4,743,720	8/8/2025
						Japan	5,394,423	4/14/2025
			EU	1,781,688	8/8/2025		
						EU	2,266,999	8/8/2025
CoM	7,417,042	7/20/2026				EU	2,270,026	8/8/2025
						EU	3,101,026	8/8/2025
						Japan	4,743,720	8/8/2025
						Japan	5,394,423	4/14/2025
			EU	1,745,064	4/14/2025		
						EU	1,781,688	8/8/2025
						EU	2,266,999	8/8/2025
Use	7,491,704	4/14/2025				EU	2,270,026	8/8/2025
						EU	3,101,026	8/8/2025
						Japan	4,743,720	8/8/2025
						Japan	5,394,423	4/14/2025
			EU	1,819,353	12/7/2025		
						EU	2,260,835	12/7/2025
CoM	7,737,112	12/7/2027				EU	2,261,236	12/7/2025
						Japan	4,990,155	12/7/2025
						Japan	5,108,509	5/9/2025
			EU	1,745,064	4/14/2025		
Use	8,129,346	4/14/2025				Japan	5,394,423	4/14/2025
						Japan	5,616,569	4/14/2025
			EU	1,781,688	8/8/2025		
						EU	1,745,064	4/14/2025
CoM	8,207,125	4/14/2025				Japan	5,394,423	4/14/2025
						Japan	5,616,569	4/14/2025
						Japan	4,743,720	8/8/2025
CoM / Use	8,207,126	4/14/2025	EU	1,745,064	4/14/2025			
						Japan	5,394,423	4/14/2025
						Japan	5,616,569	4/14/2025
			EU	1,745,064	4/14/2025			
Use	8,207,127	4/14/2025				Japan	5,394,423	4/14/2025
						Japan	5,616,569	4/14/2025
CoM / Use	8,207,297	4/14/2025	EU	1,745,064	4/14/2025			
						Japan	5,394,423	4/14/2025
						Japan	5,616,569	4/14/2025

CoM	9,493,582	2/27/2023	N/A				
			EU	2,796,134	10/21/2029		
Use	9,511,109	10/21/2029					
						Japan	5,675,629	10/21/2029
						Japan	6,081,964	10/21/2029

‡Expiration dates of European and Japanese patents are calculated as 20 years from the earliest nonprovisional filing date to which priority is claimed, and do not take into account extensions that are or may be available in these jurisdictions.

Captisol

Patents and pending patent applications covering Captisol are owned by us. Other patents and pending patent applications covering methods of making Captisol are owned by us or by Pfizer. The patents covering the Captisol product, if issued, with the latest expiration date would not be set to expire until 2033 (*see, e.g.,* U.S. Patent No. 9,493,582 (expires Feb. 27, 2033)). We have asserted U.S. Patents 8,410,077, 9,200,088, and 9,493,582 against Teva in connection with their attempt to obtain FDA approval to manufacture and sell a generic version of EVOMELA®. We also own several patents and pending patent applications covering drug products containing Captisol as a component. The type of patent protection (*e.g*., composition of matter or use) and the expiration dates for several issued patents covering Captisol are provided in the following table. In addition, certain related patents and applications in the commercially important jurisdictions of Europe and Japan are listed in the following table.

Captisol

United States			Corresponding Foreign			
Type of Protection	U.S. Patent No.	U.S. Expiration Date	Jurisdiction	Patent Number	Expiration Date‡	
CoM	8,114,438	3/19/2028	EU	2,708,225	4/22/2025	
					Japan	6,141,906	4/22/2025
CoM	10,117,940	4/22/2025	EU	2,708,225	4/22/2025	
					Japan	6,141,906	4/22/2025
			EU	1,945,228	10/26/2025	
CoM	7,629,331	10/26/2025			EU	2,335,707	10/26/2025
					EU	2,581,078	10/26/2025
					Japan	5,465,432	10/26/2026
Use	8,049,003	12/19/2026	EU	2,583,668	10/26/2025	
			EU	1,945,228	10/26/2025	
CoM	8,846,901	10/26/2025			EU	2,335,707	10/26/2025
					EU	2,581,078	10/26/2025
					Japan	5,465,432	10/26/2026
			EU	1,945,228	10/26/2025	
CoM	8,829,182	10/26/2025			EU	2,335,707	10/26/2025
					EU	2,581,078	10/26/2025
					EU	2,952,197	10/26/2025
					Japan	5,465,432	10/26/2026
CoM	9,517,252	3/13/2029	EU	2,952,197	10/26/2025	
			Japan	4,923,144	4/28/2029	
CoM / Use	7,635,773	3/13/2029			Japan	6,039,721	4/28/2029
					Japan	6,276,828	4/28/2029
					Japan	6,444,548	4/28/2029
			Japan	4,923,144	4/28/2029	
CoM	8,410,077	3/13/2029			Japan	6,039,721	4/28/2029
					Japan	6,276,828	4/28/2029
					Japan	6,444,548	4/28/2029
			Japan	4,923,144	4/28/2029	
CoM	9,200,088	3/13/2029			Japan	6,039,721	4/28/2029
					Japan	6,276,828	4/28/2029
					Japan	6,444,548	4/28/2029

			Japan	4,923,144	4/28/2029			
CoM	9,750,822	3/13/2029				Japan	6,039,721	4/28/2029
						Japan	6,276,828	4/28/2029
						Japan	6,444,548	4/28/2029
			Japan	4,923,144	4/28/2029			
CoM	10,117,951	3/13/2029				Japan	6,039,721	4/28/2029
						Japan	6,276,828	4/28/2029
						Japan	6,444,548	4/28/2029
MoM	9,751,957	2/14/2033	N/A					
CoM	9,493,582	2/27/2033	N/A					
CoM/MoM	10,040,872	2/27/2033	N/A					

‡Expiration date of European and Japanese patents are calculated as 20 years from the earliest nonprovisional filing date to which priority is claimed, and do not take into account extensions that are or may be available in these jurisdictions.

Subject to compliance with the terms of the respective agreements, our rights to receive royalty payments under our licenses with our exclusive licensors typically extend for the life of the patents covering such developments. For a discussion of the risks associated with patent and proprietary rights, see below under "*Item 1A. Risk Factors.*"

OmniAb

Our OmniAb® therapeutic antibody platforms, including OmniRat®, OmniMouse® and OmniChicken™, produce naturally optimized, fully human antibodies in animals. We have received patent protection on OmniAb antibodies and methods in 30 countries, including the United States, multiple countries throughout Europe, Japan and China (see selected cases listed in the table below) and have 56 patent applications pending in 24 countries worldwide. The patents and applications owned by us are expected to expire between 2028 and 2034 and partners are able to use the OMT patented technology to generate novel antibodies, which may be entitled to additional patent protection.

OmniAb

United States				Corresponding Foreign			
Type of Protection	U.S. Patent No.	U.S. Expiration Date	Jurisdiction	Patent Number	Expiration Date‡			
			EU	2,152,880	5/30/2028			
CoM	8,703,485	10/10/2031				EU	2,336,329	5/30/2028
						EU	2,603,323	5/30/2028
						Japan	5,823,690	5/30/2028
						Japan	6,220,827	5/30/2028
		9,388,233	5/30/2028	N/A				
		10,072,069	5/30/2028	N/A				
Use	8,907,157	5/30/2028	N/A					
CoM/Use	9,475,859	4/15/2034	N/A					

OmniAb in OmniChicken

	United States				Corresponding Foreign
Type of Protection	U.S. Patent No.	U.S. Expiration Date	Jurisdiction	Patent Number	Expiration Date‡
CoM/Use	10,030,095	12/23/2029	Europe	2,271,657	3/2/2029
MoM	8,415,173	3/2/2029	Japan	5,737,707	3/2/2029
CoM	8,592,644	8/30/2030	Japan	5,756,802	8/11/2030
CoM	9,404,125	12/29/2030	N/A		
Use	9,549,538	8/11/2030	N/A		
CoM/Use	10,010,058	8/11/2030	N/A		
CoM/Use	10,172,334	8/11/2030	N/A		
CoM/Use	8,883,452	5/8/2032	N/A		
Com/Use	9,644,038	1/7/2031	N/A		
CoM	9,380,769	5/23/2032	EU	2,713,712	5/23/2032
CoM	9,809,642	5/23/2032	N/A		
CoM/Use	9,394,372	10/16/2032	N/A		
CoM	9,982,062	10/16/2032	N/A		

‡Expiration date of European and Japanese patents are calculated as 20 years from the earliest nonprovisional filing date to which priority is claimed, and do not take into account extensions that are or may be available in these jurisdictions.

Vernalis

Our acquisition of Vernalis in October 2018 provides us with a portfolio of more than 8 fully-funded shots on goal, including RPL554, a Phase 2, novel treatment for COPD, which is partnered with Verona Pharma; and CPI-444, a Phase 1 adenosine A2A receptor antagonist for treatment of solid tumors, which is partnered with Corvus Pharmaceuticals. Vernalis has a worldwide patent portfolio of over 350 granted patents and over 35 pending applications, spanning over 60 countries.

Employees

As of February 12, 2019, including our newly acquired Vernalis subsidiary, we have 116 full-time employees, of whom 87 are involved directly in scientific research and development activities.

Investor Information

Financial and other information about us is available on our website at www.ligand.com. We make available on our website copies of our Annual Report on Form 10-K, Quarterly Reports on Form 10-Q, current reports on Form 8-K and amendments to those reports filed or furnished pursuant to Section 13(a) or 15(d) of the Exchange Act as soon as reasonably practicable after we electronically file such material with, or furnish it to, the U.S. Securities and Exchange Commission, or SEC. In addition, we have previously filed registration statements and other documents with the SEC. Any document we file may be inspected, at the SEC's public reference room at 100 F Street NE, Washington, DC 20549, or at the SEC's internet address at www.sec.gov. These website addresses are not intended to function as hyperlinks, and the information contained in our website and in the SEC's website is not intended to be a part of this filing. Information related to the operation of the SEC's public reference room may be obtained by calling the SEC at 800-SEC-0330.

ITEM 1A. RISK FACTORS

The following is a summary description of some of the many risks we face in our business. You should carefully review these risks in evaluating our business, including the businesses of our subsidiaries. You should also consider the other information described in this report. Additional risks not presently known to us or that we currently deem immaterial also may impair our business.

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Future revenue based on Promacta, Kyprolis and Evomela, as well as sales of our other products, may be lower than expected.

Novartis is obligated to pay us royalties on its sales of Promacta, and we receive revenue from Amgen based on both sales of Kyprolis and purchases of Captisol material for clinical and commercial uses. These payments are expected to be a substantial portion of our ongoing revenues for some time. In addition, we receive revenues based on sales of Evomela and other products. Any setback that may occur with respect to any of our partners' products, and in particular Promacta or Kyprolis, could significantly impair our operating results and/or reduce our revenue and the market price of our stock. Setbacks for the products could include problems with shipping, distribution, manufacturing, product safety, marketing, government regulation or reimbursement, licenses and approvals, intellectual property rights, competition with existing or new products and physician or patient acceptance of the products, as well as higher than expected total rebates, returns, discounts, or unfavorable exchange rates. These products also are or may become subject to generic competition.

Future revenue from sales of Captisol material to our license partners may be lower than expected.

Revenues from sales of Captisol material to our collaborative partners represent a significant portion of our current revenues. Any setback that may occur with respect to Captisol could significantly impair our operating results and/or reduce the market price of our stock. Setbacks for Captisol could include problems with shipping, distribution, manufacturing, product safety, marketing, government regulation or reimbursement, licenses and approvals, intellectual property rights, competition with existing or new products and physician or patient acceptance of the products using Captisol.

If products or product candidates incorporating Captisol material were to cause any unexpected adverse events, the perception of Captisol safety could be seriously harmed. If this were to occur, we may not be able to sell Captisol unless and until we are able to demonstrate that the adverse event was unrelated to Captisol, which we may not be able to do. Further, the FDA could require us to submit additional information for regulatory review or approval, including data from extensive safety testing or clinical testing of products using Captisol. This would be expensive and it may delay the marketing of Captisol-enabled products and receipt of revenue related to those products, which could significantly impair our operating results and/or reduce the market price of our stock.

We obtain Captisol from a sole source supplier, and if this supplier were to cease to be able, for any reason, to supply Captisol to us in the amounts we require, or decline to supply Captisol to us, we would be required to seek an alternative source, which could potentially take a considerable length of time and impact our revenue and customer relationships. We maintain inventory of Captisol, which has a five year shelf life, at three geographically dispersed storage locations in the United States and Europe. If we were to encounter problems maintaining our inventory, such as natural disasters, at one or more of these locations, it could lead to supply interruptions. While we believe we maintain adequate inventory of Captisol to meet our current and expected future partner needs, our estimates and projections for Captisol demand may be wrong and any supply interruptions could materially adversely impact our operating results.

We currently depend on our arrangements with our partners and licensees to sell products using our Captisol technology. These agreements generally provide that our partners may terminate the agreements at will. If our partners discontinue sales of products using Captisol, fail to obtain regulatory approval for products using Captisol, fail to satisfy their obligations under their agreements with us, or choose to utilize a generic form of Captisol should it become available, or if we are unable to establish new licensing and marketing relationships, our financial results and growth prospects would be materially affected. Furthermore, we maintain significant accounts receivable balances with certain customers purchasing Captisol materials, which may result in the concentration of credit risk. We generally do not require any collateral from our customers to secure payment of these accounts receivable. If any of our major customers were to default in the payment of their obligations to us, our business, operating results and cash

flows could be adversely affected.

Further, under most of our Captisol outlicenses, the amount of royalties we receive will be reduced or will cease when the relevant patent expires. Our low-chloride patents and foreign equivalents are not expected to expire until 2033, our high purity patents and foreign equivalents, are not expected to expire until 2029 and our morphology patents and foreign equivalents, are not expected to expire until 2025, but the initially filed patents relating to Captisol expired starting in 2010 in the United States and in 2016 in most countries outside the United States. If our other intellectual property rights are not sufficient to prevent a generic form of Captisol from coming to market and if in such case our partners choose to terminate their agreements with us, our Captisol revenue may decrease significantly.

Third party intellectual property may prevent us or our partners from developing our potential products; our and our partners' intellectual property may not prevent competition; and any intellectual property issues may be expensive and time consuming to resolve.

The manufacture, use or sale of our potential products or our licensees' products or potential products may infringe the patent rights of others. If others obtain patents with conflicting claims, we may be required to obtain licenses to those patents or to develop or obtain alternative technology. We may not be able to obtain any such licenses on acceptable terms, or at all. Any failure to obtain such licenses could delay or prevent us from pursuing the development or commercialization of our potential products.

Generally, our success will depend on our ability and the ability of our partners to obtain and maintain patents and other intellectual property rights for our and their potential products. Our patent position is uncertain and involves complex legal and technical questions for which legal principles are unresolved. Even if we or our partners do obtain patents, such patents may not adequately protect the technology we own or have licensed.

We permit our partners to list our patents that cover their branded products in the Orange Book. If a third party files an NDA or ANDA for a generic drug product that relies in whole or in part on studies contained in our partner's NDA for their branded product, the third party will have the option to certify to the FDA that, in the opinion of that third party, the patents listed in the Orange Book for our partner's branded product are invalid, unenforceable, or will not be infringed by the manufacture, use or sale of the third party's generic drug product. A third party certification that a new product will not infringe Orange Book-listed patents, or that such patents are invalid, is called a paragraph IV patent certification. If the third party submits a paragraph IV patent certification to the FDA, a notice of the paragraph IV patent certification must be sent to the NDA owner and the owner of the patents that are subject to the paragraph IV patent certification notice once the third-party's NDA or ANDA is accepted for filing by the FDA. A lawsuit may then be initiated to defend the patents identified in the notice. The filing of a patent infringement lawsuit within 45 days of the receipt of notice of a paragraph IV patent certification automatically prevents the FDA from approving the generic NDA or ANDA until the earlier of the expiration of a 30-month period, the expiration of the patents, the entry of a settlement order stating that the patents are invalid or not infringed, a decision in the infringement case that is favorable to the NDA or ANDA applicant, or such shorter or longer period as the court may order. If a patent infringement lawsuit is not initiated within the required 45-day period, the third-party's NDA or ANDA will not be subject to the 30-month stay.

Several third-parties have challenged, and additional third parties may challenge, the patents covering our partner's branded products, including Promacta, Kyprolis and Evomela, which could result in the invalidation or unenforceability of some or all of the relevant patent claims. We may from time to time become party to litigation or other proceedings as a result of Paragraph IV certifications. For example, in November 2017, CyDex, our wholly owned subsidiary, received a paragraph IV certification from Teva alleging that certain of our patents related to Captisol were invalid, unenforceable and/or will not be infringed by Teva's ANDA related to Spectrum Pharmaceuticals' NDA for Evomela. On December 20, 2017, CyDex filed a complaint against Teva in the U.S. District Court for the District of Delaware, asserting that Teva's ANDA would infringe our patents. On March 22, 2018, Teva filed an answer and counterclaims seeking declarations of non-infringement and invalidity as to each of the asserted patents and on April 12, 2018, CyDex filed an answer to Teva's counterclaims. On July 24, 2018, the U.S. District Court entered a Scheduling Order, setting a hearing on Claim Construction for April 1, 2019, and a five to six day bench trial to begin on January 27, 2020. Fact discovery is proceeding.

In addition, we cannot assure you that all of the potentially relevant prior art-information that was or is deemed available to a person of skill in the relevant art prior to the priority date of the claimed invention-relating to our and our partners' patents and patent applications has been found. If such prior art exists, it can invalidate a patent or prevent a patent from issuing from a pending patent application, and we or our partners may be subject to a third party pre-issuance submission of prior art to the United States Patent and Trademark Office. Even if patents do successfully

issue and even if such patents cover our or our partner's products or potential products, third parties may an initiate litigation or opposition, interference, re-examination, post-grant review, inter partes review, nullification or derivation action in court or before patent offices, or similar proceedings challenging the validity, enforceability or scope of such patents, which may result in the patent claims being narrowed or invalidated, may allow third parties to commercialize our or our partners' products and compete directly with us and our partners, without payment to us or our partners, or limit the duration of the patent protection of our and our partners' technology and products. For example, we are aware that a third party has requested a reexamination of U.S. Patent No. 8,703,485 related to OmniAb on the basis of certain prior art documents. If the United States Patent and Trademark Office grants the request, we will have an opportunity to respond, but we cannot assure you that this patent will be held to be valid.

Litigation or other proceedings to enforce or defend intellectual property rights are often very complex in nature, may be very expensive and time-consuming, may divert our management's attention from our core business, and may result in unfavorable results that could adversely impact our ability to prevent third parties from competing with our partner's products.

Any adverse outcome of such litigation or other proceedings could result in one or more or our patents being held invalid or unenforceable, which could adversely affect our ability to successfully execute our business strategy and negatively impact our financial condition and results of operations. However, given the unpredictability inherent in litigation, we cannot predict or guarantee the outcome of these matters or any other litigation. Regardless of how these matters are ultimately resolved, these matters may be costly, time-consuming and distracting to our management, which could have a material adverse effect on our business.

In addition, periodic maintenance fees, renewal fees, annuity fees and various other governmental fees on patents and or applications will be due to the U.S. and various foreign patent offices at various points over the lifetime of our and our licensees' patents and/or applications. We have systems in place to remind us to pay these fees, and we rely on our outside patent annuity service to pay these fees when due. Additionally, the U.S. and various foreign patent offices require compliance with a number of procedural, documentary, fee payment and other similar provisions during the patent application process. We employ reputable law firms and other professionals to help us comply, and in many cases, an inadvertent lapse can be cured by payment of a late fee or by other means in accordance with rules applicable to the particular jurisdiction. However, there are situations in which noncompliance can result in abandonment or lapse of the patent or patent application, resulting in partial or complete loss of patent rights in the relevant jurisdiction. If such an event were to occur, it could have a material adverse effect on our business.

Any conflicts with the patent rights of others could significantly reduce the coverage of our patents or limit our ability to obtain meaningful patent protection. For example, our European patent related to Agglomerated forms of Captisol was limited during an opposition proceeding, and the rejection of our European patent application related to High Purity Captisol was upheld on appealed. In addition, any determination that our patent rights are invalid may result in early termination of our agreements with our license partners and could adversely affect our ability to enter into new license agreements. We also rely on unpatented trade secrets and know-how to protect and maintain our competitive position. We require our employees, consultants, licensees and others to sign confidentiality agreements when they begin their relationship with us. These agreements may be breached, and we may not have adequate remedies for any breach. In addition, our competitors may independently discover our trade secrets.

We may also need to initiate litigation, which could be time-consuming and expensive, to enforce our proprietary rights or to determine the scope and validity of others' rights. If this occurs, a court may find our patents or those of our licensors invalid or may find that we have infringed on a competitor's rights. In addition, if any of our competitors have filed patent applications in the United States which claim technology we also have invented, the United States Patent and Trademark Office may require us to participate in expensive interference proceedings to determine who has the right to a patent for the technology.

The occurrence of any of the foregoing problems could be time-consuming and expensive and could adversely affect our financial position, liquidity and results of operations.

We rely heavily on licensee relationships, and any disputes or litigation with our partners or termination or breach of any of the related agreements could reduce the financial resources available to us, including milestone payments and future royalty revenues.

Our existing collaborations may not continue or be successful, and we may be unable to enter into future collaborative arrangements to develop and commercialize our unpartnered assets. Generally, our current collaborative partners also have the right to terminate their collaborations at will or under specified circumstances. If any of our collaborative partners breach or terminate their agreements with us or otherwise fail to conduct their collaborative activities successfully (for example, by not making required payments when due, or at all), our product development under these agreements will be delayed or terminated. Disputes or litigation may also arise with our collaborators (with us and/or with one or more third parties), including those over ownership rights to intellectual property, know-how or

technologies developed with our collaborators. For example, we are asserting our rights to receive payment against one of our collaborative partners which could harm our relationship with such partner. Such disputes or litigation could adversely affect our rights to one or more of our product candidates and could delay, interrupt or terminate the collaborative research, development and commercialization of certain potential products, create uncertainty as to ownership rights of intellectual property, or could result in litigation or arbitration. In addition, a significant downturn or deterioration in the business or financial condition of our collaborators or partners could result in a loss of expected revenue and our expected returns on investment. The occurrence of any of these problems could be time-consuming and expensive and could adversely affect our business.

Our product candidates, and the product candidates of our partners, face significant development and regulatory hurdles prior to partnering and/or marketing which could delay or prevent licensing, sales-based royalties and/or milestone revenue.

Before we or our partners obtain the approvals necessary to sell any of our unpartnered assets or partnered programs, we must show through preclinical studies and human testing that each potential product is safe and effective. We and/or our partners have a number of partnered programs and unpartnered assets moving toward or currently awaiting regulatory action. Failure to show any product's safety and effectiveness could delay or prevent regulatory approval of a product and could adversely affect our business. The drug development and clinical trials process is complex and uncertain. For example, the results of preclinical studies and initial clinical trials may not necessarily predict the results from later large-scale clinical trials. In addition, clinical trials may not demonstrate a product's safety and effectiveness to the satisfaction of the regulatory authorities. A number of companies have suffered significant setbacks in advanced clinical trials or in seeking regulatory approvals, despite promising results in earlier trials. The FDA may also require additional clinical trials after regulatory approvals are received. Such additional trials may be expensive and time-consuming, and failure to successfully conduct those trials could jeopardize continued commercialization of a product.

The speed at which we and our partners complete our scientific studies and clinical trials depends on many factors, including, but not limited to, the ability to obtain adequate supplies of the products to be tested and patient enrollment. Patient enrollment is a function of many factors, including the size of the patient population, the proximity of patients to clinical sites, the eligibility criteria for the trial and other potential drug candidates being studied. Delays in patient enrollment for our or our partners' trials may result in increased costs and longer development times. In addition, our partners have rights to control product development and clinical programs for products developed under our collaborations. As a result, these partners may conduct these programs more slowly or in a different manner than expected. Moreover, even if clinical trials are completed, we or our partners still may not apply for FDA or foreign regulatory approval in a timely manner or the FDA or foreign regulatory authority still may not grant approval.

Our drug discovery, early-stage drug development, and product reformulation programs may require substantial additional capital to complete successfully. Our partner's drug development programs may require substantial additional capital to complete successfully, arising from costs to: conduct research, preclinical testing and human studies; establish pilot scale and commercial scale manufacturing processes and facilities; and establish and develop quality control, regulatory, marketing, sales and administrative capabilities to support these programs. While we expect to fund our research and development activities from cash generated from operations to the extent possible, if we are unable to do so, we may need to complete additional equity or debt financings or seek other external means of financing. These financings could depress our stock price. If additional funds are required to support our operations and we are unable to obtain them on terms favorable to us, we may be required to cease or reduce further development or commercialization of our products, to sell some or all of our technology or assets or to merge with another entity.

Our OmniAb antibody platform faces specific risks, including the fact that no drug using antibodies from the platform has yet advanced to late stage clinical trials.

None of our collaboration partners using our OmniAb antibody platform have tested drugs based on the platform in late stage clinical trials and, therefore, none of our OmniAb collaboration partners' drugs have received FDA approval. If one of our OmniAb collaboration partners' drug candidates fails during preclinical studies or clinical trials, our other OmniAb collaboration partners may decide to abandon drugs using antibodies generated from the OmniAb platform, whether or not attributable to the platform. All of our OmniAb collaboration partners may terminate their programs at any time without penalty. In addition, our OmniRat and OmniFlic platforms, which we consider the most promising, are covered by two patents within the U.S. and two patents in the European Union and are subject to the same risks as our patent portfolio discussed above, including the risk that our patents may infringe on third party patent rights or that our patents may be invalidated. Further, we face significant competition from other companies selling human

antibody-generating rodents, especially mice which compete with our OmniMouse platform, including the VelocImmune mouse, the AlivaMab mouse, the Trianni mouse and the Kymouse. Many of our competitors have greater financial, technical and human resources than we do and may be better equipped to develop, manufacture and market competing antibody platforms.

If plaintiffs bring product liability lawsuits against us or our partners, we or our partners may incur substantial liabilities and may be required to limit commercialization of our approved products and product candidates.

As is common in our industry, our partners and we face an inherent risk of product liability as a result of the clinical testing of our product candidates in clinical trials and face an even greater risk for commercialized products. Although we are not currently a party to product liability litigation, if we are sued, we may be held liable if any product or product candidate we develop causes injury or is found otherwise unsuitable during product testing, manufacturing, marketing or sale. Regardless of

merit or eventual outcome, liability claims may result in decreased demand for any product candidates, partnered products or products that we may develop, injury to our reputation, discontinuation of clinical trials, costs to defend litigation, substantial monetary awards to clinical trial participants or patients, loss of revenue and product recall or withdrawal from the market and the inability to commercialize any products that we develop. We have product liability insurance that covers our clinical trials up to a $10.0 million annual limit. Our insurance coverage may not be sufficient to cover all of our product liability related expenses or losses and may not cover us for any expenses or losses we may suffer. If we are sued for any injury caused by our product candidates, partnered products or any future products, our liability could exceed our total assets.

Market acceptance and sales of any approved product will depend significantly on the availability and adequacy of coverage and reimbursement from third-party payors and may be affected by existing and future healthcare reform measures.

Sales of the products we license to our collaboration partners and the royalties we receive will depend in large part on the extent to which coverage and reimbursement is available from government and health administration authorities, private health maintenance organizations and health insurers, and other healthcare payors. Significant uncertainty exists as to the reimbursement status of healthcare products. Healthcare payors, including Medicare, are challenging the prices charged for medical products and services. Government and other healthcare payors are increasingly attempting to contain healthcare costs by limiting both coverage and the level of reimbursement for medical products. Even if a product is approved by the FDA, insurance coverage may not be available, and reimbursement levels may be inadequate, to cover the costs associated with the research, development, marketing and sale of the product. If government and other healthcare payors do not provide adequate coverage and reimbursement levels for any product, market acceptance and any sales could be reduced.

From time to time, legislation is implemented to reign in rising healthcare expenditures. By way of example, in March 2010, the Patient Protection and Affordable Care Act, as amended by the Health Care and Education Reconciliation Act, or collectively, the ACA, was enacted, which included a number of provisions affecting the pharmaceutical industry, including, among other things, annual, non-deductible fees on any entity that manufactures or imports some types of branded prescription drugs and increases in Medicaid rebates owed by manufacturers under the Medicaid Drug Rebate Program. Since its enactment, there have been judicial and Congressional challenges to certain aspects of the ACA, and we expect there will be additional challenges and amendments to the ACA in the future.

Other legislative changes have been proposed and adopted since the ACA was enacted, including aggregate reductions of Medicare payments to providers of 2% per fiscal year and reduced payments to several types of Medicare providers. Moreover, there has recently been heightened governmental scrutiny over the manner in which manufacturers set prices for their marketed products, which has resulted in several Congressional inquiries and proposed bills designed to, among other things, bring more transparency to product pricing, review the relationship between pricing and manufacturer patient programs, and reform government program reimbursement methodologies for drug products. Individual states in the United States have also become increasingly active in 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. We cannot predict whether other legislative changes will be adopted, if any, or how such changes would affect our operations or financial condition.

We and our collaboration partners may be subject to federal and state healthcare laws, including fraud and abuse, false claims, physician payment transparency and health information privacy and security laws. Our operations and those of our collaboration partners are subject to various federal and state fraud and abuse laws, including, without limitation, anti-kickback, false claims and physician payment transparency statutes. These laws may impact, among other things, financial arrangements with physicians, sales, marketing and education programs and the manner in which any of

those activities are implemented. In addition, we may be subject to federal and state patient privacy regulations. If our operations or those of our collaboration partners are found to be in violation of any of those laws or any other applicable governmental regulations, we or our collaboration partners may be subject to penalties, including civil and criminal penalties, damages, fines, imprisonment, exclusion from government healthcare programs or the curtailment or restructuring of operations, any of which could adversely affect our ability to operate our business and our financial condition.

Changes in funding for the FDA and other government agencies could hinder their ability to hire and retain key leadership and other personnel, or otherwise prevent new products and services from being developed or commercialized in a timely manner, which could negatively impact our business or the business of our partners.

The ability of the FDA to review and approve new products can be affected by a variety of factors, including government budget and funding levels, ability to hire and retain key personnel and accept the payment of user fees, and statutory, regulatory,

and policy changes. Average review times at the agency have fluctuated in recent years as a result. In addition, government funding of other government agencies that fund research and development activities is subject to the political process, which is inherently fluid and unpredictable.

Disruptions at the FDA and other agencies may also slow the time necessary for new drugs to be reviewed and/or approved by necessary government agencies, which would adversely affect our business or the business of our partners. For example, over the last several years, including for 35 days beginning on December 22, 2018, the U.S. government has shut down several times and certain regulatory agencies, such as the FDA, have had to furlough critical FDA employees and stop critical activities. If a prolonged government shutdown occurs, it could significantly impact the ability of the FDA to timely review and process our regulatory submissions, which could have a material adverse effect on our business. If the timing of FDA's review and approval of new products is delayed, the timing of our or our partners' development process may be delayed which would result in delayed milestone revenues and materially harm our operations of business.

Any difficulties from strategic acquisitions could adversely affect our stock price, operating results and results of operations.

We may acquire companies, businesses and products that complement or augment our existing business. We may not be able to integrate any acquired business successfully or operate any acquired business profitably. Integrating any newly acquired business could be expensive and time-consuming. Integration efforts often take a significant amount of time, place a significant strain on managerial, operational and financial resources and could prove to be more difficult or expensive than we predict. The diversion of our management's attention and any delay or difficulties encountered in connection with any future acquisitions we may consummate could result in the disruption of our ongoing business or inconsistencies in standards and controls that could negatively affect our ability to maintain third-party relationships. Moreover, we may need to raise additional funds through public or private debt or equity financing, or issue additional shares, to acquire any businesses or products, which may result in dilution for stockholders or the incurrence of indebtedness.

As part of our efforts to acquire companies, business or product candidates or to enter into other significant transactions, we conduct business, legal and financial due diligence with the goal of identifying and evaluating material risks involved in the transaction. Despite our efforts, we ultimately may be unsuccessful in ascertaining or evaluating all such risks and, as a result, might not realize the intended advantages of the transaction. If we fail to realize the expected benefits from acquisitions we may consummate in the future or have consummated in the past, whether as a result of unidentified risks, integration difficulties, regulatory setbacks, litigation with current or former employees and other events, our business, results of operations and financial condition could be adversely affected. If we acquire product candidates, we will also need to make certain assumptions about, among other things, development costs, the likelihood of receiving regulatory approval and the market for such product candidates. Our assumptions may prove to be incorrect, which could cause us to fail to realize the anticipated benefits of these transactions.

In addition, we will likely experience significant charges to earnings in connection with our efforts, if any, to consummate acquisitions. For transactions that are ultimately not consummated, these charges may include fees and expenses for investment bankers, attorneys, accountants and other advisors in connection with our efforts. Even if our efforts are successful, we may incur, as part of a transaction, substantial charges for closure costs associated with elimination of duplicate operations and facilities and acquired IPR&D charges. In either case, the incurrence of these charges could adversely affect our results of operations for particular quarterly or annual periods.

Changes or modifications in financial accounting standards, including those related to revenue recognition, may harm our results of operations.

From time to time, the FASB either alone or jointly with other organizations, promulgates new accounting principles that could have an adverse impact on our results of operations. For example, in May 2014, FASB issued a new accounting standard for revenue recognition-Accounting Standards Codification Topic 606, Revenue from Contracts with Customers, or ASC 606-that supersedes most current revenue recognition guidance. The new guidance requires a company to recognize revenue upon transfer of goods or services to a customer at an amount that reflects the expected consideration to be received in exchange for those goods or services. The new guidance became effective in fiscal 2018.

This standard has a material impact on our consolidated financial statements by accelerating the timing of revenue recognition for revenues related to royalties, and potentially certain contingent milestone based payments. Our practice has been to book royalties one quarter after our partners report sales of the underlying product. Now, under ASC 606, Ligand estimates and books royalties in the same quarter that our partners report the sale of the underlying product. As a result, we now book royalties one quarter earlier compared to our past practice. We rely on our partners' earning releases and other information from our partners to determine the sales of our partners' products and to estimate the related royalty revenues. If our partners report

incorrect sales, or if our partners delay reporting of their earnings release, our royalty estimates may need to be revised and/or our financial reporting may be delayed.

Any difficulties in implementing this guidance could cause us to fail to meet our financial reporting obligations, which could result in regulatory discipline and harm investors' confidence in us. Finally, if we were to change our critical accounting estimates, including those related to the recognition of license revenue and other revenue sources, our operating results could be significantly affected.

Uncertainties in the interpretation and application of the 2017 Tax Cuts and Jobs Act could materially affect our tax obligations and effective tax rate.

The 2017 Tax Cuts and Jobs Act (the Tax Act) was enacted on December 22, 2017, and significantly affected U.S. tax law, including by changing how the U.S. imposes tax on certain types of income of corporations and by reducing the general U.S. corporate income tax rate. The U.S. Department of Treasury has broad authority to issue regulations and interpretative guidance that may significantly impact how we will apply the law and impact our results of operations in the period issued.

The Tax Act requires certain complex computations not previously provided in U.S. tax law. As such, the application of accounting guidance for such items is currently uncertain. Further, compliance with the Tax Act and the accounting for such provisions require accumulation of certain information not previously required or regularly produced. As a result, we have provided a provisional estimate on the effect of the Tax Act in our financial statements. As additional and other regulatory guidance is issued by the applicable taxing authorities, as accounting treatment is clarified, as we perform additional analysis on the application of the law, and as we refine estimates in calculating the effect, our final analysis, which will be recorded in the period completed, may be different from our current provisional amounts, which could materially affect our tax obligations and effective tax rate.

Our ability to use our net operating loss carryforwards and certain other tax attributes to offset future taxable income may be subject to certain limitations.

As of December 31, 2018, we had U.S. federal and state net operating loss carryforwards (NOLs) of approximately $229.9 million and $125.3 million, respectively, which expire through 2037, if not utilized. Under the Tax Act, any federal NOLs arising in taxable years ending after December 31, 2017 will carry forward indefinitely. As of December 31, 2018, we had federal and California research and development tax credit carryforwards of approximately $23.0 million and $22.7 million, respectively. The federal research and development tax credit carryforwards expire in various years through 2037, if not utilized. The California research and development credit will carry forward indefinitely. Under Sections 382 and 383 of Internal Revenue Code of 1986, as amended (Code) if a corporation undergoes an "ownership change," the corporation's ability to use its pre-change NOLs and other pre-change tax attributes, such as research tax credits, to offset its future post-change income and taxes may be limited. In general, an "ownership change" occurs if there is a cumulative change in our ownership by "5% shareholders" that exceeds 50 percentage points over a rolling three-year period. Similar rules may apply under state tax laws. We believe we have experienced certain ownership changes in the past and have reduced our deferred tax assets related to NOLs and research and development tax credit carryforwards accordingly. In the event that it is determined that we have in the past experienced additional ownership changes, or if we experience one or more ownership changes as a result future transactions in our stock, then we may be further limited in our ability to use our NOLs and other tax assets to reduce taxes owed on the net taxable income that we earn in the event that we attain profitability. Furthermore, under the Tax Act, although the treatment of tax losses generated in tax years beginning before December 31, 2017 has generally not changed, tax losses generated in tax years beginning after December 31, 2017 may only offset 80% of our taxable income. This change may require us to pay federal income taxes in future years despite having potentially generated a loss for federal income tax purposes in prior years. Any such limitations on the ability to use our NOLs and other tax assets could adversely impact our business, financial condition and operating

results.

We rely on information technology and any failure, inadequacy, interruption or security lapse of that technology, including any cyber security incidents, could harm our ability to operate our business effectively.

Our business is increasingly dependent on critical, complex and interdependent information technology systems, including internet-based systems, to support business processes as well as internal and external communications. Despite the implementation of security measures, our internal computer systems and those of our partners are vulnerable to damage from cyber-attacks, computer viruses, security breaches, unauthorized access, natural disasters, terrorism, war and telecommunication and electrical failures. System failures, accidents or security breaches could cause interruptions in our operations, could lead to the loss of trade secrets or other intellectual property, could lead to the public exposure of personal information of our employees and others, and could result in a material disruption of our clinical and commercialization activities and business operations, in addition to possibly requiring substantial expenditures to remedy. To the extent that any disruption or security breach were to result in a loss of, or damage to, our data or applications, or inappropriate disclosure of confidential or proprietary information, we could incur liability and our business and financial condition could be harmed.

The occurrence of a catastrophic disaster could damage our facilities beyond insurance limits or we could lose key data which could cause us to curtail or cease operations.

We are vulnerable to damage and/or loss of vital data from natural disasters, such as earthquakes, tornadoes, power loss, fire, floods and similar events, as well as from accidental loss or destruction. If any disaster were to occur, our ability to operate our business could be seriously impaired. We have property, liability, and business interruption insurance which may not be adequate to cover our losses resulting from disasters or other similar significant business interruptions, and we do not plan to purchase additional insurance to cover such losses due to the cost of obtaining such coverage. Any significant losses that are not recoverable under our insurance policies could seriously impair our business, financial condition and prospects.

Conversion of our outstanding convertible notes may result in losses, result in the dilution of existing stockholders, create downward pressure on the price of our common stock, and restrict our ability to take advantage of future opportunities.

In August 2014, we issued $245.0 million principal amount of the 2019 Notes and in May 2018, we issued $750.0 million principle amount of the 2023 Notes. The sale of the 2019 Notes and 2023 Notes may affect our earnings per share figures, as accounting procedures require that we include in our calculation of earnings per share the number of shares of our common stock into which the 2019 Notes and 2023 Notes are convertible. The convertible notes may be converted into cash and shares of our common stock, if any (subject to our right or obligation to pay cash in lieu of all or a portion of such shares). If shares of our common stock are issued to the holders of the convertible notes upon conversion, there will be dilution to our shareholders equity and the market price of our shares may decrease due to the additional selling pressure in the market. Any downward pressure on the price of our common stock caused by the sale or potential sale of shares issuable upon conversion of the convertible notes could also encourage short sales by third parties, creating additional selling pressure on our stock. Upon the occurrence of certain circumstances, holders of the convertible notes may require us to purchase all or a portion of their notes for cash, which may require the use of a substantial amount of cash. In addition, we must use cash to settle the principal and any premium due upon conversion of the 2019 Notes for any conversion notices received on or after May 22, 2018. If such cash is not available, we may be required to sell other assets or enter into alternate financing arrangements at terms that may or may not be desirable. The existence of the convertible notes and the obligations that we incurred by issuing them may restrict our ability to take advantage of certain future opportunities, such as engaging in future debt or equity financing activities.

As of December 31, 2018, we had $27.3 million aggregate principal amount of 2019 Notes, and $750.0 million aggregate principal amount of 2023 Notes. The notes are convertible into cash, and if applicable, shares of our

common stock under certain circumstances, including trading price conditions related to our common stock. Upon conversion, we are required to record a gain or loss for the difference between the fair value of the notes to be extinguished and their corresponding net carrying value. The fair value of the notes to be extinguished depends on our current incremental borrowing rate. If our incremental borrowing rate at the time of conversion is lower than the implied interest rate of the notes, we will record a loss in our consolidated statement of income during the period in which the notes are converted.

Impairment charges pertaining to goodwill, identifiable intangible assets or other long-lived assets from our mergers and acquisitions could have an adverse impact on our results of operations and the market value of our common stock.

The total purchase price pertaining to our acquisitions in recent years of Vernalis, CyDex, Metabasis, Pharmacopeia, Neurogen, OMT and Crystal have been allocated to net tangible assets, identifiable intangible assets, in-process research and development and goodwill. To the extent the value of goodwill or identifiable intangible assets or other long-lived assets

become impaired, we will be required to incur material charges relating to the impairment. Any impairment charges could have a material adverse impact on our results of operations and the market value of our common stock.

Our charter documents and concentration of ownership may hinder or prevent change of control transactions.

Provisions contained in our certificate of incorporation and bylaws may discourage transactions involving an actual or potential change in our ownership. In addition, our Board of Directors may issue shares of common or preferred stock without any further action by the stockholders. Our directors and certain of our institutional investors collectively beneficially own a significant portion of our outstanding common stock. Such provisions and issuances may have the effect of delaying or preventing a change in our ownership. If changes in our ownership are discouraged, delayed or prevented, it would be more difficult for our current Board of Directors to be removed and replaced, even if you or our other stockholders believe that such actions are in the best interests of us and our stockholders.

Our stock price has been volatile and could experience a sudden decline in value.

The market prices for securities of biotechnology and pharmaceutical companies have historically been highly volatile, and the market has recently experienced significant price and volume fluctuations that are unrelated to the operating performance of particular companies. Continued volatility in the overall capital markets could reduce the market price of our common stock in spite of our operating performance. Further, high stock price volatility could result in higher share-based compensation expense.

Our common stock has experienced significant price and volume fluctuations and may continue to experience volatility in the future. Many factors may have a significant impact on the market price of our common stock, including, but not limited to, the following factors: results of or delays in our preclinical studies and clinical trials; the success of our collaboration agreements; publicity regarding actual or potential medical results relating to products under development by us or others; announcements of technological innovations or new commercial products by us or others; developments in patent or other proprietary rights by us or others; comments or opinions by securities analysts or major stockholders or changed securities analysts' reports or recommendations; future sales or shorting of our common stock by existing stockholders; regulatory developments or changes in regulatory guidance; litigation or threats of litigation; economic and other external factors or other disaster or crises; the departure of any of our officers, directors or key employees; period-to-period fluctuations in financial results; and price and volume fluctuations in the overall stock market.

Our results of operations and liquidity needs could be materially negatively affected by market fluctuations and economic downturn.

Our results of operations could be materially negatively affected by economic conditions generally, both in the United States and elsewhere around the world. Concerns over inflation, energy costs, geopolitical issues, the availability and cost of credit, and the U.S. financial markets have in the past contributed to, and may continue in the future to contribute to, increased volatility and diminished expectations for the economy and the markets. Domestic and international equity markets periodically experience heightened volatility and turmoil. These events may have an adverse effect on us. In the event of a market downturn, our results of operations could be adversely affected by those factors in many ways, including making it more difficult for us to raise funds if necessary, and our stock price may further decline. We cannot provide assurance that our investments are not subject to adverse changes in market value. If our investments experience adverse changes in market value, we may have less capital to fund our operations.

Item 1B. Unresolved Staff

Comments

None.

Item 2. Properties

We currently lease premises consisting of approximately 5,000 square feet of office space in San Diego which serves as our corporate headquarters. The lease expires in April 2023.

We lease approximately 1,500 square feet of laboratory space located at the Bioscience and Technology Business Center in Lawrence, Kansas. The lease expires in December 2020.

We lease approximately 13,000 square feet of office and laboratory space located in Emeryville, California. The lease expires in August 2021.
In connection with the Vernalis acquisition in October 2018, we lease approximately 28,000 square feet of office and laboratory space located in Cambridge, United Kingdom. The lease expires in September 2019, and we are currently working with the landlord on potential renewal options.

Item 3. Legal Proceedings

See "*Item 8. Financial Statements and Supplementary Data—Notes to Consolidated Financial Statements—Note (9), Commitments and Contingencies—Legal Proceedings.*"

Item 4. Mine Safety Disclosures

Not applicable.

PART II

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

Our common stock is traded on the Nasdaq Global Market under the symbol "LGND." As of February 15, 2019, there were approximately 523 holders of record of the common stock.

Except for 2007, during which we declared a cash dividend on our common stock of $2.50 per share, we have not paid any dividends on our common stock in the past and currently do not expect to pay cash dividends or make any other distributions on common stock in the future. We expect to retain our future earnings, if any, for use in the operation and expansion of our business, to pay down debt and potentially for share repurchases. Any future determination to pay dividends on common stock will be at the discretion of our board of directors and will depend upon our financial condition, results of operations, capital requirements and such other factors as the board deems relevant.

The following table presents information regarding repurchases by us of our common stock during the three months ended December 31, 2018 under the stock repurchase program approved by our board of directors in September 2018, under which we may acquire up to $200 million of our common stock in open market and negotiated purchases for a period of up to three years.

ISSUER PURCHASES OF EQUITY SECURITIES

	Total Number of Shares Purchased	Average Price Paid Per Share		Total Number of Shares Purchased as Part of Publicly Announced Plans or Programs	Maximum Dollar Value of Shares that May Yet Be Purchased Under the Program (in thousands)	
October 1 - October 31, 2018	—	$	—	—	$	200,000
November 1 - November 30, 2018	295,210	$	152.83	295,210	$	154,883
December 1 - December 31, 2018	208,038	$	142.46	208,038	$	125,246
Total	503,248	$	148.54	503,248		

On January 23, 2019, the board of directors elected to increase the existing $200 million share repurchase program, authorizing us to repurchase up to a maximum of $350 million of its outstanding common stock under the repurchase program. The repurchase program will expire, as originally scheduled, on September 20, 2021. Since December 31, 2018 and as of February 28, 2019, we acquired 400,177 additional shares during 2019, and the maximum dollar value of shares that may yet be purchased under the repurchase program was $225.9 million.

In addition, in May 2018, we issued the 2023 Notes with an aggregate principal amount of $750.0 million. A portion of the proceeds from such issuance totaling $49.7 million were used to repurchase 260,000 shares of our common stock.

The information required by Item 201(d) of Regulation S-K is incorporated by reference to the 2019 Annual Meeting Proxy Statement as defined in Item 10 below.

Performance Graph

The graph below shows the five-year cumulative total stockholder return assuming the investment of $100 and is based on the returns of the component companies weighted monthly according to their market capitalizations. The graph compares total stockholder returns of our common stock, of all companies traded on the Nasdaq Stock market, as represented by the Nasdaq Composite® Index, and of the Nasdaq Biotechnology Stock Index, as prepared by The Nasdaq Stock Market Inc.

The stockholder return shown on the graph below is not necessarily indicative of future performance and we will not make or endorse any predictions as to future stockholder returns.

	12/31/2013	12/31/2014	12/31/2015	12/31/2016	12/31/2017	12/31/2018
Ligand	$ 100.00	$ 101.16	$ 206.12	$ 193.17	$ 260.32	$ 257.98
NASDAQ Composite-Total Return	$ 100.00	$ 114.75	$ 122.74	$ 133.62	$ 173.22	$ 168.30
NASDAQ Biotechnology Index	$ 100.00	$ 134.40	$ 150.22	$ 118.15	$ 143.74	$ 131.00

Item 6. Selected Consolidated Financial Data

The following selected historical consolidated financial and other data are qualified by reference to, and should be read in conjunction with, our consolidated financial statements and the related notes thereto appearing elsewhere herein and "Management's Discussion and Analysis of Financial Condition and Results of Operations." Our selected statement of operations data set forth below for each of the years ended December 31, 2018, 2017, 2016, 2015 and 2014 and the balance sheet data as of December 31, 2018, 2017, 2016, 2015 and 2014 are derived from our consolidated financial statements.

	Year Ended December 31,				
	2018	2017	2016	2015	2014
Consolidated Statements of Operations Data:		(in thousands, except per share amounts)			
Royalties	$ 128,556	$ 88,685	$ 59,423	$ 38,194	$ 29,994
Material sales	29,123	22,070	22,502	27,662	28,488
License fees, milestones, and other revenues	93,774	30,347	27,048	6,058	6,056
Total revenues	251,453	141,102	108,973	71,914	64,538
Cost of material sales	6,337	5,366	5,571	5,807	9,136
Amortization of intangibles	15,792	12,120	10,643	2,375	2,375
Research and development	27,863	26,887	21,221	11,005	9,747
General and administrative	37,734	28,653	27,653	25,398	23,654
Total operating costs and expenses	87,726	73,026	65,088	44,585	44,912
Income from operations	163,727	68,076	43,885	27,329	19,626
Income (loss) from continuing operations including noncontrolling interests	143,321	12,556	(2,367)	227,444	10,892
Loss attributable to	—	—	—	(2,380)	(1,132)

noncontrolling interests								
Income (loss) from continuing operations	143,321		12,556		(2,367)		229,824		12,024	
Discontinued operations	—		—		731		—		—	
Net income (loss)	143,321		12,556		(1,636)		229,824		12,024	
Basic per share amounts:										
Income (loss) from continuing operations	$	6.77	$	0.60	$	(0.11)	$	11.61	$	0.59
Discontinued operations	—		—		0.04		—		—	
Net income (loss)	$	6.77	$	0.60	$	(0.08)	$	11.61	$	0.59
Weighted average number of common shares-basic	21,160		21,032		20,831		19,790		20,419	
Diluted per share amounts:										
Income (loss) from continuing operations	$	5.96	$	0.53	$	(0.11)	$	10.83	$	0.56
Discontinued operations	—		—		0.04		—		—	
Net income (loss)	$	5.96	$	0.53	$	(0.08)	$	10.83	$	0.56
Weighted average number of common shares-diluted	24,067		23,481		20,831		21,228		21,433	

	December 31, 2018	2017	2016	2015	2014
	(in thousands)				
Consolidated Balance Sheet Data:					
Cash, cash equivalents, short-term investments, restricted cash and investments	$ 767,188	208,099	$ 149,393	$ 229,947	$ 168,597
Working capital (deficit)	788,291	(1,847)	(64,076)	(8,109)	162,379
Total assets	1,260,803	671,021	601,585	503,061	258,029
Other long-term obligations (excludes long-term portions of deferred revenue, net and deferred gain)	7,776	9,981	3,603	3,330	208,757
Total notes payable, net (including current portion)	636,297	224,529	212,910	201,985	195,908
Accumulated deficit	(229,197)	(400,924)		(429,491)	(659,315)
Total stockholders' equity	560,914	399,788	341,290	237,282	26,318

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

Our Management's Discussion and Analysis of Financial Condition and Results of Operations (MD&A) will help readers understand our results of operations, financial condition, and cash flow. It is provided in addition to the accompanying consolidated financial statements and notes. This MD&A is organized as follows:
•*Results of Operations.* Detailed discussion of our revenue and expenses.
•*Liquidity and Capital Resources.* Discussion of key aspects of our consolidated statements of cash flows, changes in our financial position, and our financial commitments.
•*Off-Balance Sheet Arrangements.* We have no off-balance sheet arrangements.
•*Contractual Obligations.* Tabular disclosure of known contractual obligations as of December 31, 2018.
•*Critical Accounting Policies and Estimates.* Discussion of significant changes we believe are important to understand the assumptions and judgments underlying our consolidated financial statements.
•*Recent AccountingPronouncements.* For summary of recent accounting pronouncements applicable to our consolidated financial statements, see "*Item 8. Financial Statements and Supplementary Data—Notes to Consolidated Financial Statements—Note (1), Basis of Presentation and Summary of Significant Accounting Policies*."

Results of Operations

Revenue

(Dollars in thousands)	2018	2017	Change	% Change	2016	Change	% Change
Royalty Revenue	$ 128,556	$ 88,685	$ 39,871	45%	$ 59,423	$ 29,262	49%
Material Sales	29,123	22,070	7,053	32%	22,502	(432)	(2)%
License fees, milestones and other revenue	93,774	30,347	63,427	209%	27,048	3,299	12%
Total revenue	$ 251,453	$ 141,102	$ 110,351	78%	$ 108,973	$ 32,129	29%

We adopted ASC 606, the new revenue standard, in the first quarter of 2018 and now recognize royalties on sales of products commercialized by our partners in the quarter the product is sold as opposed to on a one-quarter lag as previously recognized under ASC 605, the legacy revenue standard. The results for the reporting periods beginning after January 1, 2018 are presented in accordance with the new standard, although comparative information has not been restated and continues to be reported under the accounting standards and policies in effect for those periods.

Royalty revenue is a function of our partners' product sales and the applicable royalty rate. Promacta and Kyprolis royalty rates are under a tiered royalty rate structure with the highest tier being 9.4% and 3.0%, respectively. Evomela has a fixed royalty rate of 20%.

Total revenue for 2018 increased $110.4 million or 78% compared with 2017 and for 2017 it increased $32.1 million or 29% compared with 2016.

Royalty revenue increased in each year presented primarily due to an increase in sales by our partners of Promacta and Kyprolis. Material sales increased year over year in 2018 due to timing of customer purchases of Captisol for use in clinical trials and in commercialized products. The increase in license fee, milestones and other revenues in 2018 compared to 2017 is primarily driven by a $47.0 million OmniAb platform license fee received from WuXi and $20.0 million received from Roivant upon entering into the GRA license agreement to develop and commercialize RVT-1502 (formerly named LGD-6972). The increase in license fees, milestones and other revenues in 2017 compared to 2016 was primarily due to OmniAb license fees and milestone payments.

The following table represents royalty revenue by program under the new (ASC 606) and prior (ASC 605) revenue standard:

(in millions)	2018 Estimated Partner Product Sales	Effective Royalty Rate	2018 Royalty Revenue under ASC 606	2018 Product Sales reported on quarter lag	Effective Royalty Rate	2018 Royalty Revenue under ASC 605	2017 Product Sales reported on quarter lag	Effective Royalty Rate	2017 Royalty Revenue under ASC 605
Promacta	$ 1,173.4	8.5%	$ 99.3	$ 1,098.4	8.4%	$ 92.3	$ 787.6	8.0%	$ 62.9
Kyprolis	980.5	2.2%	21.7	947.5	2.2%	20.9	817.0	2.0%	16.4
Evomela	28.1	20.0%	5.7	28.6	20.0%	5.7	35.8	20.0%	7.2
Other	163.5	1.2%	1.9	162.0	1.3%	2.1	155.7	1.4%	2.2
Total	$ 2,345.5		$ 128.6	$ 2,236.5		$ 121.0	$ 1,796.1		$ 88.7

Operating Costs and Expenses

(Dollars in thousands)	2018	2017	Change	% Change	2016	Change	% Change
Cost of material sales	$ 6,337	$ 5,366	$ 971	18%	$ 5,571	$ (205)	(4)%
Amortization of intangibles	15,792	12,120	3,672	30%	10,643	1,477	14%
Research and development	27,863	26,887	976	4%	21,221	5,666	27%
General and administrative	37,734	28,653	9,081	32%	27,653	1,000	4%
Total operating costs and expenses	$ 87,726	$ 73,026	$ 14,700	20%	$ 65,088	$ 7,938	12%

Total operating costs and expenses for 2018 increased $14.7 million or 20% compared with 2017, while total operating costs and expenses as a percentage of revenue decreased in 2018 as compared to 2017. Cost of material sales increased year over year in 2018 primarily due to higher material sales as a result of timing of customer purchases. Amortization of intangibles increased year over year in 2018 due primarily due to the Crystal acquisition in

the fourth quarter of 2017, the Vernalis acquisition in the fourth quarter of 2018 and amortization of previous indefinite lived IPR&D assets that were out-licensed or impaired. General and administrative expenses increased year over year in 2018 primarily due to increased business development activities, an increase in share-based compensation and the Vernalis acquisition.

Total operating costs and expenses for 2017 increased $7.9 million or 12% compared with 2016, while the total operating costs and expenses as a percentage of revenue decreased in 2017 as compared to 2016. Cost of material sales decreased year over year in 2017 primarily due to lower material sales as a result of timing of customer purchases. Amortization of intangibles increased year over year in 2017 due primarily to the acquisition of Crystal in October 2017. Research and development expenses and general and administrative expenses increased year over year in 2017 due primarily to increased business development activities, timing of internal development costs and increased share-based compensation expense and headcount related expenses associated with Crystal.

We do not provide forward-looking estimates of costs and time to complete our ongoing research and development projects as such estimates would involve a high degree of uncertainty. Uncertainties include our inability to predict the outcome of research and clinical studies, regulatory requirements placed upon us by regulatory authorities such as the FDA and EMA, our inability to predict the decisions of our partners, our ability to fund research and development programs, competition from other entities of which we may become aware in future periods, predictions of market potential for products that may be derived from our work, and our ability to recruit and retain personnel or third-party contractors with the necessary knowledge and skills to perform certain research. Refer to "*Item 1A. Risk Factors*" for additional discussion of the uncertainties surrounding our research and development initiatives.

Other income (expense)

(Dollars in thousands)	2018	2017	Change	% Change	2016	Change	% Change
Gain (loss) from Viking	50,187	(2,048)	52,235	(2,551)%	(23,132)	21,084	(91)%
Interest income	13,999	2,060	11,939	580%	664	1,396	210%
Interest expense	(48,276)	(13,460)	(34,816)	259%	(12,842)	(618)	5%
Other (expense) income, net	(6,307)	2,603	(8,910)	(342)%	(615)	3,218	(523)%
Total other income (expense,) net	$ 9,603	$ (10,845)	$ 20,448	(189)%	$ (35,925)	$ 25,080	(70)%

In the first quarter of 2018, we discontinued accounting for our ownership interest in Viking common stock under the equity method and now account for Viking as an equity security with changes in the fair value of Viking common stock recorded as "Gain (loss) from Viking." The increase in gain (loss) from Viking is a result of a $42.4 million unrealized gain recorded in 2018. In addition, gain (loss) from Viking in 2018 includes a realized gain of $2.5 million resulting from the sale of Viking shares as well as an unrealized gain relating to an increase in the market value of Viking warrants held by us of $5.4 million.

In 2017, we recorded a $4.7 million loss from Viking for our proportionate share of Viking's losses based on our ownership of Viking common stock and a $2.9 million gain on dilution resulting from Viking's financings. In 2016, we recorded a $5.0 million loss from Viking for our proportionate share of Viking's losses based on our ownership of Viking common stock and $10.7 million for loss on dilution resulting from Viking's financing. Additionally, we recorded an impairment charge in 2016 of $7.4 million relating to our investment in Viking.

Interest income consists primarily of short-term investment transactions and the change in fair market value of the investments. The increase over the prior periods presented is due to the increase in our short-term investment balances which, in the current year, is a result of the 2023 Notes financing on May 22, 2018.

Interest expense includes the 0.75% coupon cash interest expense in addition to the $44.0 million non-cash

accretion of discount on our 2019 Notes and 2023 Notes for the year ended December 31, 2018. The increase from prior year is primarily due to the issuance of the 2023 Notes in May 2018 and a $3.2 million loss on debt extinguishment resulting from the settlement of a portion of our 2019 Notes in 2018. See "*Item 8. Financial Statements and Supplementary Data—Notes to Consolidated Financial Statements—Note (6), Convertible Senior Notes.*"

The increase in Other income (expense), net, in 2018 as compared to the prior year is due primarily to the increase in the fair value of contingent liabilities associated with our Metabasis acquisition and a net increase in our derivative instrument expense associated with our convertible notes and hedge transactions. See "*Item 8. Financial Statements and Supplementary Data—Notes to Consolidated Financial Statements—Note (6), Convertible Senior Notes.*" The year over year variance in Other expense (income), net, in 2017 as compared to 2016 is due to an increase in the fair value of the Viking note receivable and gain on the sale of short-term investments.

Income tax expense

(Dollars in thousands)	2018	2017	Change	% Change	2016	Change	% Change
Income before income tax expense	$ 173,330	$ 57,231	$ 116,099	203%	$7,960	$ 49,271	619%
Income tax expense	(30,009)	(44,675)	14,666	(33)%	(10,327)	(34,348)	333%
Income (loss) from operations	$ 143,321	$ 12,556	$ 130,765	1,041%	$(2,367)	$ 14,923	(630)%
Effective Tax Rate	17 %	78 %			130%		

Our effective tax rate for 2018, 2017 and 2016 was 17%, 78%, and 130%, respectively. Our tax rate is affected by recurring items, such as the U.S. federal and state statutory tax rates and the relative amounts of income we earn in those jurisdictions, which we expect to be fairly consistent in the near term. It is also affected by discrete items that may occur in any given year, but are not consistent from year to year. In addition to state income taxes, the items below had the most significant impact on the difference between our statutory U.S. income tax rate and our effective tax rate.

2018

•$8.1 million (5%) decrease due to excess tax benefits from share-based compensation which are recorded as a discrete item within the provision for income tax pursuant to ASU 2016-09
•$4.2 million (2%) decrease due to changes in valuation allowance primarily relating to capital loss carryovers and research and development tax credits.
•$3.1 million (2%) increase from expired NOLs and credits
•$2.8 million (2%) reduction from research and development tax credits
•$0.9 million (1%) increase from non-cash contingent consideration charges that are nondeductible for tax purposes
•$0.9 million (1%) increase from Section 162(m) limitation

2017

•$32.4 million (55%) increase due to the provisional estimated impact of the Tax Act and primarily due to the impact of revaluing our U.S. deferred tax assets and liabilities based on the statutory rates at which they are expected to be recognized in the future, which for federal purposes was reduced from 35% to 21%
•$4.0 million (7%) decrease due to excess tax benefits from share-based compensation which are recorded as a discrete item within the provision for income tax pursuant to ASU 2016-09
•$4.2 million (7%) reduction due to decrease in valuation allowance primarily relating to our Viking deferred tax asset and change in corporate tax rates under the Tax Act
•$2.8 million (5%) reduction from research and development tax credits
•$1.3 million (2%) increase in uncertain tax positions
•$0.9 million (2%) increase from non-cash contingent consideration charges that are nondeductible for tax purposes

2016

•$6.3 million (79%) increase in valuation allowance primarily relating to Viking deferred tax asset

•$1.4 million (18%) increase in uncertain tax positions
•$1.2 million (15%) increase from non-cash contingent consideration charges that are nondeductible for tax purposes
•$1.5 million (19%) reduction from research and development credits

Discontinued operations

In 2006, we entered into a purchase agreement with Eisai pursuant to which Eisai agreed to acquire our Oncology product line which included four marketed oncology drugs: ONTAK, Targretin capsules, Targretin gel and Panretin gel. Certain liabilities were recorded associated with the disposal of the product line. During the year ended December 31, 2016, we recognized a $1.1 million gain due to subsequent changes in certain estimates and liabilities previously recorded. We recorded a provision for income taxes related to the gain of $0.4 million.

Liquidity and Capital Resource

At December 31, 2018, we had approximately $117.2 million in cash and cash equivalents, of which approximately $7.5 million was held by our foreign subsidiaries. Cash and cash equivalents increased by $96.5 million from last year, due to factors described in the "Cash Flow Summary" below. Our primary source of liquidity, other than our holdings of cash, cash equivalents, and investments, has been cash flows from operations. Our ability to generate cash from operations provides us with the financial flexibility we need to meet operating, investing, and financing needs.

Historically, we have liquidated our short-term investments and/or issued debt and equity securities to finance our business needs as a supplement to cash provided by operating activities. As of December 31, 2018, we had $601.2 million in short-term investments. Our short-term investments include U.S. government debt securities, investment-grade corporate debt securities and certificates of deposit. We have established guidelines relative to diversification and maturities of our investments in order to provide both safety and liquidity. These guidelines are periodically reviewed and modified to take advantage of trends in yields and interest rates. Additionally, we own certain securities which are classified as short-term investments that we received as a result of a milestone and an upfront license payment as well as 6.0 million shares in Viking.

In August 2014, we issued the 2019 Notes with aggregate principal amount of $245.0 million. During 2018, $217.7 million in principal of the 2019 Notes were converted and $27.3 million in principal remained outstanding as of December 31, 2018, which will be paid off in cash upon the due date.

In May 2018, we issued the 2023 Notes with an aggregate principal amount of $750.0 million. A portion of the proceeds from such issuance totaling $49.7 million were used to repurchase 260,000 shares of our common stock. The 2023 Notes were not convertible as of December 31, 2018. It is our intent and policy to settle conversions through combination settlement, which essentially involves payment in cash equal to the principal portion and delivery of shares of common stock for the excess of the conversion value over the principal portion.

We anticipate that our current cash, cash equivalents, and short-term investments, together with cash provided by operating activities are sufficient to fund our near term capital and operating needs for at least the next 12 months. Operating needs include the planned costs to operate our business, including amounts required to fund working capital and capital expenditures. Our primary short-term needs for capital, which are subject to change, include:

•potential early repayment of debt obligations as a result of conversions;
•repurchases of our outstanding common stock;
•the continued advancement of research and development efforts;
•potential strategic acquisitions and investments; and
•the expansion needs of our facilities, including costs of leasing additional facilities.

As of December 31, 2018, we had $12.5 million in fair value of contingent consideration liabilities associated with prior acquisitions to be settled in future periods.

During 2018, we used $77.8 million to repurchase 522,248 of our outstanding shares under the stock repurchase programs authorized by our Board of Directors. As of December 31, 2018, there remains $125.2 million under the authorized program. See *"Item 5. Market for Registrant's Common Equity, Related Stockholder Matters, and Issuer Purchase of Equity Securities*."

Cash Flow Summary

(in thousands)	2018	2017	2016
Net cash provided by			

(used in):			
Operating activities	$ 194,059	$ 88,570	$ 60,733
Investing activities	(423,269)	(79,179)	(134,415)
Financing activities	328,585	(7,523)	(4,994)

In 2018, we generated cash from operations, from issuance of the 2023 Notes and associated warrants, and from issuance of common stock under employee stock plans. During the same period we used cash for investing activities, including the acquisition of commercial rights, net purchases of short-term investments, payments made to acquire Vernalis, payments to CVR holders and capital expenditures. We also used cash for financing activities, including principal payments related to

conversions of the 2019 Notes, payments to purchase the bond hedge associated with the 2023 Notes, payments for taxes related to net share settlement of equity awards and to repurchase shares of our common stock.

In 2017, we generated cash from operations and from issuance of common stock under employee stock plans. During the same period we used cash for investing activities, including net purchases of short-term investments, payments made to acquire Crystal, payments to CVR holders and capital expenditures. We also used cash to pay taxes related to net share settlement of equity awards and to repurchase shares of our common stock.

In 2016, we generated cash from operations and from issuance of common stock under employee stock plans. During the same period we used cash for investing activities, including net purchases of short-term investments, payments made to acquire OMT, commercial license rights from Cormatrix, Viking common stock and shares of an equity method investee, payments to CVR holders and capital expenditures. We also used cash to pay taxes related to net share settlement of equity awards and to repurchase shares of our common stock.

Off-Balance Sheet Arrangements

We do not participate in any transactions that generate relationships with unconsolidated entities or financial partnerships, such as entities often referred to as structured finance or special purpose entities, which would have been established for the purpose of facilitating off-balance sheet arrangements or other contractually narrow or limited purposes. During the fiscal year ended December 31, 2018, we were not involved in any “off-balance sheet arrangements” within the meaning of the rules of the Securities and Exchange Commission.

We lease our office facilities under operating lease arrangements with varying terms through April 2023. The agreements provide for increases in annual rents based on changes in the Consumer Price Index or fixed percentage increases of 3.0%. We had no off-balance sheet arrangements at December 31, 2018, 2017 and 2016.

Contractual Obligations

As of December 31, 2018, future minimum payments due under our contractual obligations are as follows (in thousands):

	Payments Due by Period				
	Total	**Less than 1 year**	**1-2 years**	**3-4 years**	**Thereafter**
Purchase obligations (1)	$ 12,754	$ 6,164	$ 6,590	$ —	$ —
Notes payable (2)	$ 803,211	$ 33,758	$ 11,250	$ 758,203	$ —
Operating lease obligations (3)	$ 2,963	$ 1,620	$ 1,145	$ 198	$ —

(1) Amounts represent our commitments under our supply agreement with Hovione for Captisol purchases.
(2) Amounts represent contractual amounts due under our convertible senior notes, including interest based on the fixed rate of 0.75% per year.
(3) We lease an office and research facility, which we have fully vacated under operating lease arrangements expiring on June 2019. We sublet these facilities through the end of our lease. As of December 31, 2018, we expect to receive aggregate future minimum lease payments totaling $0.4 million (non-discounted) over the duration of the sublease agreement, which are not included in the table above.

Critical Accounting Policies and Estimates

The preparation of financial statements in conformity with GAAP requires estimates and assumptions that affect the reported amounts of assets and liabilities, revenues and expenses, and related disclosures of contingent liabilities in

the consolidated financial statements and accompanying notes. The SEC has defined a company's critical accounting policies as the ones that are most important to the portrayal of the company's financial condition and results of operations, and which require the company to make its most difficult and subjective judgments, often as a result of the need to make estimates of matters that are inherently uncertain. Based on this definition, we have identified the critical accounting policies and judgments addressed below. We also have other key accounting policies, which involve the use of estimates, judgments, and assumptions that are significant to understanding our results. For additional information, see "*Item 8. Financial Statements and Supplementary Data—Notes to Consolidated Financial Statements—Note (1), Basis of Presentation and Summary of Significant Accounting Policies*." Although we believe that our estimates, assumptions, and judgments 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

On January 1, 2018, we adopted ASC 606, which amends the guidance for recognition of revenue from contracts with customers using the modified-retrospective method applied to those contracts that were not completed as of January 1, 2018. We apply the following five-stop model in order to determine the revenue: (i) identification of the promised goods or services in the contract; (ii) determination of whether the promised goods or services are performance obligations, including whether
they are distinct in the context of the contract; (iii) measurement of the transaction price, including the constraint on variable consideration; (iv) allocation of the transaction price to the performance obligations; and (v) recognition of revenue when (or as) the Company satisfies each performance obligation.

We receive royalty revenue on sales by our partners of products covered by patents that we or our partners own under the contractual agreements. We do not have future performance obligations under these license arrangements. We generally satisfy our obligation to grant intellectual property rights on the effective date of the contract. However, we apply the royalty recognition constraint required under the guidance for sales-based royalties which requires a sales-based royalty to be recorded no sooner than the underlying sale. Therefore, royalties on sales of products commercialized by our partners are recognized in the quarter the product is sold. Our partners generally report sales information to us on a one quarter lag. Thus, we estimate the expected royalty proceeds based on an analysis of historical experience and interim data provided by our partners including their publicly announced sales. Differences between actual and estimated royalty revenues are adjusted for in the period in which they become known, typically the following quarter.

Our contracts with customers often will include future contingent milestone based payments. We include contingent milestone based payments in the estimated transaction price when there is a basis to reasonably estimate the amount of the payment. These estimates are based on historical experience, anticipated results and our best judgment at the time. If the contingent milestone based payment is sales-based, we apply the royalty recognition constraint and record revenue when the underlying sale has taken place. Significant judgments must be made in determining the transaction price for our sales of intellectual property. Because of the risk that products in development with our partners will not reach development based milestones or receive regulatory approval, we generally recognize any contingent payments that would be due to us upon or after the development milestone or regulatory approval.

Revenue from material sales is recognized when control of Captisol material or intellectual property license rights is transferred to our customers in an amount that reflects the consideration we expect to receive from our customers in exchange for those products. This process involves identifying the contract with a customer, determining the performance obligations in the contract, determining the contract price, allocating the contract price to the distinct performance obligations in the contract, and recognizing revenue when the performance obligations have been satisfied. A performance obligation is considered distinct from other obligations in a contract when it provides a benefit to the customer either on its own or together with other resources that are readily available to the customer and is separately identified in the contract. We consider a performance obligation satisfied once we have transferred control of the product, meaning the customer has the ability to use and obtain the benefit of the Captisol material or intellectual property license right. We recognize revenue for satisfied performance obligations only when we determine there are no uncertainties regarding payment terms or transfer of control. Sales tax and other taxes we collect concurrent with revenue-producing activities are excluded from revenue. We expense incremental costs of obtaining a contract when incurred if the expected amortization period of the asset that we would have recognized is one year or less or the amount is immaterial. We did not incur any incremental costs of obtaining a contract during the periods reported.

Depending on the terms of the arrangement, we may also defer a portion of the consideration received because we have to satisfy a future obligation. We use an observable price to determine the stand-alone selling price for separate performance obligations or a cost plus margin approach when one is not available. We have elected to recognize the

cost for freight and shipping when control over Captisol material has transferred to the customer as an expense in cost of material sales.

We occasionally have sub-license obligations related to arrangements for which we receive license fees, milestones and royalties. We evaluate the determination of gross as a principal versus net as an agent reporting based on each individual agreement.

Intangible Assets and Other Long-Lived Assets — Impairment Assessments

We regularly perform reviews to determine if the carrying values of our long-lived assets are impaired. A review of identifiable intangible assets and other long-lived assets is performed when an event occurs indicating the potential for impairment. If indicators of impairment exist, we first assess the impairment evaluation and then assess the recoverability of the affected long-lived assets and compare their fair values to the respective carrying amounts if needed. An impairment evaluation

is based on an undiscounted cash flow analysis at the lowest level at which cash flows of the long-lived assets are largely independent of other groups of assets and liabilities.

In order to estimate the fair value of identifiable intangible assets and other long-lived assets, we estimate the present value of future cash flows from those assets. The key assumptions that we use in our discounted cash flow model are the amount and timing of estimated future cash flows to be generated by the asset over an extended period of time and a rate of return that considers the relative risk of achieving the cash flows, the time value of money, and other factors that a willing market participant would consider. Significant judgment is required to estimate the amount and timing of future cash flows and the relative risk of achieving those cash flows.

Assumptions and estimates about future values and remaining useful lives are complex and often subjective. They can be affected by a variety of factors, including external factors such as industry and economic trends, and internal factors such as changes in our business strategy and our internal forecasts. For example, if our future operating results do not meet current forecasts or if we experience a sustained decline in our market capitalization that is determined to be indicative of a reduction in fair value of our reporting unit, we may be required to record future impairment charges for purchased intangible assets. Impairment charges could materially decrease our future net income and result in lower asset values on our balance sheet.

Contingent Liabilities

In October 2017, we acquired Crystal for total cash consideration of $27.2 million, plus contingent consideration of up to an additional $10.5 million over a five year period following the acquisition date based on certain research milestones and a portion of the payments that we receive from a specified part of the historical Crystal business. The contingent consideration is measured at fair value using an income approach valuation technique, specifically with probability weighted and discounted cash flows. The fair value of the liability is assessed at each reporting date and the change in fair value is recorded in our consolidated statements of operations. The carrying amount of the liability may fluctuate significantly and actual amounts paid may be materially different than the carrying amount of the liability. The fair value of the contingent consideration liability as of December 31, 2018 was $8.4 million.

In connection with our acquisition of CyDex in January 2011, we recorded contingent liabilities for amounts potentially due to holders of the CyDex CVRs and certain other contingency payments. The fair value of the liability is assessed at each reporting date using the income approach incorporating the estimated future cash flows from potential milestones and revenue sharing. The change in fair value is recorded in our consolidated statements of operations. The carrying amount of the liability may fluctuate significantly and actual amounts paid may be materially different than the carrying amount of the liability.

In connection with our acquisition of Metabasis in January 2010, we issued Metabasis stockholders four tradable CVRs, one CVR from each of four respective series of CVR, for each Metabasis share. The CVRs entitle Metabasis stockholders to cash payments as proceeds are received by us from the sale or partnering of any of the Metabasis drug development programs. The fair values of the CVRs are remeasured at each reporting date through the term of the related agreement. Changes in the fair values are reported in the statement of operations as income (decreases) or expense (increases). The carrying amount of the liability may fluctuate significantly based upon quoted market prices and actual amounts paid under the agreements may be materially different than the carrying amount of the liability.

See additional information in "*Item 8. Financial Statements and Supplementary Data—Notes to Consolidated Financial Statements—Note (4), Fair Value Measurement.*"

Income Taxes

Our provision for income taxes, deferred tax assets and liabilities, and reserves for unrecognized tax benefits reflect our best assessment of estimated future taxes to be paid. Significant judgments and estimates based on interpretations of existing tax laws or regulations in the United States are required in determining our provision for income taxes. Changes in tax laws, statutory tax rates, and estimates of our future taxable income could impact the deferred tax

assets and liabilities provided for in the consolidated financial statements and would require an adjustment to the provision for income taxes.

Deferred tax assets are regularly assessed to determine the likelihood they will be recovered from future taxable income. A valuation allowance is established when we believe it is more likely than not the future realization of all or some of a deferred tax asset will not be achieved. In evaluating our ability to recover deferred tax assets within the jurisdiction which they arise, we consider all available positive and negative evidence. Factors reviewed include the cumulative pre-tax book income for the past three years, scheduled reversals of deferred tax liabilities, our history of earnings and reliability of our forecasts, projections of pre-tax book income over the foreseeable future, and the impact of any feasible and prudent tax planning strategies.

We recognize the impact of a tax position in our financial statements only if that position is more likely than not of being sustained upon examination by taxing authorities, based on the technical merits of the position. Tax authorities regularly examine our returns in the jurisdictions in which we do business and we regularly assess the tax risk of our return filing positions. Due to the complexity of some of the uncertainties, the ultimate resolution may result in payments that are materially different from our current estimate of the tax liability. These differences, as well as any interest and penalties, will be reflected in the provision for income taxes in the period in which they are determined.

Recent Accounting Pronouncements

For the summary of recent accounting pronouncements applicable to our consolidated financial statements, see "*Item 8. Financial Statements and Supplementary Data—Notes to Consolidated Financial Statements—Note (1), Basis of Presentation and Summary of Significant Accounting Policies.*"

Item 7A. Quantitative and Qualitative Disclosures About Market Risk

We are exposed to market risk from interest rates and equity prices which could affect our results of operations, financial condition and cash flows. We manage our exposure to these market risks through our regular operating and financing activities.

Investment Portfolio Risk

At December 31, 2018, our investment portfolio included investments in available-for-sale equity securities of $601.2 million and investment in Viking common stock of $46.2 million . These securities are subject to market risk and may decline in value based on market conditions.

Equity Price Risk

Our 2019 Notes include conversion and settlement provisions that are based on the price of our common stock at conversion or maturity of the notes, as applicable. The minimum amount of cash we may be required to pay is $245.0 million, but will ultimately be determined by the price of our common stock. The fair values of our 2019 Notes are dependent on the price and volatility of our common stock and will generally increase or decrease as the market price of our common stock changes. In order to minimize the impact of potential dilution to our common stock upon the conversion of the 2019 Notes, we entered into convertible bond hedges covering 3,264,643 shares of our common stock. Concurrently with entering into the convertible bond hedge transactions, we entered into warrant transactions whereby we sold warrants with an exercise price of approximately $125.08 per share, subject to adjustment. During 2018, we received notices for conversion of $217.7 million, which were all settled as of December 31, 2018. Throughout the term of the 2019 Notes, the notes may have a dilutive effect on our earnings per share to the extent the stock price exceeds the conversion price of the notes. Additionally, the warrants may have a dilutive effect on our earnings per share to the extent the stock price exceeds the strike price of the warrants.

Our 2023 Notes include conversion and settlement provisions that are based on the price of our common stock at conversion or maturity of the notes, as applicable. As of December 31, 2018, the "if-converted value" did not exceed the principal amount of the 2023 Notes. See detail in "*Item 8. Financial Statements and Supplementary Data—Notes to Consolidated Financial Statements—Note (6), Convertible Senior Notes.*"

Foreign Currency Risk

Through our licensing and business operations, together with our recent acquisition of Vernalis, we are exposed to foreign currency risk. Foreign currency exposures arise from transactions denominated in a currency other than the functional currency and from foreign denominated revenues and profit translated into U.S. dollars. Our license partners sell our products worldwide in currencies other than the U.S. dollar. Because of this, our revenues from royalty payments are subject to risk from changes in exchange rates.

We purchase Captisol from Hovione, located in Lisbon, Portugal. Payments to Hovione are denominated and paid in U.S. dollars; however, the unit price of Captisol contains an adjustment factor which is based on the sharing of foreign currency risk between the two parties. The effect of an immediate 10% change in foreign exchange rates would not have a material impact on our financial condition, results of operations or cash flows. We do not currently hedge our exposures to foreign currency fluctuations.

Interest Rate Risk

We are exposed to market risk involving rising interest rates. To the extent interest rates rise, our interest costs could increase. An increase in interest costs of 10% would not have a material impact on our financial condition, results of operations or cash flows.

Item 8. Consolidated Financial Statements and Supplementary Data

INDEX TO CONSOLIDATED FINANCIAL STATEMENTS

Report of Independent Registered Public Accounting Firm

The Board of Directors and Stockholders of Ligand Pharmaceuticals Incorporated

Opinion on the Financial Statements

We have audited the accompanying consolidated balance sheets of Ligand Pharmaceuticals Incorporated (the Company) as of December 31, 2018 and 2017, the related consolidated statements of operations, comprehensive income (loss), stockholders' equity and cash flows for each of the three years in the period ended December 31, 2018, 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, 2018 and 2017, and the results of its operations and its cash flows for each of the three years in the period ended December 31, 2018, in conformity with U.S. generally accepted accounting principles.

We also have audited, in accordance with the standards of the Public Company Accounting Oversight Board (United States) (PCAOB), the Company's internal control over financial reporting as of December 31, 2018, based on criteria established in Internal Control-Integrated Framework issued by the Committee of Sponsoring Organizations of the Treadway Commission (2013 Framework), and our report dated February 28, 2019 expressed an unqualified opinion thereon.

Adoption of ASU No. 2014-09

As discussed in Note 1 to the consolidated financial statements, the Company changed its method of accounting for recognizing revenue due to the adoption of Accounting Standards Update (ASU) 2014-09, Revenue from Contracts with Customers (Topic 606), and the amendments in ASUs 2015-14, 2016-10, and 2016-12, effective January 1, 2018.

Adoption of ASU No. 2016-01

As discussed in Note 1 to the consolidated financial statements, the Company changed its method of accounting for financial instruments due to the adoption of Accounting Standards Update (ASU) 2016-01, Financial Instruments-Recognition and Measurement of Financial Assets and Financial Liabilities, effective January 1, 2018.

Adoption of ASU No. 2016-09

As discussed in Note 1 to the consolidated financial statements, the Company changed its method of accounting for share-based payment transactions in 2017 due to the adoption of the amendments to the FASB Accounting Standards Codification resulting from Accounting Standards Update (ASU) No. 2016-09, Compensation - Stock Compensation (Topic 718): Improvements to Employee Share-Based Payment Accounting, effective January 1, 2017.

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 U.S. federal securities laws and the applicable rules and regulations of the Securities and Exchange Commission and the PCAOB. We conducted our audits in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the 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 included 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.

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/s/ Ernst & Young LLP
We have served as the Company‘s auditor since 2016.

San Diego, California
February 28, 2019

LIGAND PHARMACEUTICALS INCORPORATED
CONSOLIDATED BALANCE SHEETS
(in thousands, except share data)

	December 31, 2018	2017
ASSETS		
Current assets:		
Cash and cash equivalents	$ 117,164	$ 20,620
Short-term investments	601,217	181,041
Investment in Viking	46,191	—
Accounts receivable, net	55,850	25,596
Note receivable from Viking	—	3,877
Inventory	7,124	4,373
Derivative asset	22,576	—
Other current assets	20,418	1,514
Total current assets	870,540	237,021
Deferred income taxes, net	46,521	84,422
Investment in Viking	—	6,438
Intangible assets, net	219,793	228,584
Goodwill	86,646	85,959
Commercial license rights	31,460	19,526
Property and equipment, net	5,372	4,212
Other assets	471	4,859
Total assets	$ 1,260,803	$ 671,021
LIABILITIES AND STOCKHOLDERS' EQUITY		
Current liabilities:		
Accounts payable	$ 4,183	$ 2,259
Accrued liabilities	19,200	7,377
Current contingent liabilities	5,717	4,703
Deferred revenue	3,286	—
Derivative liability	23,430	—
2019 convertible senior notes, net	26,433	224,529
Total current liabilities	82,249	238,868
2023 convertible senior notes, net	609,864	—
Long-term contingent liabilities	6,825	9,258
Other long-term liabilities	951	4,248
Total liabilities	699,889	252,374
Commitments and contingencies		
	—	18,859

Equity component of currently redeemable convertible notes (Note 6)		
Stockholders' equity:		
Common stock, $0.001 par value; 60,000,000 and 33,333,333 shares authorized; 20,765,533 and 21,148,665 shares issued and outstanding at December 31, 2018 and 2017, respectively	21	21
Additional paid-in capital	791,114	798,205
Accumulated other comprehensive income (loss)	(1,024)	2,486
Accumulated deficit	(229,197)	(400,924)
Total stockholders' equity	560,914	399,788
Total liabilities and stockholders' equity	$ 1,260,803	$ 671,021

See accompanying notes to these consolidated financial statements.

LIGAND PHARMACEUTICALS INCORPORATED
CONSOLIDATED STATEMENTS OF OPERATIONS
(in thousands, except per share amounts)

	Year Ended December 31,		
	2018	**2017**	**2016**
Revenues:			
Royalties	$ 128,556	$ 88,685	$ 59,423
Material sales	29,123	22,070	22,502
License fees, milestones and other revenues	93,774	30,347	27,048
Total revenues	251,453	141,102	108,973
Operating costs and expenses:			
Cost of material sales	6,337	5,366	5,571
Amortization of intangibles	15,792	12,120	10,643
Research and development	27,863	26,887	21,221
General and administrative	37,734	28,653	27,653
Total operating costs and expenses	87,726	73,026	65,088
Income from operations	163,727	68,076	43,885
Other income (expense):			
Gain (loss) from Viking	50,187	(2,048)	(23,132)
Interest income	13,999	2,060	664
Interest expense	(48,276)	(13,460)	(12,842)
Other income (expense), net	(6,307)	2,603	(615)
Total other income (expense), net	9,603	(10,845)	(35,925)
Income before income tax expense	173,330	57,231	7,960
Income tax expense	(30,009)	(44,675)	(10,327)
Income (loss) from operations	143,321	12,556	(2,367)
Discontinued operations:			
Gain on sale of Oncology Product Line before income taxes	—	—	1,139
Income tax expense on discontinued operations	—	—	(408)
	—	—	731

Income from discontinued operations			
Net income (loss):	$ 143,321	$ 12,556	$ (1,636)
Basic per share amounts(1):			
Income (loss) from continuing operations	$ 6.77	$ 0.60	$ (0.11)
Income from discontinued operations	—	—	0.04
Net income (loss)	$ 6.77	$ 0.60	$ (0.08)
Diluted per share amounts(1):			
Income (loss) from continuing operations	$ 5.96	$ 0.53	$ (0.11)
Income from discontinued operations	—	—	0.04
Net income (loss)	$ 5.96	$ 0.53	$ (0.08)
Weighted average common shares outstanding:			
Basic	21,160	21,032	20,831
Diluted	24,067	23,481	20,831

(1) The sum of net income per share amounts may not equal the total due to rounding

See accompanying notes to these consolidated financial statements.

LIGAND PHARMACEUTICALS INCORPORATED
CONSOLIDATED STATEMENTS OF COMPREHENSIVE INCOME (LOSS)
(in thousands)

	Year Ended December 31,		
	2018	**2017**	**2016**
Net income (loss)	$ 143,321	$ 12,556	$ (1,636)
Unrealized net gain on available-for-sale securities, net of tax	73	143	93
Foreign currency translation	(921)	—	—
Less: Reclassification of net realized gains included in net income (loss), net of tax	—	(400)	(2,253)
Comprehensive income (loss)	$ 142,473	$ 12,299	$ (3,796)

See accompanying notes to these consolidated financial statements.

LIGAND PHARMACEUTICALS INCORPORATED
CONSOLIDATED STATEMENT OF STOCKHOLDERS' EQUITY
(in thousands, except share data)

	Common Stock			Additional paid-in capital	Accumulated other comprehensive income (loss)	Accumulated deficit	Total stockholders' equity
	Shares	Amount					
Balance at January 1, 2016	19,949,012	$ 20	$ 661,850	$ 4,903	$ (429,491)	$ 237,282	
Issuance of common stock under employee stock compensation plans, net	210,626		5,416	—	—	5,416	
Shares issued in OMT acquisition	790,163		77,330	—	—	77,331	
Reclassification of equity component of currently redeemable convertible notes	—	—	10,065	—	—	10,065	
Share-based compensation	—	—	18,893	—	—	18,893	
Repurchase of common stock	(40,500)		(3,901)	—	—	(3,901)	
Other comprehensive loss	—	—	—	(2,160)	—	(2,160)	
Net loss	—	—	—	—	(1,636)	(1,636)	
Balance at December 31, 2016	20,909,301	21	$ 769,653	$ 2,743	$ (431,127)	$ 341,290	
Issuance of common stock under employee stock compensation plans, net	253,364		(5,558)	—	—	(5,558)	
Reclassification of equity component of currently redeemable convertible notes	—	—	10,704	—	—	10,704	
Share-based compensation	—	—	24,916	—	—	24,916	
Repurchase of common stock	(14,000)		(1,966)	—	—	(1,966)	
Other comprehensive loss	—	—	—	(257)	—	(257)	

Cumulative-effect adjustment from adoption of ASU 2016-09	—	—		456		—		17,647		—		18,103				
Net income	—	—		—		—		12,556				12,556				
Balance at December 31, 2017	21,148,665		21	$	798,205	$	2,486	$	(400,924)			$	399,788			
Issuance of common stock under employee stock compensation plans, net	399,116			16,417		—		—				16,417				
Reclassification of equity component of currently redeemable convertible notes	—	—		18,859		—		—				18,859				
Share-based compensation	—	—		20,846		—		—				20,846				
Repurchase of common stock	(782,248)			(127,481)		—		—				(127,481)				
Other comprehensive income	—	—		—		73						73				
Cumulative-effect adjustment from adoption of ASU 2016-01	—	—		—		(2,662)		2,662				—				
Cumulative-effect adjustment from adoption of ASU 2014-09, net of tax	—	—		—		—		25,581				25,581				
Derivative associated with 2019 Notes and Bond Hedge	—	—		(1,559)		—		—				(1,559)				
Loss on settlement of 2019 Notes	—	—		3,187		—		—				3,187				
Warrant repurchase in connection with 2019 Notes	—	—		(30,472)		—		—				(30,472)				
Loss on repurchase of warrants in connection with 2019 Notes	—	—		1,792		—		—				1,792				
Tax effect on 2019 Notes transactions	—	—		(1,680)		—		—				(1,680)				

Derivative associated with 2023 Notes and Bond Hedge	—	—		(1,807)		—		—		(1,807)						
Warrant derivative in connection with 2023 Notes	—	—		97,805		—		—		97,805						
Tax effect for 2023 Notes transactions	—	—		(3,181)		—		—		(3,181)						
Foreign currency translation adjustment	—	—		—		(921)		—		(921)						
Other tax adjustments	—	—		183		—		163		346						
Net income	—	—		—		—		143,321		143,321						
Balance at December 31, 2018	20,765	$	533	21	$	791,114	$	(1,024)	$	(229,197)	$	560,914				

See accompanying notes to these consolidated financial statements.

LIGAND PHARMACEUTICALS INCORPORATED
CONSOLIDATED STATEMENTS OF CASH FLOWS
(in thousands)

	Year Ended December 31,		
	2018	**2017 (Revised)***	**2016 (Revised)***
Operating activities			
Net income (loss)	$ 143,321	$ 12,556	$ (1,636)
Less: income from discontinued operations	—	—	731
Income (loss) from continuing operations	143,321	12,556	(2,367)
Adjustments to reconcile net income to net cash provided by operating activities:			
Change in estimated fair value of contingent liabilities	3,448	2,580	3,334
Realized gain on sale of short-term investment	(2,611)	(831)	(2,352)
Depreciation and amortization	14,718	11,714	11,290
(Gain) loss on equity investment in Viking	(42,346)	2,048	23,132
Change in fair value of the convertible debt receivable from Viking and warrants	(5,411)	(4,032)	(462)
Amortization of premium (discount) on investments, net	(5,452)	(81)	348
Amortization of debt discount and issuance fees	43,954	11,619	10,925
Share-based compensation	20,846	24,915	18,893
Deferred income taxes, net	29,739	44,518	10,697

Royalties recorded in retained earnings upon adoption of ASC 606	32,707	—	—
Change in derivative asset and liability fair value	2,931	—	—
Changes in operating assets and liabilities, net of acquisitions:			
Accounts receivable, net	(29,544)	(8,358)	(8,525)
Inventory	(2,559)	(843)	(244)
Other current assets	(868)	402	526
Other long term assets	728	—	183
Accounts payable and accrued liabilities	(4,542)	(1,713)	(2,369)
Contingent liabilities	(3,842)	(4,998)	(2,268)
Deferred revenue	(1,158)	(926)	(8)
Net cash provided by operating activities	194,059	88,570	60,733
Investing activities			
Purchase of commercial license rights	(10,000)	—	(17,695)
Purchase of Viking common stock and warrant	—	—	(700)
Purchase of common stock in equity method investment	—	—	(1,000)
Cash paid for acquisition, net of cash acquired	(5,856)	(26,653)	(92,502)
Payments to CVR holders and other contingency payments	(1,000)	—	—
Purchases of property and equipment	(887)	(2,156)	(1,850)
	(1,434,255)	(254,258)	(164,438)

Purchases of short-term investments			
Proceeds from sale of short-term investments	131,942	86,985	24,596
Proceeds from maturity of short-term investments	892,873	109,649	118,874
Proceeds from commercial license rights	—	7,054	—
Proceeds received from repayment of Viking note receivable	3,914	200	300
Net cash used in investing activities	(423,269)	(79,179)	(134,415)
Financing activities			
Repayment of debt	(217,674)	—	—
Gross proceeds from issuance of 2023 Convertible Senior Notes	750,000	—	—
Payment of debt issuance costs	(16,900)	—	—
Proceeds from issuance of warrants	90,000	—	—
Purchase of convertible bond hedge	(140,250)	—	—
Proceeds from bond hedge settlement	439,559	—	—
Payments to convert holders for bond conversion	(439,581)	—	—
Net proceeds from stock option exercises and ESPP	20,183	4,517	6,415

Taxes paid related to net share settlement of equity awards	(3,765)	(10,074)	(999)
Share repurchases	(122,868)	(1,966)	(3,901)
Repurchase of warrants	(30,094)	—	—
Payments to CVR Holders	(25)	—	(6,509)
Net cash provided by (used in) financing activities	328,585	(7,523)	(4,994)
Effect of exchange rate changes on cash	(215)	—	—
Net increase (decrease) in cash and cash equivalents	99,375	1,868	(78,676)
Cash, cash equivalents and restricted cash at beginning of year	20,620	18,752	97,428
Cash, cash equivalents and restricted cash at end of year	$ 119,780	$ 20,620	$ 18,752
Supplemental disclosure of cash flow information			
Cash paid during the year:			
Interest paid	$ 1,513	$ 1,838	$ 1,838
Taxes paid	$ 341	$ 157	$ 38
Supplemental schedule of non-cash investing and financing activities			
Stock issued for acquisition, net of issuance cost	$ —	$ —	$ (77,331)
Stock and warrant received for repayment of Viking notes receivable	$ —	$ —	$ 1,200
Accrued inventory purchases	$ 2,059	$ 1,007	$ 646

Unrealized gain on AFS investments	$ 48	$ 144	$ (1,109)

**See Note (1) for detail on the revision.*

See accompanying notes to these consolidated financial statements.

Unless the context requires otherwise, references in this report to "Ligand," "we," "us," the "Company," and "our" refer to Ligand Pharmaceuticals Incorporated and its consolidated subsidiaries.

1. Basis of Presentation and Summary of Significant Accounting Policies

Business

Ligand is a biopharmaceutical company with a business model based on developing or acquiring assets which generate royalty, milestone or other passive revenue for the Company using a lean corporate cost structure. We operate in one business segment: development and licensing of biopharmaceutical assets.

Principles of Consolidation

The accompanying consolidated financial statements include Ligand and its wholly-owned subsidiaries. All significant intercompany accounts and transactions have been eliminated in consolidation.

Basis of Presentation

Our consolidated financial statements have been prepared in accordance with U.S. GAAP and include the accounts of our parent company and its wholly-owned subsidiaries. All intercompany transactions and balances have been eliminated in consolidation.

Reclassifications

Certain reclassifications have been made to the previously issued statement of operations to conform with the current period presentation. See detail in *Accounting Standards Recently Adopted* subsection below for further information.

Use of Estimates

The preparation of consolidated financial statements in conformity with U.S. GAAP requires the use of estimates and assumptions that affect the amounts reported in the consolidated financial statements and the accompanying notes. Actual results may differ from those estimates.

Concentrations of Business Risk

Financial instruments that potentially subject to significant concentrations of credit risk consist primarily of cash equivalents and investments. We invest excess cash principally in United States government debt securities, investment grade corporate debt securities and certificates of deposit. We have established guidelines relative to diversification and maturities that maintain safety and liquidity. These guidelines are periodically reviewed and modified to take advantage of trends in yields and interest rates.

A relatively small number of partners account for a significant percentage of our revenue. Revenue from significant partners, which is defined as 10% or more of our total revenue, was as follows:

	December 31,		
	2018	2017	2016
Partner A	40%	46%	41%
Partner B	13%	19%	14%

Partner C	20%	< 10%	< 10%

We obtain Captisol from two sites at a single supplier, Hovione. If this supplier were not able to supply the requested amounts of Captisol from each site, and if our safety stocks of material were depleted, we would be unable to continue to derive revenues from the sale of Captisol until we obtained material from an alternative source, which could take a considerable length of time.

Cash Equivalents & Short Term Investments

Cash equivalents consist of all investments with maturities of three months or less from the date of acquisition. Short-term investments primarily consist of investments in debt securities that have effective maturities greater than three months and less than twelve months from the date of acquisition. We classify our short-term investments as "available-for-sale". Such investments are carried at fair value, with unrealized gains and losses included in the statement of comprehensive income (loss). We determine the cost of investments based on the specific identification method.

Accounts Receivable

Trade accounts receivable are recorded at the net invoice value and are not interest bearing. We consider receivables past due based on the contractual payment terms which range from 30 to 90 days. We reserve specific receivables if collectability is no longer reasonably assured. We re-evaluate such reserves on a regular basis and adjust the reserves as needed. Once a receivable is deemed to be uncollectible, such balance is charged against the reserve.

Inventory

Inventory, which consists of finished goods, is stated at the lower of cost or market value. We determine cost using the first-in, first-out method. We analyze our inventory levels periodically and write down inventory to net realizable value if it has become obsolete, has a cost basis in excess of its expected net realizable value or is in excess of expected requirements. There were no write downs related to obsolete inventory recorded for the years ended December 31, 2018, 2017 and 2016.

Property and Equipment

Property and equipment are stated at cost, subject to review for impairment, and depreciated over the estimated useful lives of the assets, which generally range from three to ten years, using the straight-line method. Amortization of leasehold improvements is recorded over the shorter of the lease term or estimated useful life of the related asset. Maintenance and repairs are charged to operations as incurred. When assets are sold, or otherwise disposed of, the cost and related accumulated depreciation are removed from the accounts and any gain or loss is included in operating expense.

Business Combinations

The acquisition method of accounting for business combinations requires us to use significant estimates and assumptions, including fair value estimates, as of the business combination date and to refine those estimates as necessary during the measurement period (defined as the period, not to exceed one year, in which we may adjust the provisional amounts recognized for a business combination).

Under the acquisition method of accounting, we recognize separately from goodwill the identifiable assets acquired, the liabilities assumed, including contingent consideration and all contractual contingencies, generally at the acquisition date fair value. Contingent purchase consideration to be settled in cash are remeasured to estimated fair value at each reporting period with the change in fair value recorded in other income (expense), net. Costs that we incur to complete the business combination such as investment banking, legal and other professional fees are not considered part of consideration and we charge them to general and administrative expense as they are incurred.

We measure goodwill as of the acquisition date as the excess of consideration transferred, which we also measure at fair value, over the net of the acquisition date amounts of the identifiable assets acquired and liabilities assumed. In addition, IPR&D is capitalized and assessed for impairment annually. IPR&D is amortized upon product commercialization or upon out-licensing the underlying intellectual property where we have no active involvement in the licensee's development activities. IPR&D is amortized over the estimated life of the commercial product or licensing arrangement.

Should the initial accounting for a business combination be incomplete by the end of a reporting period that falls within the measurement period, we report provisional amounts in our financial statements. During the measurement

period, we adjust the provisional amounts recognized at the acquisition date to reflect new information obtained about facts and circumstances that existed as of the acquisition date that, if known, would have affected the measurement of the amounts recognized as of that date and we record those adjustments to our financial statements in the period of change, if any.

Under the acquisition method of accounting for business combinations, if we identify changes to acquired deferred tax asset valuation allowances or liabilities related to uncertain tax positions during the measurement period and they relate to new information obtained about facts and circumstances that existed as of the acquisition date, those changes are considered a

measurement period adjustment and we record the offset to goodwill. We record all other changes to deferred tax asset valuation allowances and liabilities related to uncertain tax positions in current period income tax expense.

Contingent Liabilities

In connection with the acquisition of Crystal in October 2017, we may be required to pay up to an additional $10.5 million in purchase consideration upon achievement of certain commercial and development milestones to the Crystal shareholders.

In connection with the acquisition of CyDex in January 2011, we recorded a contingent liability for amounts potentially due to holders of the CyDex CVRs and former license holders. The liability is periodically assessed based on events and circumstances related to the underlying milestones, royalties and material sales. In connection with the acquisition of Metabasis in January 2010, we issued Metabasis stockholders four tradable CVRs for each Metabasis share. The fair values of the CVRs are remeasured at each reporting date through the term of the related agreement.

Any change in fair value is recorded in our consolidated statement of operations. For additional information, see "*Note (4), Fair Value Measurement and Note (7), Balance Sheet Account Details*."

Goodwill, Intangible Assets and Other Long-Lived Assets

Goodwill, which has an indefinite useful life, represents the excess of cost over fair value of net assets acquired. Goodwill is reviewed for impairment at least annually during the fourth quarter, or more frequently if an event occurs indicating the potential for impairment. During the goodwill impairment review, we assess qualitative factors to determine whether it is more likely than not that the fair value of our reporting unit is less than the carrying amount, including goodwill. We operate in one reporting unit. The qualitative factors include, but are not limited to, macroeconomic conditions, industry and market considerations, and the overall financial performance. If, after assessing the totality of these qualitative factors, we determine that it is not more likely than not that the fair value of our reporting unit is less than the carrying amount, then no additional assessment is deemed necessary. Otherwise, we proceed to perform the two-step test for goodwill impairment. The first step involves comparing the estimated fair value of the reporting unit with the carrying value, including goodwill. If the carrying amount of the reporting unit exceeds the fair value, the second step of the goodwill impairment test is performed to determine the amount of loss, which involves comparing the implied fair value of the goodwill to the carrying value of the goodwill. We may also elect to bypass the qualitative assessment in a period and elect to proceed to perform the first step of the goodwill impairment test. We performed the annual assessment for goodwill impairment during the fourth quarter of 2018, noting no impairment.

Our identifiable intangible assets are typically composed of acquired core technologies, licensed technologies, customer relationships and trade names. The cost of identifiable intangible assets with finite lives is generally amortized on a straight-line basis over the assets' respective estimated useful lives. We regularly perform reviews to determine if any event has occurred that may indicate that intangible assets with finite useful lives and other long-lived assets are potentially impaired. If indicators of impairment exist, an impairment test is performed to assess the recoverability of the affected assets by determining whether the carrying amount of such assets exceeds the undiscounted expected future cash flows. If the affected assets are not recoverable, we estimate the fair value of the assets and record an impairment loss if the carrying value of the assets exceeds the fair value. Factors that may indicate potential impairment include a significant decline in our stock price and market capitalization compared to the net book value, significant changes in the ability of a particular asset to generate positive cash flows, and the pattern of utilization of a particular asset.

Commercial license rights

Commercial license rights consist of the following (in thousands):

	December 31, 2018	December 31, 2017
Aziyo & CorMatrix	$ 17,696	$ 17,696
Palvella	10,000	—
Selexis	8,602	8,602
	36,298	26,298
Less: accumulated amortization	(4,838)	(6,772)
Total commercial license rights, net	$ 31,460	$ 19,526

Commercial license rights represent a portfolio of future milestone and royalty payment rights acquired from Selexis in April 2013 and April 2015, CorMatrix in May 2016, and Pavella in December 2018. Individual commercial license rights acquired are accounted for as financial assets further discussed below.

In December 2018, we entered into a development funding and royalties agreement with Palvella. Pursuant to the agreement, we will receive up to $8.0 million of milestone payments upon the achievement by Palvella of certain regulatory milestones for PTX-022, a product candidate being developed to treat pachyonychia congentia, and corporate and financing milestones. In addition to the milestone payments, Palvella will pay us tiered royalties from 5.0% to 9.8% based on aggregate annual worldwide net sales of any PTX-022 products, if approved, subject to Palvella’s right to reduce the royalty rates by making payments in certain circumstances. We paid Palvella an upfront payment of $10.0 million, which Palvella is required to use to fund the development of PTX-022. We will not incur any expenses to develop or commercialize PTX-022. Our director, Todd Davis, is also a director of Palvella, who beneficially owns 2% of Palvella's outstanding equity. Mr. Davis recused himself from all of the board's consideration of the purchase agreement between us and Palvella, including any financial analysis, the terms of the purchase agreement and the vote to approve the purchase agreement and the related transactions.

In May 2017, we entered into a royalty agreement with Aziyo pursuant to which we will receive royalties from certain marketed products that Aziyo acquired from CorMatrix. Pursuant to the agreement, we received $10.0 million in 2017 from Aziyo to buydown the royalty rates on the products CorMatrix sold to Aziyo. The agreement closed on May 31, 2017, in connection with the closing of the asset sale from CorMatrix to Aziyo (the “CorMatrix Asset Sale”). Per the agreement, we will receive a 5% royalty on the products Aziyo acquired in the CorMatrix Asset Sale, reduced from the original 20% royalty from CorMatrix pursuant to the previously disclosed interest purchase agreement, dated May 3, 2016 (the “Original Interest Purchase Agreement”) between CorMatrix and us. In addition, Aziyo has agreed to pay us up to $10.0 million of additional milestones tied to cumulative net sales of the products Aziyo acquired in the CorMatrix Asset Sale and to extend the term on these royalties by one year. The royalty agreement will terminate on May 31, 2027. In addition, in May 2017, we entered into an amended and restated interest purchase agreement (the “Amended Interest Purchase Agreement”) with CorMatrix, which supersedes in its entirety the Original Interest Purchase Agreement. Other than removing the commercial products sold to Aziyo in the CorMatrix Sale, the terms of the Amended Interest Purchase Agreement remain unchanged with respect to the CorMatrix developmental pipeline products, including the royalty rate of 5% on such pipeline products. The Amended Interest Purchase Agreement will terminate 10 years from the date of the first commercial sale of such products.

We account for the Aziyo commercial license right as a financial asset in accordance with ASC 310 and amortize the commercial license right using the effective interest method whereby we forecast expected cash flows over the term of the arrangement to arrive at an annualized effective interest. The annual effective interest associated with the forecasted cash flows from the royalty agreement with Aziyo as of December 31, 2018 is 26%. Revenue is calculated by multiplying the carrying value of the commercial license right by the effective interest. The payments received in 2018 were accordingly allocated between revenue and the amortization of the commercial license rights.

We elected a prospective approach to account for changes in estimated cash flows and selected a method for determining when an impairment would be recognized and how to measure that impairment. In circumstances where our new estimate of expected cash flows is greater than previously expected, we will update our yield prospectively. While it has not occurred to date, in circumstances where our new estimate of expected cash flows is less than previously expected and below our original estimated yield we will record an impairment. Impairment will be recognized by reducing the financial asset to an amount that represents the present value of our most recent estimate of expected cash flows discounted by the original effective interest rate. In circumstances where our new estimate of expected cash flows is less than previously expected, but not below our original estimated yield, we will update our yield prospectively.

We account for commercial license rights related to developmental pipeline products on a non-accrual basis. These developmental pipeline products are non-commercialized, non-approved products that require FDA or other regulatory approval, and thus have uncertain cash flows. The developmental pipeline products are on a non-accrual basis as we are not yet able to forecast future cash flows given their pre-commercial stages of development. We will prospectively update the yield model under the effective interest method once the underlying products are commercialized and we can reliably forecast expected cash flows. Income will be calculated by multiplying the carrying value of the commercial license right by the effective interest rate.

Revenue Recognition

Our revenue is generated primarily from royalties on sales of products commercialized by our partners, Captisol material sales, license fees and development, regulatory and sales based milestone payments.

On January 1, 2018, we adopted ASC 606 which amends the guidance for recognition of revenue from contracts with customers by using the modified-retrospective method applied to those contracts that were not completed as of January 1, 2018. The results for reporting periods beginning January 1, 2018, are presented in accordance with the new standard, although comparative information has not been restated and continues to be reported under the accounting standards and policies in effect for those periods.

Upon adoption, we recorded a net decrease of $25.6 million to accumulated deficit due to the cumulative impact of adopting the new standard, with the impact related primarily to the acceleration of royalty revenue, net of related deferred tax impact. See additional information in *Disaggregation of Revenue* subsection below. Our accounting policies under the new standard were applied prospectively and are noted below.

Royalties, License Fees and Milestones

We receive royalty revenue on sales by our partners of products covered by patents that we or our partners own under the contractual agreements. We do not have future performance obligations under these license arrangements. We generally satisfy our obligation to grant intellectual property rights on the effective date of the contract. However, we apply the royalty recognition constraint required under the guidance for sales-based royalties which requires a sales-based royalty to be recorded no sooner than the underlying sale. Therefore, royalties on sales of products commercialized by our partners are recognized in the quarter the product is sold. Our partners generally report sales information to us on a one quarter lag. Thus, we estimate the expected royalty proceeds based on an analysis of historical experience and interim data provided by our partners including their publicly announced sales. Differences between actual and estimated royalty revenues are adjusted for in the period in which they become known, typically the following quarter.

Our contracts with customers often will include future contingent milestone based payments. We include contingent milestone based payments in the estimated transaction price when there is a basis to reasonably estimate the amount of the payment. These estimates are based on historical experience, anticipated results and our best judgment at the time. If the contingent milestone based payment is sales-based, we apply the royalty recognition constraint and record revenue when the underlying sale has taken place. Significant judgments must be made in determining the transaction price for our sales of intellectual property. Because of the risk that products in development with our partners will not reach development based milestones or receive regulatory approval, we generally recognize any contingent payments that would be due to us upon or after the development milestone or regulatory approval.

Material Sales

We recognize revenue when control of Captisol material or intellectual property license rights is transferred to our customers in an amount that reflects the consideration we expect to receive from our customers in exchange for those products. This process involves identifying the contract with a customer, determining the performance obligations in the contract, determining the contract price, allocating the contract price to the distinct performance obligations in the contract, and recognizing revenue when the performance obligations have been satisfied. A performance obligation is considered distinct from other obligations in a contract when it provides a benefit to the customer either on its own or together with other resources that are readily available to the customer and is separately identified in the contract. We consider a performance obligation satisfied once we have transferred control of the product, meaning the customer has the ability to use and obtain the benefit of the Captisol material or intellectual property license right. We recognize revenue for satisfied performance obligations only when we determine there are no uncertainties regarding payment terms or transfer of control. Sales tax and other taxes we collect concurrent with revenue-producing activities are excluded from revenue. We expense incremental costs of obtaining a contract when incurred if the expected amortization period of the asset that we would have recognized is one year or less or the amount is immaterial. We did not incur any incremental costs of obtaining a contract during the periods reported.

Depending on the terms of the arrangement, we may also defer a portion of the consideration received because we have to satisfy a future obligation. We use an observable price to determine the stand-alone selling price for separate performance obligations or a cost plus margin approach when one is not available. We have elected to recognize the cost for freight and shipping when control over Captisol material has transferred to the customer as an expense in cost of material sales.

The timing of revenue recognition, billings and cash collections results in billed accounts receivable, unbilled receivables (contract assets), and customer advances and deposits (contract liabilities) on the Consolidated Balance Sheet. Except for royalty revenue, we generally receive payment at the point we satisfy our obligation or soon after. Therefore, we do not generally carry a contract asset or deferred revenue balance.

We have revenue sharing arrangements whereby certain revenue proceeds are shared with a third party. The revenue standard requires an entity to determine whether it is a principal or an agent in these transactions by evaluating the nature of its promise to the customer. We received a $4.6 million milestone payment from a license partner during 2018 of which $3.0 million was paid to a third-party in-licensor. We recorded net revenue of $1.6 million as we believe we are an agent in the transaction. We record amounts due to third-party in-licensors as general and administrative expenses when we are the principal in the transaction.

Disaggregation of Revenue

Under ASC 605, the legacy revenue standard, we would have reported total royalty revenue of $121.0 million during 2018, disaggregated as follows: Promacta $92.3 million, Kyprolis $20.9 million, Evomela $5.7 million, and Other $2.1 million. During 2017, royalty revenue continued to be reported in accordance with ASC 605 and was $88.7 million or disaggregated as follows: Promacta $62.9 million, Kyprolis $16.4 million, Evomela $7.2 million and Other $2.2 million. During 2016, royalty revenue continued to be reported in accordance with ASC 605 and was $59.4 million or disaggregated as follows: Promacta $43.0 million, Kyprolis $12.1 million, Evomela $1.4 million and Other $2.9 million.

Under ASC 606, royalty revenue was $128.6 million during 2018 or disaggregated as follows: Promacta $99.3 million, Kyprolis $21.7 million, Evomela $5.7 million and Other $1.9 million.

The following table represents disaggregation of Material Sales and License fees, milestone and other (in thousands), which are not affected by the adoption of ASC 606:

	Year ended December 31,		
	2018	**2017**	**2016**
Material Sales			
Captisol	$ 29,123	$ 22,070	$ 22,502
License fees, milestones and other			
License fees	78,195	13,665	10,570
Milestones	6,577	11,093	16,091
Other	9,002	5,589	387
	$ 93,774	$ 30,347	$ 27,048

Preclinical Study and Clinical Trial Accruals

Substantial portions of our preclinical studies and all of our clinical trials have been performed by third-party laboratories, CROs. We account for a significant portion of the clinical study costs according to the terms of our contracts with CROs. The terms of the CRO contracts may result in payment flows that do not match the periods over which services are provided to us under such contracts. Our objective is to reflect the appropriate preclinical and clinical trial expenses in our financial statements in the same period as the services occur. As part of the process of preparing our financial statements, we rely on cost information provided by our CROs. We are also required to estimate certain of our expenses resulting from the obligations under the CRO contracts. Accordingly, our preclinical study and clinical trial accrual is dependent upon the timely and accurate reporting of CROs and other third-party vendors. We periodically evaluate our estimates to determine if adjustments are necessary or appropriate as more information becomes available concerning changing circumstances, and conditions or events that may affect such

estimates. No material adjustments to preclinical study and clinical trial accrued expenses have been recognized to date.

Research and Development Expenses

Research and development expense consists of labor, material, equipment, and allocated facilities costs of our scientific staff who are working pursuant to our collaborative agreements and other research and development projects. Also included in research and development expenses are third-party costs incurred for our research programs including in-licensing costs, CRO costs and costs incurred by other research and development service vendors. We expense these costs as they are incurred. When we make payments for research and development services prior to the services being rendered, we record those amounts as prepaid assets on our consolidated balance sheet and we expense them as the services are provided.

Share-Based Compensation

We incur share-based compensation expense related to restricted stock, ESPP, and stock options.

Restricted stock unit (RSU) and performance stock unit (PSU) are all considered restricted stock. The fair value of restricted stock is determined by the closing market price of our common stock on the date of grant. We recognize share-based compensation expense based on the fair value on a straight-line basis over the requisite service periods of the awards, taking into consideration of forfeitures. PSU represents a right to receive a certain number of shares of common stock based on the achievement of corporate performance goals and continued employment during the vesting period. At each reporting period, we reassess the probability of the achievement of such corporate performance goals and any expense change resulting from an adjustment in the estimated shares to be released are treated as a cumulative catch-up in the period of adjustment.

We use the Black-Scholes-Merton option-pricing model to estimate the fair value of stock purchases under ESPP and stock options granted. The model assumptions include expected volatility, term, dividends, and the risk-free interest rate. We look to historical and implied volatilities of our stock to determine the expected volatility. The expected term of an award is based on historical forfeiture experience, exercise activity, and on the terms and conditions of the stock awards. The expected dividend yield is determined to be 0% given that except for 2007, during which we declared a cash dividend on our common stock of $2.50 per share, we have not paid any dividends on our common stock in the past and currently do not expect to pay cash dividends or make any other distributions on common stock in the future. The risk-free interest rate is based upon U.S. Treasury securities with remaining terms similar to the expected term of the share-based awards.

We grant options, RSUs and PSUs to employees and non-employee directors. Non-employee directors are accounted for as employees. Options and RSUs granted to certain non-employee directors vest one year from the date of grant. Options granted to employees vest 1/8 on the six month anniversary of the date of grant, and 1/48 each month thereafter for forty-two months. RSUs and PSUs granted to employees vest over three years. All option awards generally expire ten years from the date of grant.

Share-based compensation expense for awards to employees and non-employee directors is recognized on a straight-line basis over the vesting period until the last tranche vests.

Derivatives

In May 2018, we issued $750.0 million aggregate principal amount of 2023 Notes, bearing cash interest at a rate of 0.75% per year, payable semi-annually, as further described in “Footnote 6. Convertible Senior Notes.” Concurrently with the issuance of the notes, we entered into a series of convertible note hedge and warrant transactions which in combination are designed to reduce the potential dilution to our stockholders and/or offset the cash payments we are required to make in excess of the principal amount upon conversion of the notes. The conversion option associated with the 2023 Notes temporarily met the criteria for an embedded derivative liability which required bifurcation and separate accounting. In addition, the note hedge and warrants were also temporarily classified as a derivative asset and liability, respectively, on our consolidated balance sheet. As a result of shareholder approval to increase the number of authorized shares of our common stock on June 19, 2018, as discussed in “Footnote 6. Convertible Senior Notes,” the derivative asset and liabilities were reclassified to additional paid-in capital. Changes in the fair value of these derivatives prior to being classified in equity were reflected in other expense, net, in our consolidated statements of operations.

The following table summarizes the inputs and assumptions used in the Black-Scholes model to calculate the fair value of the assets and the inputs and assumptions used in the Binomial model to calculate the fair value of the derivative liabilities associated with the 2023 Notes:

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	As of May 22, 2018	As of June 19, 2018
Common stock price	$187.09	$195.91
Exercise price, conversion premium and bond hedge	$248.48	$248.48
Exercise price, warrant	315.38	315.38
Risk-free interest rate	2.9%	2.8%
Volatility	30%-35%	30%-35%
Dividend yield	—	—
Annual coupon rate	0.75%	0.75%
Remaining contractual term (in years)	5.05	4.98

In connection with our 2019 Notes, which we issued in August 2014 for $245.0 million aggregate principal amount, on May 22, 2018, we amended it making an irrevocable election to settle the entire note in cash. As a result, we reclassified from equity to derivative liability the fair value of the conversion premium as of May 22, 2018. Amounts paid in excess of the principal amount will be offset by an equal receipt of cash under the corresponding convertible bond hedge. As a result, we reclassified from equity to derivative asset the fair value of the bond hedge as of May 22, 2018. Changes in the fair value of these derivatives are reflected in other expense, net, in our condensed consolidated statements of operations.

The following table summarizes the inputs and assumptions used in the Black-Scholes model to calculate the fair value of the derivative assets and the inputs and assumptions used in the Binomial model to calculate the fair value of the derivative liability associated with the 2019 Notes:

	As of May 22, 2018	As of December 31, 2018
Common stock price	$187.09	$135.70
Exercise price, conversion premium and bond hedge	$75.05	$75.05
	2.47%	2.60%

Risk-free interest rate		
Volatility	30%-35%	30%-35%
Dividend yield	—	—
Annual coupon rate	0.75%	0.75%
Remaining contractual term (in years)	1.25	0.63

Income Taxes

The provision for income taxes is computed using the asset and liability method, under which deferred tax assets and liabilities are recognized for the expected future tax consequences of temporary differences between the financial reporting and tax bases of assets and liabilities, and for the expected future tax benefit to be derived from tax loss and credit carryforwards. Deferred tax assets and liabilities are determined using the enacted tax rates in effect for the years in which those tax assets are expected to be realized. The effect of a change in tax rates on deferred tax assets and liabilities is recognized in the provision for income taxes in the period that includes the enactment date.

Deferred tax assets are regularly assessed to determine the likelihood they will be recovered from future taxable income. A valuation allowance is established when we believe it is more likely than not the future realization of all or some of a deferred tax asset will not be achieved. In evaluating the ability to recover deferred tax assets within the jurisdiction which they arise we consider all available positive and negative evidence. Factors reviewed include the cumulative pre-tax book income for the past three years, scheduled reversals of deferred tax liabilities, history of earnings and reliable forecasting, projections of pre-tax book income over the foreseeable future, and the impact of any feasible and prudent tax planning strategies.

We recognize the impact of a tax position in the financial statements only if that position is more likely than not of being sustained upon examination by taxing authorities, based on the technical merits of the position. Any interest and penalties related to uncertain tax positions will be reflected in income tax expense.

Discontinued Operations

In 2006, we entered into a purchase agreement with Eisai pursuant to which Eisai agreed to acquire our Oncology product line which included four marketed oncology drugs: ONTAK, Targretin capsules, Targretin gel and Panretin gel. During the year ended December 31, 2016 we recognized a $1.1 million gain due to subsequent changes in certain estimates and liabilities previously recorded. We recorded a provision for income taxes related to the gain of $0.4 million.

Income (loss) Per Share

Basic income (loss) per share is calculated by dividing net income by the weighted-average number of common shares outstanding during the period. Diluted income per share is computed based on the sum of the weighted average number of common shares and potentially dilutive common shares outstanding during the period. Diluted loss per share is computed based on the sum of the weighted average number of common shares outstanding during the period.

Potentially dilutive common shares consist of shares issuable under 2019 and 2023 convertible senior notes, stock options and restricted stock. 2019 and 2023 convertible senior notes have a dilutive impact when the average market price of the Company’s common stock exceeds the applicable conversion price of the respective notes. It is our intent and policy to settle conversions through combination settlement, which essentially involves payment in cash equal to the principal portion and delivery of shares of common stock for the excess of the conversion value over the principal portion. In addition, post May 22, 2018, the 2019 Notes can only be settled in cash and therefore there will be no further impact on income (loss) per share of these notes. Potentially dilutive common shares from stock options and restricted stock are determined using the average share price for each period under the treasury stock method. In addition, the following amounts are assumed to be used to repurchase shares: proceeds from exercise of stock options and the average amount of unrecognized compensation expense for restricted stock. In loss periods, basic net loss per share and diluted net loss per share are identical since the effect of otherwise dilutive potential common shares is anti-dilutive and therefore excluded

The following table presents the calculation of weighted average shares used to calculate basic and diluted earnings per share (in thousands):

	Year Ended December 31,		
	2018	2017	2016
Weighted average shares outstanding:	21,160	21,032	20,831
Dilutive potential common shares:			
Restricted stock	72	141	—
Stock options	1,125	1,000	—
Warrants associated with 2019 Notes	1,017	94	—
2019 Convertible Senior Notes	693	1,214	—
	24,067	23,481	20,831

Shares used to compute diluted income per share			
Potentially dilutive shares excluded from calculation due to anti-dilutive effect	2,845	335	3,544

Comprehensive Income (Loss)

Comprehensive income (loss) represents net income (loss) adjusted for the change during the periods presented in unrealized gains and losses on available-for-sale securities, foreign currency translation adjustments, and reclassification adjustments for realized gains or losses included in net income (loss). The unrealized gains or losses are reported on the Consolidated Statements of Comprehensive Income (Loss).

Foreign Currency Translation

The British Pound Sterling is the functional currency of Vernalis and the corresponding financial statements have been translated into U.S. Dollars in accordance with ASC 830-30, *Translation of Financial Statements*. Assets and liabilities are translated at end-of-period rates while revenues and expenses are translated at average rates in effect during the period in which the activity took place. Equity is translated at historical rates and the resulting cumulative translation adjustments are included as a component of accumulated other comprehensive income (loss).

Accounting Standards Recently Adopted

Revenue Recognition - In May 2014, the FASB issued new guidance related to revenue recognition, ASU 2014-09, Revenue from Contracts with Customers (Topic 606), and the amendments in ASUs 2015-14, 2016-10 and 2016-12, which outlines a comprehensive revenue recognition model and supersedes most current revenue recognition guidance. The new guidance requires a company to recognize revenue upon transfer of goods or services to a customer at an amount that reflects the expected consideration to be received in exchange for those goods or services. ASC 606 defines a five-step approach for recognizing revenue, which may require a company to use more judgment and make more estimates than under the current guidance. We adopted this new standard as of January 1, 2018, by using the modified-retrospective method. See *Revenue*, *Royalties*, *Licenses Fees and Milestones*, *Material Sales*, and *Disaggregation of Revenue* subsections mentioned above for further information.

Financial Instruments - In January 2016, the FASB issued ASU 2016-01, Financial Instruments - Overall (Subtopic 825-10), which requires equity investments (other than those accounted for under the equity method or those that result in consolidation) to be measured at fair value, with changes in fair value recognized in net income. We have strategic investments, including Viking, that fall under this guidance update. We have adopted ASU 2016-01 effective January 1, 2018 as a cumulative-effect adjustment and reclassified $2.7 million unrealized gains on equity investments, net of tax, from accumulated other comprehensive income to accumulated deficit on our consolidated balance sheet. Effective January 1, 2018, our results of operations include the changes in fair value of these financial instruments. See "*Item 8. Financial Statements and Supplementary Data—Notes to Consolidated Financial Statements—Note (2), Investment in Viking*" for additional information.

Stock Compensation - In March 2016, the FASB issued ASU 2016-09, Compensation - Stock Compensation (Topic 718), which aims to simplify the accounting for share-based payment transactions, including accounting for income taxes, classification on the statement of cash flows, accounting for forfeitures, and classification of awards as either liabilities or equity. We have adopted this standard effective January 1, 2017. This standard increases the volatility of net income by requiring excess tax benefits from share-based payment arrangements to be classified as discrete items within the provision for income taxes, rather than recognizing excess tax benefits in additional paid-in capital. Upon adoption in the first quarter of 2017, we recorded $17.6 million to accumulated deficit on our consolidated balance sheet, primarily related to unrealized tax benefits associated with share-based compensation. Also, as a result of the adoption of this new standard, we made an accounting policy election to recognize forfeitures as they occur and will no longer estimate expected forfeitures. In addition, excess income tax benefits from share-based compensation arrangements are classified as cash flows from operations, rather than cash flows from financing activities. We elected to apply the cash flows classification guidance prospectively and have not adjusted prior periods.

Statement of Cash Flows - In August 2016 the FASB issued ASU 2016-15, Statement of Cash Flows (Topic 230), Classification of Certain Cash Receipts and Cash Payments. The new standard clarifies certain aspects of the statement of cash flows, and aims to reduce diversity in practice regarding how certain transactions are classified in the statement of cash flows. This standard was effective January 1, 2018. We adopted ASU 2016-15 effective January 1, 2018. For the year ended December 31, 2017, we have reclassed $5.0 million payments to CVR holders and other contingency payments from investing activities to operating activities. For the year ended December 31, 2016, we have reclassed $8.8 million payments to CVR holders and other contingency payments from investing activities to operating activities and financing activities in amount of $2.3 million and $6.5 million, respectively. In addition, in November 2016, the FASB issued ASU 2016-18, Statement of Cash Flows (Topic 230), Restricted Cash. The standard requires that a statement of cash flows explains the change during the period in the total of cash, cash equivalents, and amounts generally described as restricted cash or restricted cash equivalents. Therefore, restricted cash should be included with cash and cash equivalents when reconciling the beginning-of-period and end-of-period total amounts shown on the statement of cash flows. The new guidance is effective for interim and annual periods beginning after December 15, 2017. We adopted this standard retrospectively, effective January 1, 2018 and included restricted cash amount of $2.6 million, which was included in other current assets in our consolidated balance sheet as of December 31, 2018, in the consolidated statement of cash flows. See additional information in "Footnote 7. Balance

Sheet Account Details." We did not have any restricted cash as of December 31, 2017 and 2016 .

Accounting Standards Not Yet Adopted

Leases - In February 2016, the FASB issued ASU 2016-02, Leases (Topic 842). This standard requires organizations that lease assets to recognize the assets and liabilities created by those leases. The standard also will require disclosures to help investors and other financial statement users better understand the amount, timing, and uncertainty of cash flows arising from leases. The ASU becomes effective for public companies for fiscal years and interim periods within those fiscal years, beginning after December 15, 2018. In 2018, the FASB issued guidance that provides an optional transition method for adoption of this standard, which allows organizations to initially apply the new requirements at the effective date, recognize a cumulative effect adjustment to the opening balance of retained earnings, and continue to apply the legacy guidance in ASC 840, Leases,

including its disclosure requirements, in the comparative periods presented. We adopted this standard on January 1, 2019 by applying this optional transition method. For leases with a term of 12 months or less, we elected to not recognize lease assets and lease liabilities and expense the leases over a straight-line basis for the term of those leases. The adoption of this standards update resulted in no material impact to our balance sheet, statement of operations, equity or cash flows.

Financial Instruments - In June 2016, the FASB issued ASU 2016-13, Financial Instruments - Credit Losses: Measurement of Credit Losses on Financial Instruments (Topic 326), which amends the impairment model by requiring entities to use a forward-looking approach based on expected losses to estimate credit losses on certain types of financial instruments, including trade receivables and available for sale debt securities. ASU 2016-13 is effective for us beginning in the first quarter of 2020, with early adoption permitted. We are currently evaluating the impact of this ASU on our consolidated financial statements.

Fair Value Measurement - In August 2018, the FASB issued ASU 2018-13, Fair Value Measurement: Disclosure Framework— Changes to the Disclosure Requirements for Fair Value Measurement (Topic 820), which modifies the disclosure requirements on fair value measurements. ASU 2018-13 is effective for us beginning in the first quarter of 2020, with earlier adoption permitted. We are currently evaluating the impact of this ASU on our consolidated financial statements.

We do not believe that any other recently issued, but not yet effective accounting pronouncements, if adopted, would have a material impact on our consolidated financial statements or disclosures.

2. Investment in Viking

Our current ownership in Viking is approximately 8.8% and we account it as investment in an available-for-sale security due to the fact that 1) we do not have the ability to exercise significant influence over Viking, 2) we are not involved in Viking's ongoing operations, and 3) Viking does not rely on us to provide technology products, expertise, support or services. Our investment in Viking is measured at fair value, with changes in fair value recognized in net income.

Our ownership in Viking was 17.6% and 30.3% as of December 31, 2017 and 2016, respectively. As a result of Viking's public stock offerings, we recorded a dilution gain of $2.7 million and a dilution loss of $10.7 million for the years ended December 31, 2017 and 2016, respectively. These amounts were recognized in Loss from Viking in our consolidated statement of operations. Our equity ownership interest in Viking decreased during the first quarter of 2018 to approximately 12.4% due to Viking's financing events in February 2018. As a result, in February 2018, we concluded that we did not exert significant influence over Viking and discontinued accounting for our investment in Viking under the equity method. Viking is considered a related party as we maintain a seat on Viking's board of directors.

Ligand and Viking were previously parties to a Loan and Security Agreement, dated May 21, 2014 (as amended by the First Amendment to Loan and Security Agreement, dated April 8, 2015, and the Second Amendment to Loan and Security Agreement, dated January 22, 2016, the “Loan and Security Agreement”), pursuant to which we loaned $2.5 million to Viking. Such debt was evidenced by a Senior Convertible Promissory Note (the “Convertible Note”). Pursuant to the terms of the Loan and Security Agreement, upon the consummation of the Follow-On Public Offering on April 13, 2016, Viking repaid us $1.5 million, which payment was composed of $0.3 million in cash, with the remaining balance paid in Viking’s equity securities, resulting in the issuance of 960,000 shares of common stock to us in the Follow-On Public Offering. Such payment was applied, first, to accrued and unpaid interest on the Convertible Note and, second, to the unpaid principal amount of the Convertible Note. On July 15, 2017, Viking repaid an additional $0.2 million in cash. Such payment was applied, first, to accrued and unpaid interest on the Convertible Note and, second, to the unpaid principal amount of the Convertible Note. On May 23, 2018, the

Convertible Note was repurchased in full by Viking for $3.9 million in cash. As of December 31, 2018, the Convertible Note and Loan and Security Agreement are no longer outstanding.

We also have outstanding warrants to purchase 1.5 million shares of Viking's common stock at an exercise price of $1.50 per share. We recorded the warrants in other current assets in our consolidated balance sheets at fair value of $9.3 million and $3.9 million at December 31, 2018 and 2017, respectively. For the years ended December 31, 2018, 2017 and 2016, a gain of $5.4 million, $3.2 million and $0.3 million on the fair market value of the warrants, respectively, was included within other income. See further discussion in "*Note (4), Fair Value Measurement.*"

Prior to the adoption of ASU 2016-01, we reviewed our investment in Viking on a regular basis and assess whether events, changes in circumstances or the passage of time, in management's judgment, indicate that a loss in the market value of the investment may be other than temporary. This might include, but would not necessarily be limited to, the period of time during which the carrying value of our investment is significantly above the observed market value, a deterioration in Viking's financial condition, or an adverse event relating to its lead clinical programs.

Based on a sustained low Viking common stock unit price during the year ended December 31, 2016, we determined that an other than temporary decrease in the value of our investment in Viking had occurred. We wrote down the value of our investment in Viking to its estimated fair value which resulted in impairment charges of $7.4 million for the year ended December 31, 2016.

Subsequent to the adoption of ASU 2016-01, we no longer account for our investment in Viking under the equity method; instead, it is measured at fair value, with changes in fair value recognized in net income.

3. Business Combinations

As set forth below, we completed three acquisitions from January 1, 2016 through December 31, 2018, and all were accounted for as business combinations. We applied the acquisition method of accounting. Accordingly, we recorded the tangible and intangible assets acquired and liabilities assumed at their estimated fair values as of the applicable date of acquisition. For each acquisition, we did not incur any material acquisition related costs.

Vernalis Acquisition

In October 2018, we acquired Vernalis, a structure-based drug discovery biotechnology company for $43.0 million, funded through cash on hand. The acquisition of Vernalis increases our overall portfolio of fully-funded programs. As Vernalis' operations are not considered material, pro forma information is not provided.

The preliminary allocation of the consideration was allocated to the acquisition date fair values of acquired assets and assumed liabilities as follows (in thousands):

Cash and cash equivalents	$	34,286
Restricted cash	2,836	
Other assets	6,383	
Accounts payable and accrued liabilities	(3,403)	
Restructuring and product reserves	(7,118)	
Deferred revenue	(746)	
Intangibles assets with finite life - core technology	7,000	
Goodwill	3,740	
	$	42,978

None of the goodwill is deductible for tax purposes. The fair value of the core technologies were based on the

discounted cash flow method that estimated the present value of the hypothetical royalty/milestone streams derived from the licensing of the related technologies. These projected cash flows were discounted to present value using a discount rate of 34.0%. The fair value of the core technology is being amortized on a straight-line basis over the weighted average estimated useful life of approximately nine years.

The estimated fair values of assets acquired and liabilities assumed, including deferred tax assets and liabilities, purchased intangibles and deferred revenue are provisional. The accounting for these amounts falls within the measurement period and therefore we may adjust these provisional amounts to reflect new information obtained about facts and circumstances that existed as of the acquisition date.

Crystal Acquisition

On October 6, 2017, we acquired all of the assets and liabilities of Crystal. Crystal is a biotechnology company focused in avian genetics and the generation of fully-human therapeutic engineering of animals for the generation of fully-human therapeutic antibodies through its OmniChicken® technology. Under the terms of the agreement, we were to pay Crystal selling shareholders $27.2 million in cash including a $2.2 million working capital adjustment, and up to an additional $10.5 million of cash consideration based on Crystal's achievement of certain research and business milestones prior to December 31, 2019. In addition, Crystal's selling shareholders will receive 10% of revenues realized by Ligand above $15 million between the closing date and December 31, 2022 from existing collaboration agreements between Crystal and three of its collaborators, and Crystal's selling shareholders will receive 20% of revenues above $1.5 million generated between the closing date and

December 31, 2022 pursuant to a fourth existing collaboration agreement with a large pharmaceutical company. As of December 31, 2018, $0.2 million of the initial $27.2 million of cash consideration remained outstanding.

At the closing of the acquisition, we recorded an $8.4 million contingent liability for amounts potentially due to Crystal shareholders. The initial fair value of the liability was determined using a probability weighted income approach incorporating the estimated future cash flows from potential milestones and revenue sharing. These cash flows were then discounted to present value using discount rates based on our estimated corporate credit rating, and averaged to approximately 4.6%. Refer to *Note 4 Fair Value Measurement* for further discussion. The liability has been periodically assessed based on events and circumstances related to the underlying milestones, and any changes in fair value are recorded in our consolidated statements of operations. The carrying amount of the liability may fluctuate significantly and actual amounts paid may be materially different than the carrying amount of the liability. There was no change in the fair value of the contingent liabilities from the initial valuation date to December 31, 2018.

The aggregate acquisition consideration was determined to be $35.7 million, consisting of (in thousands):

Cash paid to Crystal shareholders	$	26,877
Cash payable to Crystal Shareholders	336	
Assumed liabilities	129	
Fair value of contingent consideration	8,401	
Total consideration	$	35,743

The acquisition consideration was allocated to the acquisition date fair values of acquired assets and assumed liabilities as follows (in thousands):

Cash and cash equivalents	$	224
Accounts receivable	2,513	
Prepaid expenses and other assets	201	
Property and equipment, net	589	
Current liabilities assumed	(354)	
Deferred revenue	(4,624)	
Deferred tax	(9,503)	

liabilities, net		
Intangible asset with finite life - core technology	36,000	
Goodwill	10,697	
Total consideration	$	35,743

The fair value of the core technology, or OmniChicken technology, was based on the discounted cash flow method that estimated the present value of a hypothetical royalty stream derived from the licensing of the OmniChicken technology. These projected cash flows were discounted to present value using a discount rate of 10.8%. The fair value of the core technology is being amortized on a straight-line basis over the estimated useful life of 20 years.

The excess of the acquisition date consideration over the fair values assigned to the assets acquired and the liabilities assumed was $10.7 million and was recorded as goodwill, which is not deductible for tax purposes and is primarily attributable to Crystal’s potential revenue growth from combining the Crystal and Ligand businesses and workforce, as well as the benefits of access to different markets and customers.

OMT Acquisition

On January 8, 2016, we acquired substantially all of the assets and liabilities of OMT. OMT is a biotechnology company engaged in the genetic engineering of animals for the generation of human therapeutic antibodies through its OmniAb® technology. The aggregate acquisition consideration was $173.4 million, consisting of (in thousands, except per share amounts):

Cash consideration	$	96,006
Total share consideration:		
Actual number of shares issued	790	
Multiplied by: Ligand closing share price on January 8, 2016	98	
Total share consideration	$	77,373
Total consideration	$	173,379

The acquisition consideration was allocated to the acquisition date fair values of acquired assets and assumed liabilities as follows (in thousands):

Cash and cash equivalents	$	3,504
Accounts receivable	5	
Income tax receivable	136	
Prepaid expenses and other current assets	1	
Deferred tax liabilities, net	(55,708)	
Intangible asset with finite life - core technology	167,000	
Liabilities assumed	(1,528)	
Goodwill	59,969	
Total consideration	$	173,379

The fair value of the core technology, or OMT's OmniAb technology, was based on the discounted cash flow method that estimated the present value of a hypothetical royalty stream derived from the licensing of the OmniAb technology. These projected cash flows were discounted to present value using a discount rate of 15.5%. The fair value of the core technology is being amortized on a straight-line basis over the estimated useful life of 20 years.

The excess of the acquisition date consideration over the fair values assigned to the assets acquired and the liabilities assumed was $60.0 million and was recorded as goodwill, which is not deductible for tax purposes and is primarily attributable to OMT's potential revenue growth from combining the OMT and Ligand businesses and workforce, as well as the benefits of access to different markets and customers.

4. Fair Value Measurement

We measure certain financial assets and liabilities at fair value on a recurring basis. Fair value is a market-based measurement that should be determined using assumptions that market participants would use in pricing an asset or liability. We establish a three-level hierarchy to prioritize the inputs used in measuring fair value. The levels are described in the below with level 1 having the highest priority and level 3 having the lowest:
Level 1 - Observable inputs such as quoted prices in active markets
Level 2 - Inputs other than the quoted prices in active markets that are observable either directly or indirectly
Level 3 - Unobservable inputs in which there is little or no market data, which require the Company to develop its own assumptions

The following table provides a summary of the assets and liabilities that are measured at fair value on a recurring basis as of December 31, 2018 and 2017 (in thousands):

	Fair Value Measurements at Reporting Date Using			
December 31, 2018	**Quoted Prices in Active Markets for Identical Assets**	**Significant Other Observable Inputs**	**Significant Unobservable Inputs**	
Total	**(Level 1)**	**(Level 2)**	**(Level 3)**	
Assets:				
Short-term investments (1)	$ 647,408	$ 47,517	$ 599,891	$ —
Investment in warrants (3)	9,257	9,257	—	—
Total assets	$ 656,665	$ 56,774	$ 599,891	$ —
Liabilities:				
Contingent liabilities - Crystal (4)	$ 6,477	$ —	$ —	6,477
Contingent liabilities - Cydex (5)	514	—	—	514
Contingent liabilities - Metabasis (6)	5,551	—	5,551	—
Liability for amounts owed to a former licensor (7)	199	199	—	—
Total liabilities	$ 12,741	$ 199	$ 5,551	$ 6,991

	Fair Value Measurements at Reporting Date Using

December 31, 2017	Total	Quoted Prices in Active Markets for Identical Assets (Level 1)	Significant Other Observable Inputs (Level 2)	Significant Unobservable Inputs (Level 3)
Assets:				
Short-term investments (1)	$ 181,041	1,896	$ 179,145	$ —
Note receivable Viking (2)	3,877	—	—	3,877
Investment in warrants (3)	3,846	3,846	—	—
Total assets	$ 188,764	$ 5,742	$ 179,145	$ 3,877
Liabilities:				
Contingent liabilities - Crystal (4)	$ 8,401	$ —	$ —	$ 8,401
Contingent liabilities - Cydex (5)	1,589	—	—	1,589
Contingent liabilities - Metabasis (6)	3,971	—	3,971	—
Liability for amounts owed to a former licensor (7)	284	284	—	—
Total liabilities	$ 14,245	$ 284	$ 3,971	$ 9,990

(1) Amounts Investments in equity securities (including investments in Viking), are classified as level 1 as the fair value is determined using quoted market prices in active markets for the same securities. Short-term investments in marketable securities with maturities greater than 90 days are classified as level 2 of the fair

value hierarchy, as these investment securities are valued based upon quoted prices for identical or similar instruments in markets that are not active, and model-based valuation techniques for which all significant assumptions are observable in the market.

(2) The fair value of the Convertible Note receivable from Viking at December 31, 2017 approximated the book value since the contractual maturity date was within five months from the end of 2017, and there was no plan to extend the maturity date. The fair value at December 31, 2017 was determined using a probability weighted option pricing model. The fair value is subjective and is affected by certain significant input to the valuation model such as the estimated volatility of the common stock, which was estimated to be 75% at December 31, 2017. Changes in these assumptions may materially affect the fair value estimate. For the years ended December 31, 2018, December 31, 2017, and December 31, 2016, we reported an increase in the fair value of 0.0 million, an increase in the fair value of $0.9 million, and a decrease in the fair value of $0.2 million, respectively in "Other, net" of the consolidated statement of operations. See further discussion in "*Note (2), Investment in Viking*."

(3) Investment in warrants, which we received as a result of Viking's partial repayment of the Viking note receivable and our purchase of Viking common stock and warrants in April 2016, is classified as level 1 as the fair value is determined using quoted market prices in active markets for the same securities. See further discussion in "*Note (2), Investment in Viking*."

(4) The fair value of Crystal contingent liabilities was determined using a probability weighted income approach. Most of the contingent payments are based on development or regulatory milestones as defined in the merger agreement with Crystal. The fair value is subjective and is affected by changes in inputs to the valuation model including management's estimates regarding the timing and probability of achievement of certain developmental and regulatory milestones. At

December 31, 2018, most of the development and regulatory milestones were estimated to be highly probable of being achieved in 2019. Changes in these estimates may materially affect the fair value.

(5) The fair value of CyDex contingent liabilities was determined based on the income approach. To the extent the estimated future income may vary significantly given the long-term nature of the estimate, we utilize a Monte Carlo model. The fair value is subjective and is affected by changes in inputs to the valuation model including management's estimates of timing and probability of achievement of certain revenue thresholds and developmental and regulatory milestones which may be achieved and affect amounts owed to former license holders.

(6) In connection with our acquisition of Metabasis in January 2010, we issued Metabasis stockholders four tradable CVRs, one CVR from each of four respective series of CVR, for each Metabasis share. The CVRs entitle Metabasis stockholders to cash payments as frequently as every six months as cash is received by us from proceeds from the sale or partnering of any of the Metabasis drug development programs, among other triggering events. The liability for the CVRs is determined using quoted prices in a market that is not active for the underlying CVR. The carrying amount of the liability may fluctuate significantly based upon quoted market prices and actual amounts paid under the agreements may be materially different than the carrying amount of the liability. Several of the Metabasis drug development programs have been outlicensed to Viking, including VK2809. VK2809 is a novel selective TR- agonist with potential in multiple indications, including hypercholesterolemia, dyslipidemia, NASH, and X-ALD. Under the terms of the agreement with Viking, we may be entitled to up to $375.0 million of development, regulatory and commercial milestones and tiered royalties on potential future sales including a $10.0 million payment upon initiation of a Phase 3 clinical trial. Another Metabasis drug development program, RVT-1502, has been outlicensed to Metavant. RVT-1502 is a novel, orally-bioavailable, small molecule, glucagon receptor antagonist or "GRA." We may be entitled to up to $529.0 million in milestone payments and royalties.

(7) The liability for amounts owed to a former licensor is determined using quoted market prices in active markets for the underlying investment received from a partner, a portion of which is owed to a former licensor.

A reconciliation of the level 3 financial instruments as of December 31, 2018 is as follows (in thousands):

Assets:		
Fair value of level 3 financial instruments as of December 31, 2017	$	3,877
Cash payment received as repayment of note receivable		(3,877)
Fair value of level 3 financial instrument assets as of December 31, 2018	$	—
Liabilities		
Fair value of level 3 financial instruments as of December 31, 2017	$	9,990
Payments to CVR holders		(1,025)

and other contingency payments		
Fair value adjustments to contingent liabilities	(1,974)	
Fair value of level 3 financial instruments as of December 31, 2018	$	6,991

Assets Measured on a Non-Recurring Basis

We apply fair value techniques on a non-recurring basis associated with valuing potential impairment losses related to our goodwill, indefinite-lived intangible assets, long-lived assets, and equity investments.

We evaluate goodwill and indefinite-lived intangible assets annually for impairment and whenever circumstances occur indicating that goodwill might be impaired. We determine the fair value of our reporting unit based on a combination of inputs, including the market capitalization of Ligand, as well as Level 3 inputs such as discounted cash flows, which are not observable from the market, directly or indirectly. We determine the fair value of our indefinite-lived intangible assets using the income approach based on Level 3 inputs.

Other than certain indefinite-lived intangible asset, there were no impairment of our goodwill, indefinite-lived assets, or long-lived assets recorded during the three years ended December 31, 2018, 2017 and 2016.

Fair Value of Financial Instruments

In August 2014 and May 2018, we issued the 2019 Notes and 2023 Notes, respectively. We use quoted market rates in an inactive market, which are classified as a Level 2 input, to estimate the current fair value of our 2019 and 2023 Notes. The carrying value of the notes does not reflect the market rate. See "*Note (6), Convertible Senior Notes*" for additional information related to the fair value.

5. Lease Obligations

We lease office facilities under various operating leases. These leases expire between 2019 and 2023. Total rent expense, net under all office leases for 2018, 2017 and 2016 was $1.0 million, $0.3 million and $0.3 million, respectively. The following table provides a summary of operating lease obligations and payments expected to be received from sublease agreements as of December 31, 2018 (in thousands):

Operating lease obligations:	**Lease Termination Date**	**Less than 1 year**	**1-2 years**	**3-4 years**	**Total**
Corporate headquarters - San Diego, CA	April 2023	$ 135	$ 283	$ 198	$ 616
Office and research facility - La Jolla, CA	June 2019	373	—	—	373
Bioscience and Technology Business Center - Lawrence, KS	December 2020	57	56	—	113
Office - Emeryville, CA	August 2021	260	455	—	715
Research Facility - Emeryville, CA	August 2021	203	351	—	$ 554
Office - Winnersh, United Kingdom	April 2019	43	—	—	43
Research Facility - Cambridge, United Kingdom	September 2019	549	—	—	549
Total operating lease obligations		$ 1,620	$ 1,145	$ 198	$ 2,963
Sublease payments expected to be received:					
Office and research facility - La Jolla, CA	June 2019	360	—	—	360
Net operating lease obligations		$ 1,260	$ 1,145	$ 198	$ 2,603

6. Convertible Senior Notes

0.75% Convertible Senior Notes due 2019

In August 2014, we issued $245.0 million aggregate principal amount of 2019 Notes, resulting in net proceeds of $239.3 million. The implied estimated effective rate of the liability component of the 2019 Notes was 5.83%. The 2019 Notes are convertible into common stock at an initial conversion rate of 13.3251 shares per $1,000 principal

amount of convertible notes, subject to adjustment upon certain events, which is equivalent to an initial conversion price of approximately $75.05 per share of common stock. The notes bear cash interest at a rate of 0.75% per year, payable semi-annually.

Holders of the 2019 Notes may convert the notes at any time prior to the close of business on the business day immediately preceding May 15, 2019, under any of the following circumstances:

(1) during any fiscal quarter (and only during such fiscal quarter) commencing after December 31, 2014, if, for at least 20 trading days (whether or not consecutive) during the 30 consecutive trading day period ending on the last trading day of the immediately preceding fiscal quarter, the last reported sale price of our common stock on such trading day is greater than 130% of the conversion price on such trading day;

(2) during the five business day period immediately following any 10 consecutive trading day period, in which the trading price per $1,000 principal amount of notes was less than 98% of the product of the last reported sale price of our common stock on such trading day and the conversion rate on each such trading day; or

(3) upon the occurrence of certain specified corporate events as specified in the indenture governing the notes.

As of December 31, 2017, our last reported sale price of our common stock exceeded the 130% threshold described above and accordingly the 2019 Notes were classified as a current liability. As a result, the related unamortized discount of $18.9 million at December 31, 2017, was classified as temporary equity component of currently redeemable convertible notes on our consolidated balance sheet.

As of December 31, 2018, our 2019 Notes are due in less than one year, and accordingly have been classified as a current liability. Under the original indenture conversion, we were obligated to deliver cash to settle the principal and may deliver cash or shares of common stock, at our option, to settle any premium due upon conversion for any conversion notices received prior

to May 22, 2018. We made an irrevocable election to settle the entire note in cash per a supplemental indenture entered into on May 22, 2018. As such, we must deliver cash to settle the principal and any premium due upon conversion for any conversion notices received on or after May 22, 2018.

As a result of the requirement to deliver cash to settle any premium due upon conversion, on May 22, 2018, we reclassified from equity to liability the conversion option (a derivative) fair value of $341.6 million. In accordance with ASC 815, Derivatives and Hedging, the derivative was adjusted to its fair value as of December 31, 2018 to $23.4 million with the resulting $118.7 million increase, net of payments made, reflected in other expense, net, in our consolidated statements of operations for the year ended December 31, 2018.

In March and April 2018, we received notices for conversion of $21.8 million of principal amount of the 2019 Notes which were settled in May and June 2018. We paid the noteholders the conversion value of the notes in cash, up to the principal amount of the 2019 Notes. The excess of the conversion value over the principal amount, totaling $31.6 million, was paid in shares of common stock. In July and August 2018, we received notices for conversion of $195.9 million of principal amount of the 2019 Notes which were settled in October and November 2018. We paid the noteholders the $195.9 million principal amount and the excess of conversion value over the principal amount, totaling $439.6 million, in cash. The equity dilution and cash conversion premium payment upon conversion of the 2019 Notes was offset by the reacquisition of the shares and cash under the convertible bond hedge transactions entered into in connection with the offering of the 2019 Notes. As a result of the conversions, we recorded a $3.2 million loss on extinguishment of debt calculated as the difference between the estimated fair value of the debt and the carrying value of the 2019 Notes as of the settlement dates. To measure the fair value of the converted 2019 Notes as of the settlement dates, the applicable interest rates were estimated using Level 2 observable inputs and applied to the converted notes using the same methodology as in the issuance date valuation.

Convertible Bond Hedge and Warrant Transactions

In August 2014, to minimize the impact of potential dilution to our common stock upon conversion of the 2019 Notes, we entered into convertible bond hedges and sold warrants covering 3,264,643 shares of our common stock. The convertible bond hedges have an exercise price of $75.05 per share and are exercisable when and if the 2019 Notes are converted. If upon conversion of the 2019 Notes, the price of our common stock is above the exercise price of the convertible bond hedges, the counterparties will deliver shares of common stock and/or cash with an aggregate value approximately equal to the difference between the price of common stock at the conversion date and the exercise price, multiplied by the number of shares of common stock related to the convertible bond hedge transaction being exercised. The convertible bond hedges and warrants described below are separate transactions entered into by us and are not part of the terms of the 2019 Notes. Holders of the 2019 Notes and warrants will not have any rights with respect to the convertible bond hedges. We paid $48.1 million for these convertible bond hedges and recorded the amount as a reduction to additional paid-in capital.

Conversion notices received after May 22, 2018 relating to the 2019 Notes must be fully settled in cash and amounts paid in excess of the principal amount will be offset by an equal receipt of cash under the convertible bond hedge. As a result of the irrevocable cash election, on May 22, 2018, we reclassified from equity to derivative asset the remaining bond hedge fair value of $340.0 million and marked it to market as of December 31, 2018 to $22.6 million with the resulting $119.4 million increase, net of $471.2 million in payments received, reflected in other expense, net, in our consolidated statements of operations for the year ended December 31, 2018.

Concurrently with the convertible bond hedge transactions, we entered into warrant transactions whereby we sold warrants to acquire 3,264,643 shares of common stock with an exercise price of $125.08 per share, subject to certain adjustments. The warrants have various expiration dates ranging from November 13, 2019 to April 22, 2020. The warrants will have a dilutive effect to the extent the market price per share of common stock exceeds the applicable exercise price of the warrants, as measured under the terms of the warrant transactions. We received $11.6 million for

these warrants and recorded this amount to additional paid-in capital. The common stock issuable upon exercise of the warrants will be in unregistered shares, and we do not have the obligation and do not intend to file any registration statement with the SEC registering the issuance of the shares under the warrants. We continue to have the ability to avoid settling the warrants associated with the 2019 Notes in cash after May 22, 2018. Accordingly, the warrants continue to be classified in additional paid in capital.

In November 2018, we modified agreements with one of the bond hedge counterparties to cash settle a total of 525,000 warrants. As the modifications required the warrants to be cash settled, the fair value of the warrants was reclassified from stockholders' equity to a derivative liability on the modification dates, resulting in a $28.3 million deduction to additional paid-in-capital during 2018. We settled these repurchases for total consideration of $30.1 million and recorded a $1.8 million loss during 2018 on the change in the fair value of the derivative liabilities between their modification and settlement dates, which is included in other expense, net in the accompanying consolidated statement of operations. As a result, as of December 31, 2018, 2,739,643 warrants remain outstanding.

0.75% Convertible Senior Notes due 2023

In May 2018, we issued $750 million aggregate principal amount of 2023 Notes, bearing cash interest at a rate of 0.75% per year, payable semi-annually. The net proceeds from the offering, after deducting the initial purchasers' discount and offering expenses, were approximately $733.1 million. The 2023 Notes will be convertible into cash, shares of common stock, or a combination of cash and shares of common stock, at our election, based on an initial conversion rate, subject to adjustment, of 4.0244 shares per $1,000 principal amount of the 2023 Notes which represents an initial conversion price of approximately $248.48 per share.

Holders of the 2023 Notes may convert the notes at any time prior to the close of business on the business day immediately preceding November 15, 2022, under any of the following circumstances:

(1) during any fiscal quarter (and only during such fiscal quarter) commencing after September 30, 2018, if, for at least 20 trading days (whether or not consecutive) during the 30 consecutive trading day period ending on the last trading day of the immediately preceding fiscal quarter, the last reported sale price of our common stock on such trading day is greater than 130% of the conversion price on such trading day;

(2) during the five business day period immediately following any 10 consecutive trading day period, in which the trading price per $1,000 principal amount of notes was less than 98% of the product of the last reported sale price of our common stock on such trading day and the conversion rate on each such trading day; or

(3) upon the occurrence of certain specified corporate events as specified in the indenture governing the notes.

At the May 22, 2018 issuance date of the 2023 Notes, we did not have the necessary number of authorized but unissued shares of our common stock available to settle the conversion option of the 2023 Notes in shares. Therefore, in accordance with guidance found in ASC 815-15 – Embedded Derivatives, the conversion option of the Notes was deemed an embedded derivative requiring bifurcation from the 2023 Notes (host contract) and separate accounting as a derivative liability. The fair value of the conversion option derivative liability at May 22, 2018 was $144.0 million, which was recorded as a reduction to the carrying value of the debt. This debt discount is amortized to interest expense over the term of the debt using the effective interest method. Up to the date in which we received shareholder approval on June 19, 2018 to increase the authorized number of shares of our common stock, the conversion option was accounted for as a liability with the resulting change in fair value of $13.5 million during that period reflected in other expense, net, in our consolidated statements of operations for the year ended December 31, 2018. As of December 31, 2018, the debt discount remains and continues to be amortized to interest expense.

The notes will have a dilutive effect to the extent the average market price per share of common stock for a given reporting period exceeds the conversion price of $248.48. As of December 31, 2018, the "if-converted value" did not exceed the principal amount of the 2023 Notes.

In connection with the issuance of the 2023 Notes, we incurred $16.9 million of issuance costs, which primarily consisted of underwriting, legal and other professional fees. The portion of these costs allocated to the conversion option totaling $3.2 million was recorded as interest expense for the twelve months ended December 31, 2018. The

portion of these costs allocated to the liability component totaling $13.7 million is amortized to interest expense using the effective interest method over the five year expected life of the 2023 Notes.

It is our intent and policy to settle conversions through combination settlement, which essentially involves payment in cash equal to the principal portion and delivery of shares of common stock for the excess of the conversion value over the principal portion.

Convertible Bond Hedge and Warrant Transactions

In conjunction with the 2023 Notes, in May 2018, we entered into convertible bond hedges and sold warrants covering 3,018,327 shares of our common stock to minimize the impact of potential dilution to our common stock and/or offset the cash payments we are required to make in excess of the principal amount upon conversion of the 2023 Notes. The convertible bond hedges have an exercise price of $248.48 per share and are exercisable when and if the 2023 Notes are converted. We paid $140.3 million for these convertible bond hedges. If upon conversion of the 2023 Notes, the price of our common stock is above the exercise price of the convertible bond hedges, the counterparties will deliver shares of common stock and/or cash with an aggregate value approximately equal to the difference between the price of common stock at the conversion date and the exercise price, multiplied by the number of shares of common stock related to the convertible bond hedge transaction being exercised. The convertible bond hedges and warrants described below are separate transactions entered into by us and are not part of the terms of the 2023 Notes. Holders of the 2023 Notes and warrants will not have any rights with respect to the convertible bond hedges.

Concurrently with the convertible bond hedge transactions, we entered into warrant transactions whereby we sold warrants covering 3,018,327 shares of common stock with an exercise price of $315.38 per share, subject to certain adjustments. We received $90.0 million for these warrants. The warrants have various expiration dates ranging from August 15, 2023 to February 6, 2024. The warrants will have a dilutive effect to the extent the market price per share of common stock exceeds the applicable exercise price of the warrants, as measured under the terms of the warrant transactions. The common stock issuable upon exercise of the warrants will be in unregistered shares, and we do not have the obligation and do not intend to file any registration statement with the SEC registering the issuance of the shares under the warrants.

For the period from May 22, 2018, the issuance date of the bond hedge and warrant transactions, to June 19, 2018, the date shareholders approved an increase in our authorized shares of common stock, the bond hedges and warrants required cash settlement and were accounted for as a derivative asset and liability, respectively, with the resulting increase in fair value of $19.2 million and $7.5 million reflected in other expense, net, in our consolidated statements of operations for twelve months ended December 31, 2018.

The following table summarizes information about the equity and liability components of the 2019 Notes and 2023 Notes (in thousands).

	December 31, 2018	**December 31, 2017**
Principle amount of 2019 Notes outstanding	$ 27,326	$ 245,000
Unamortized discount (including unamortized debt issuance cost)	(893)	(20,471)
Total current portion of notes payable	$ 26,433	$ 224,529
Principle amount of 2023 Notes outstanding	$ 750,000	$ —
	(140,136)	—

Unamortized discount (including unamortized debt issuance cost)				
Total long-term portion of notes payable	$	609,864	$	—
Carrying value of equity component of 2023 Notes	$	127,997	$	—
Fair value of convertible senior notes outstanding (Level 2)	$	713,533	$	446,360

As of December 31, 2018, there were no events of default or violation of any covenants under our financing obligations.

7. Balance Sheet Account Details

Short-term Investments

The following table summarizes the various investment categories at December 31, 2018 and 2017 (in thousands):

	Cost	Gross unrealized gains	Gross unrealized losses	Estimated fair value
December 31, 2018				
Short-term investments				
Bank deposits	$ 311,066	$ 26	$ (29)	$ 311,063
Corporate bonds	53,223	1	(45)	53,179
Corporate equity securities	135	1,191	—	1,326
Commercial paper	225,731	8	(76)	225,663
U.S. Government bonds	7,982	—	(9)	7,973
Municipal bonds	2,017	—	(4)	2,013
	$ 600,154	$ 1,226	$ (163)	$ 601,217
December 31, 2017				
Short-term investments				
Bank deposits	$ 80,095	$ 6	$ (42)	$ 80,059
Corporate bonds	55,335	—	(96)	55,239
Corporate equity securities	207	1689	—	1,896
Commercial paper	27,933	—	(20)	27,913
Agency bonds	4,991	—	(1)	4,990
U.S. Government bonds	8,939	—	(10)	8,929
Municipal bonds	2,028	—	(13)	2,015
	$ 179,528	$ 1,695	$ (182)	$ 181,041

Other current assets consist of the following (in thousands):

December 31, 2018	2017
$ 2,616	$ —

Restricted cash		
Investment in Viking warrants	9,257	—
Other	8,545	1,514
	$ 20,418	$ 1,514

Property and equipment is stated at cost and consists of the following (in thousands):

	December 31, 2018	2017
Lab and office equipment	$ 4,183	$ 3,460
Leasehold improvements	2,418	1,917
Computer equipment and software	936	697
	7,537	6,074
Less accumulated depreciation and amortization	(2,165)	(1,862)
	$ 5,372	$ 4,212

Depreciation of equipment is computed using the straight-line method over the estimated useful lives of the assets which range from three to ten years. Leasehold improvements are amortized using the straight-line method over their estimated useful lives or their related lease term, whichever is shorter. Depreciation expense of $0.9 million, $0.4 million, and $0.2 million was recognized for the years ended December 31, 2018, 2017, and 2016, respectively, and is included in operating expenses.

Goodwill and identifiable intangible assets consist of the following (in thousands):

	December 31, 2018	2017
Indefinite lived intangible assets		
IPR&D	$ —	$ 7,923
Goodwill	86,646	85,959
Definite lived intangible assets		
Complete technology	235,413	222,900
Less: Accumulated amortization	(35,070)	(23,301)
Trade name	2,642	2,642
Less: Accumulated amortization	(1,048)	(916)
Customer relationships	29,600	29,600
Less: Accumulated amortization	(11,744)	(10,264)
Total goodwill and other identifiable intangible assets, net	$ 306,439	$ 314,543

Amortization of finite lived intangible assets is computed using the straight-line method over the estimated useful life of the asset of 20 years. Amortization expense of $15.8 million, $11.3 million, and $10.6 million was recognized for the years ended December 31, 2018 and 2017, and 2016, respectively. Estimated amortization expense for the years ending December 31, 2018 through 2023 is $13.6 million per year. For each of the years ended December 31, 2018, 2017, and 2016, there was no impairment of intangible assets with finite lives.

Accrued liabilities consist of the following (in thousands):

	December 31, 2018	2017
Compensation	$ 4,045	$ 4,085
Legal	942	430
Amounts owed to former licensees	428	396

Royalties owed to third parties	1,025	954
Payments due to broker for share repurchases	4,613	—
Return reserve	3,590	—
Restructuring	1,093	—
Other	3,464	1,512
	$ 19,200	$ 7,377

Contingent liabilities:

In connection with the acquisition of CyDex in January 2011, we issued a series of CVRs and also assumed certain contingent liabilities. We may be required to make additional payments upon achievement of certain clinical and regulatory milestones to the CyDex shareholders and former license holders. We paid CyDex shareholders, through 2016, 20% of all CyDex-related revenue, but only to the extent that, and beginning only when, CyDex-related revenue for the year exceeds $15.0 million; plus an additional 10% of all CyDex-related revenue recognized during such year, but only to the extent, and beginning only when aggregate CyDex-related revenue for such year exceeds $35.0 million.

In connection with the acquisition of Metabasis in January 2010, we entered into four CVR agreements with Metabasis shareholders. The CVRs entitle the holders to cash payments as frequently as every six months as proceeds are received by us upon the sale or licensing of any of the Metabasis drug development programs and upon the achievement of specified milestones.

The following table summarizes contingent liabilities as of December 2018 and 2017 (in thousands):

	December 31, 2016	Payments	Fair Value Adjustment	Additions	December 31, 2017	Payments	Fair Value Adjustment	December 31, 2018
Cydex	$ 6,600	$ (5,000)	$ —	$ —	$ 1,600	$ (25)	$ (1,050)	$ 525
Metabasis	$ 1,500	$ —	$ 2,500	$ —	$ 4,000	$ (3,900)	$ 5,400	$ 5,500
Crystal	$ —	$ —	$ —	$ 8,400	$ 8,400	$ (1,000)	$ (924)	$ 6,476
Total	**$ 8,100**	**$ (5,000)**	**$ 2,500**	**$ 8,400**	**$ 14,000**	**$ (4,925)**	**$ 3,426**	**$ 12,501**

8. Stockholders' Equity

Share-based Compensation Expense

The following table summarizes share-based compensation expense (in thousands):

	December 31, 2018	2017	2016
Share-based compensation expense as a component of:			
Research and development expenses	$ 8,352	$ 14,235	$ 8,836
General and administrative expenses	12,494	10,680	10,057
	$ 20,846	$ 24,915	$ 18,893

Stock Plans

In May 2012 and May 2016, our 2002 Stock Incentive Plan was amended to increase the number of shares available for issuance by 1.8 million and 0.9 million shares, respectively. As of December 31, 2018, there were 0.6 million shares available for future option grants or direct issuance under the Amended 2002 Plan.
Following is a summary of our stock option plan activity and related information:

	Shares	Weighted Average Exercise Price	Weighted Average Remaining Contractual Term in Years	Aggregate Intrinsic Value (In thousands)
Balance at December 31, 2017	1,876,332	$ 53.17	5.77	$ 157,340
Granted	228,362	162.00		
Exercised	(358,162)	55.24		
Forfeited	(10,228)	114.53		
	1,736,304	66.71	5.47	125,858

Balance at December 31, 2018					
Exercisable at December 31, 2018	1,313,374	47.03	4.56	117,314	
Options vested and expected to vest as of December 31, 2018	1,734,304	$ 66.71	5.47	$	125,858

The weighted-average grant-date fair value of all stock options granted during 2018, 2017 and 2016 was $66.71, $53.17 and $46.53 per share, respectively. The total intrinsic value of all options exercised during 2018, 2017 and 2016 was approximately $51.9 million, $13.3 million and $12.0 million, respectively.
Cash received from options exercised, net of fees paid, in 2018, 2017 and 2016 was $19.8 million, $4.7 million and $6.2 million, respectively.

Following is a further breakdown of the options outstanding as of December 31, 2018:

Range of exercise prices	Options outstanding	Weighted average remaining life in years	Weighted average exercise price	Options exercisable	Weighted average exercise price
$8.58 - $10.05	184,702	1.87	$ 10.00	184,702	$ 10.00
$10.12 - $12.81	46,510	2.92	11.40	46,510	11.40
$14.47 - $14.47	217,616	3.11	14.47	203,616	14.47
$16.14 - $17.88	38,790	0.17	16.36	38,790	16.36
$21.92 - $21.92	200,372	4.13	21.92	200,372	21.92
$32.00 - $56.26	182,767	5.70	50.38	174,470	50.10
$63.58 - $67.53	20,434	5.44	67.42	20,153	67.47
$74.42 - $74.42	190,825	5.12	74.42	190,825	74.42
$85.79 - $100.38	299,282	7.57	93.32	157,872	91.62
$101.15 - $195.91	353,006	8.79	148.50	96,064	131.77
	1,734,304	5.47	$ 66.71	1,313,374	$ 47.03

The assumptions used for the specified reporting periods and the resulting estimates of weighted-average grant date fair value per share of options granted:

	Year Ended December 31,		
	2018	2017	2016
Risk-free interest rate	2.7%-3.0%	1.9%-2.2%	1.3%-1.9%
Expected volatility	33%-36%	43%-47%	48%-50%
Expected term	5.1 to 5.8 years	6.5 to 6.8 years	6.6 to 6.7 years

As of December 31, 2018, there was $20.4 million of total unrecognized compensation cost related to non-vested stock options. That cost is expected to be recognized over a weighted average period of 2.39 years.

Restricted Stock Activity

The following is a summary of our restricted stock activity and related information:

	Shares	Weighted-Average Grant Date Fair Value	
Outstanding at December 31, 2017	133,294	$	91.60
Granted	62,133	169.92	
Vested	(61,989)	86.19	
Forfeited	(1,165)	125.16	
Outstanding at December 31, 2018	132,273	$	130.63

As of December 31, 2018, unrecognized compensation cost related to non-vested stock awards amounted to $9.2 million. That cost is expected to be recognized over a weighted average period of 1.38 years.

Employee Stock Purchase Plan

As of December 31, 2018, 64,008 shares of our common stock are available for future issuance under the Amended Employee Stock Purchase Plan, or ESPP. The ESPP permits eligible employees to purchase up to 1,250 shares of Ligand common stock per calendar year at a discount through payroll deductions. The price at which stock is purchased under the ESPP is equal to 85% of the fair market value of the common stock on the first of a six month offering period or purchase date, whichever is lower. There were 3,386, 3,061 and 1,961 shares issued under the ESPP in 2018, 2017 and 2016, respectively.

Share Repurchases

In May 2018, in conjunction with our 2023 Notes debt offering, we repurchased 260,000 shares of our common stock at a cost of $191.14 per share. In September 2018, the board of directors authorized us to repurchase up to $200.0 million of our common stock from time to time over a period of up to three years (the "Repurchase Program"). As of December 31, 2018, $125.2 million remains available for repurchase under the authorized program. On January 23, 2019, the board of directors elected to increase the Repurchase Program, authorizing us to repurchase up to a maximum of $350.0 million of our outstanding common stock under the Repurchase Program. The Repurchase Program will expire, as originally scheduled, on September 20, 2021. Since December 31, 2018 and as of February 28, 2019, we acquired 400,177 additional shares during 2019, and the maximum dollar value of shares that may yet be purchased under the Repurchase Program was $225.9 million.

During the years ended December 31, 2018, 2017 and 2016, we repurchased 782,248 shares for $127.5 million, 14,000 shares for $2.0 million, and 40,500 shares for $3.9 million, respectively.

9. Commitment and Contingencies: Legal Proceedings

We record an estimate of a loss when the loss is considered probable and estimable. Where a liability is probable and there is a range of estimated loss and no amount in the range is more likely than any other number in the range, we record the minimum estimated liability related to the claim in accordance with *ASC 450, Contingencies*. As additional information becomes available, we assess the potential liability related to our pending litigation and revises our estimates. Revisions in the our estimates of potential liability could materially impact our results of operations.

On July 27, 2018, AG Oncon, LLC, AG Ofcon, Ltd., Calamos Market Neutral Income Fund, Capital Ventures International, Citadel Equity Fund Ltd., Opti Opportunity Master Fund, Polygon Convertible Opportunity Master Fund, Wolverine Flagship Fund Trading Limited, as plaintiffs, filed a complaint in the Court of Chancery of the State of Delaware (AG Oncon, LLC v. Ligand Pharmaceuticals Inc.) alleging claims for violation of the Trust Indenture Act, breach of contract, damages and a declaratory judgment that the Supplemental Indenture, dated as of February 20, 2018, entered into by us and Wilmington Trust, National Association, as trustee, is invalid. On October 1, 2018, we filed a motion to dismiss the plaintiffs' complaint. The hearing on our motion is currently scheduled for April 3, 2019. We believe the allegations are completely without merit, reject all claims raised by the plaintiffs and intend to vigorously defend this matter.

In November 2017, CyDex, our wholly owned subsidiary, received a paragraph IV certification from Teva alleging that certain of our patents related to Captisol were invalid, unenforceable and/or will not be infringed by Teva's ANDA related to Spectrum Pharmaceuticals' NDA for Evomela. On December 20, 2017, CyDex filed a complaint against Teva in the U.S. District Court for the District of Delaware, asserting that Teva's ANDA would infringe our patents. On March 22, 2018, Teva filed an answer and counterclaims seeking declarations of non-infringement and invalidity as to each of the asserted patents and on April 12, 2018, CyDex filed an answer to Teva's counterclaims. On July 24, 2018, the U.S. District Court entered a Scheduling Order, setting a hearing for April 1, 2019, and a trial may begin in January 2020.

10. Income Taxes

The Tax Act was enacted on December 22, 2017 and includes a number of changes to existing tax laws that impact us, most notably it reduces the US federal corporate tax rate from 35% to 21%, for tax years beginning after December 31, 2017. The Tax Act made modifications to allowable tax depreciation, the deductability of compensation for officers, the deductibility of meals and entertainment expenses, and the deductibility of interest expense.

We remeasured our deferred tax assets and liabilities based on the impact of the federal tax rate change, recording a decrease to our net deferred tax asset balance and a corresponding increase to our income tax provision of approximately $0.6 million and $32.4 million for the year ended December 31, 2018 and 2017, respectively. We completed our accounting for the Tax Act during the fourth quarter of 2018.

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The components of the income tax expense (benefit) for continuing operations are as follows (in thousands):

	Year Ended December 31,		
	2018	2017	2016
Current expense (benefit):			
Federal	$ —	$ —	$ 21
State	424	111	12
Foreign	(158)	261	—
	266	372	33
Deferred expense (benefit):			
Federal	29,928	44,075	10,534
State	(185)	228	(240)
Foreign	—	—	—
	$ 30,009	$ 44,675	$ 10,327

A reconciliation of income tax expense (benefit) from continuing operations to the amount computed by applying the statutory federal income tax rate to the net income (loss) from continuing operations is summarized as follows (in thousands):

	Year Ended December 31,		
	2018	2017	2016
Tax at federal statutory rate	$ 36,400	$ 20,031	$ 2,786
State, net of federal benefit	1,635	622	175
Contingent liabilities	948	903	1,225
Share-based compensation	(8,131)	(4,019)	263
Research and development credits	(2,758)	(2,821)	(1,525)
Change in uncertain tax positions	858	1,308	1,423
Rate change for changes in federal or state law	178	32,429	25
Change in valuation allowance	(4,225)	(4,169)	6,283

Expired NOLs and credits	3,054	—	—
Change in derivatives	615	—	—
Other	1,435	391	(328)
	$ 30,009	$ 44,675	$ 10,327

We remeasured certain deferred tax assets and liabilities based on the rates at which they are expected to reverse in the future, which is generally 21%. Significant components of our deferred tax assets and liabilities as of December 31, 2018 and 2017 are shown below. We assess the positive and negative evidence to determine if sufficient future taxable income will be generated to use the existing deferred tax assets. Our evaluation of evidence resulted in management concluding that the majority of our deferred tax assets will be realized. However, we maintain a valuation allowance to offset certain net deferred tax assets as management believes realization of such assets are uncertain as of December 31, 2018, 2017 and 2016. The valuation allowance decreased $2.5 million in 2018, decreased $8.4 million in 2017 and increased $6.3 million in 2016.

	December 31, 2018	2017
	(in thousands)	
Deferred tax assets:		
Net operating loss carryforwards	$ 57,181	$ 90,272
Research credit carryforwards	31,101	30,677
Fixed assets and intangibles	1,637	1,984
Accrued expenses	657	845
Deferred revenue	957	17
Capital Loss Carryforward	—	1,609
Investment in Viking	—	5,137
Other	11,430	12,499
	102,963	143,040
Valuation allowance for deferred tax assets	(4,476)	(6,987)
Net deferred tax assets	$ 98,487	$ 136,053
Deferred tax liabilities:		
Retrophin fair value adjustment	(179)	(243)
Convertible debt	(2,905)	(737)
Identified intangibles	(44,643)	(48,237)
Identified indefinite lived intangibles	(1,759)	(2,414)
Investment in Viking	(2,480)	—
Net deferred tax liabilities	$ (51,966)	$ (51,631)
	$ 46,521	$ 84,422

Deferred income taxes, net

As of December 31, 2018, we had federal net operating loss carryforwards set to expire through 2037 of $229.9 million and $125.3 million of state net operating loss carryforwards. We also have $23.0 million of federal research and development credit carryforwards, which expire through 2037. We have $22.7 million of California research and development credit carryforwards that have no expiration date.

Pursuant to Section 382 and 383 of the Internal Revenue Code of 1986, as amended, utilization of our net operating losses and credits may be subject to annual limitations in the event of any significant future changes in its ownership structure. These annual limitations may result in the expiration of net operating losses and credits prior to utilization. The deferred tax assets as of December 31, 2018 are net of any previous limitations due to Section 382 and 383.
We account for income taxes by evaluating a probability threshold that a tax position must meet before a financial statement benefit is recognized. The minimum threshold is a tax position that is more likely than not to be sustained upon examination by the applicable taxing authority, including resolution of any related appeals or litigation processes, based on the technical merits of the position. Our remaining liabilities for uncertain tax positions are presented net of the deferred tax asset balances on the accompanying consolidated balance sheet.
A reconciliation of the amount of unrecognized tax benefits at December 31, 2018, 2017 and 2016 is as follows (in thousands):

	December 31, 2018	2017	2016
Balance at beginning of year	$ 29,363	$ 38,770	$ 36,452
Additions based on tax positions related to the current year	1,247	1,067	70
Additions for tax positions of prior years	336	109	2,408
Reductions for tax positions of prior years	(657)	(10,583)	(160)
Balance at end of year	$ 30,289	$ 29,363	$ 38,770

Included in the balance of unrecognized tax benefits at December 31, 2018 is $28.2 million of tax benefits that, if recognized would impact the effective rate. There are no positions for which it is reasonably possible that the uncertain tax benefit will significantly increase or decrease within twelve months.

We recognize interest and penalties related to uncertain tax positions in income tax expense. As of December 31, 2018 and December 31, 2017, we recognized an immaterial amount of interest and penalties. We file income tax returns in the United States, various state jurisdictions, United Kingdom, and Canada with varying statutes of limitations. The federal statute of limitation remains open for the 2014 tax year to the present. The state income tax returns generally remain open for the 2013 tax year through the present. Net operating loss and research credit carryforwards arising prior to these years are also open to examination if and when utilized.

The IRS began an audit of our 2016 tax year during the quarter ended June 30, 2018. We believe our reserve for unrecognized tax benefits and contingent tax issues is adequate with respect to all open years. Notwithstanding the foregoing, we could adjust our provision for income taxes and contingent tax liability based on future developments.

11. Summary of Unaudited Quarterly Financial Information

The following financial information reflects all normal recurring adjustments, which are, in the opinion of management, necessary for a fair statement of the results and cash flows of interim periods. Summarized quarterly data for 2018 and 2017 are as follows (in thousands, except per share amounts):

	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
2018				
Total revenues	$ 56,157	$ 90,043	$ 45,663	$ 59,590
Total operating costs and expenses	19,116	19,868	22,301	26,441
Income tax (expense) benefit	(10,033)	(22,419)	(11,864)	14,307
Net income (loss)	45,279	73,160	67,362	(42,482)
Basic per share amounts:				
Net income (loss)	$ 2.13	$ 3.45	$ 3.19	$ (2.02)
Diluted per share amounts:				
Net income (loss)	$ 1.83	$ 2.99	$ 2.80	$ (2.02)
Weighted average shares—basic	21,209	21,212	21,148	21,071
Weighted average shares—diluted	24,800	24,438	24,052	21,071
2017				
Total revenues	$ 29,267	$ 27,995	$ 33,375	$ 50,465
Total operating costs and expenses	19,051	14,980	16,882	22,113
	(1,114)	(2,242)	(3,645)	(37,674)

Income tax expense							
Net income (loss)	5,079		6,058		8,426	(7,007)	
Basic per share amounts:							
Net income (loss)	$	0.24	$	0.29	$ 0.40	$	(0.33)
Diluted per share amounts:							
Net income (loss)	$	0.22	$	0.26	$ 0.36	$	(0.33)
Weighted average shares—basic	20,938		21,013		21,071	21,109	
Weighted average shares—diluted	23,019		23,216		23,551	21,109	

Item 9. Changes in and Disagreements with Accountants on Accounting and Financial Disclosure

None.

Item 9A. Controls and Procedures

(a) Evaluation of Disclosure Controls and Procedures

We are responsible for maintaining disclosure controls and procedures designed to provide reasonable assurance that information required to be disclosed in reports we file under the Exchange Act is recorded, processed, summarized and reported within the specified time periods and accumulated and communicated to management, including our Chief Executive Officer and Chief Financial Officer, as appropriate, to allow timely decisions regarding required disclosure. The design of any system of controls is based in part upon certain assumptions about the likelihood of future events, and there can be no assurance that any design will succeed in achieving its stated goals under all potential future conditions; over time, controls may become inadequate because of changes in conditions, or the degree of compliance with policies or procedures may deteriorate. Because of the inherent limitations in a cost-effective control system, misstatements due to error or fraud may occur and not be detected. As of the end of the period covered by this Annual Report on Form 10-K, we have carried out an evaluation, under the supervision and with the participation of our management, including our Chief Executive Officer and Chief Financial Officer, of the effectiveness of our disclosure controls and procedures, as defined in Rules 13a-15(e) and 15d-15(e) under the Exchange Act, and have concluded our disclosure controls and procedures were effective at a reasonable assurance level as of December 31, 2018.

There have been no changes in our internal control over financial reporting that occurred during the quarter ended December 31, 2018 that have materially affected, or are reasonably likely to materially affect, our internal control over financial reporting.

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

Management is responsible for establishing and maintaining adequate internal control over financial reporting for the Company. Internal control over financial reporting is a process to provide reasonable assurance regarding the reliability of our financial reporting for external purposes in accordance with accounting principles generally accepted in the United States of America. Internal control over financial reporting includes maintaining records that in reasonable detail accurately and fairly reflect our transactions; providing reasonable assurance that transactions are recorded as necessary for preparation of our financial statements in accordance with generally accepted accounting principles; providing reasonable assurance that receipts and expenditures are made in accordance with our management and directors; and providing reasonable assurance that unauthorized acquisition, use or disposition of company assets that could have a material effect on our financial statements would be prevented or detected on a timely basis. Because of its inherent limitations, internal control over financial reporting is not intended to provide absolute assurance that a misstatement of our financial statements would be prevented or detected.

Under the supervision and with the participation of our management, including our Chief Executive Officer and Chief Financial Officer, we conducted an evaluation of the effectiveness of our internal control over financial reporting based on the framework established by the COSO as set forth in the 2013 Internal Control-Integrated Framework. Based on our evaluation under the 2013 framework in Internal Control - Integrated Framework, management concluded that our internal controls over financial reporting were effective as of December 31, 2018.

Ernst & Young LLP, an independent registered public accounting firm, has audited the Company’s consolidated financial statements included in this Annual Report on Form 10-K and has issued an attestation report, included herein, on the effectiveness of our internal control over financial reporting as of December 31, 2018.

Report of Independent Registered Public Accounting Firm

The Board of Directors and Stockholders of Ligand Pharmaceuticals Incorporated

Opinion on Internal Control Over Financial Reporting

We have audited Ligand Pharmaceuticals Incorporated's internal control over financial reporting as of December 31, 2018, 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, Ligand Pharmaceuticals Incorporated (the Company) maintained, in all material respects, effective internal control over financial reporting as of December 31, 2018, based on the COSO criteria.

We also have audited, in accordance with the standards of the Public Company Accounting Oversight Board (United States) (PCAOB), the consolidated balance sheets of the Company as of December 31, 2018 and 2017, the related consolidated statements of operations, comprehensive income (loss), stockholders' equity and cash flows for each of the three years in the period ended December 31, 2018, and the related notes and our report dated February 28, 2019 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 Management's Report on Internal Control Over Financial Reporting. Our responsibility is to express an opinion on the Company's internal control over financial reporting based on our audit. We are a public accounting firm registered with the PCAOB and are required to be independent with respect to the Company in accordance with the U.S. federal securities laws and the applicable rules and regulations of the Securities and Exchange Commission and the PCAOB.

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

Our audit 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

San Diego, California
February 28, 2019

Item 9B. Other Information

None.

Part III

Item 10. Directors, Executive Officers and Corporate Governance

Code of Conduct

The Board of Directors has adopted a Code of Conduct and Ethics Policy ("Code of Conduct") that applies to all officers, directors and employees. The Company will promptly disclose (1) the nature of any amendment to the Code of Conduct that applies to our principal executive officer, principal financial officer, principal accounting officer or controller or persons performing similar functions and (2) the nature of any waiver, including an implicit waiver, from a provision of our Code of Conduct that is granted to one of these specified officers, the name of such person who is granted the waiver and the date of the waiver on our website in the future. The Code of Conduct can be accessed via our website (http://www.ligand.com), Corporate Overview page. You may also request a free copy by writing to: Investor Relations, Ligand Pharmaceuticals Incorporated, 3911 Sorrento Valley Blvd, Suite 110, San Diego, CA 92121.

The other information under Item 10 is hereby incorporated by reference to Ligand's Definitive Proxy Statement to be filed with the SEC within 120 days of December 31, 2018.

Item 11. Executive Compensation

Item 11 is hereby incorporated by reference to Ligand's Definitive Proxy Statement to be filed with the SEC within 120 days of December 31, 2018.

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

Item 12 is hereby incorporated by reference to Ligand's Definitive Proxy Statement to be filed with the SEC within 120 days of December 31, 2018.

Item 13. Certain Relationships

and Related Transactions, and Director Independence

Item 13 is hereby incorporated by reference to Ligand's Definitive Proxy Statement to be filed with the SEC within 120 days of December 31, 2018.

Item 14. Principal Accountant Fees and Services

Item 14 is hereby incorporated by reference to Ligand's Definitive Proxy Statement to be filed with the SEC within 120 days of December 31, 2018.

PART IV

Item 15. Exhibits and Financial Statement Schedule

(a) The following documents are included as part of this Annual Report on Form 10-K.

(1) Financial statements

(2) Schedules not included herein have been omitted because they are not applicable or the required information is in the consolidated financial statements or notes thereto.

(3) The following exhibits are filed as part of this Form 10-K and this list includes the Exhibit Index.

		Incorporated by Reference				
Exhibit Number	**Description of Exhibit**	**Form**	**File Number**	**Date of Filing**	**Exhibit Number**	**Filed Herewith**
2.1	Agreement and Plan of Merger,	8-K	001-33093	December 18, 2015	2.1	

	dated as of December 17, 2015, by and among Ligand Pharmaceuticals Incorporated, Open Monoclonal Technology, Inc., OMT, LLC, Schrader 1 Acquisition, Inc., Schrader 2 Acquisition, Inc. and Fortis Advisors LLC				
2.2	Rule 2.7 Announcement issued by Ligand Holdings UK Ltd., dated August 9, 2018	8-K	001-33093	August 9, 2018	2.1
3.1	Amended and Restated Certificate of Incorporation of the Company.	S-4	333-58823	July 9, 1998	3.1
3.2	Certificate of Amendment of the Amended and Restated Certificate of Incorporation of the Company, dated June 14, 2000	10-K	0-20720	March 29, 2001	3.5
3.3	Certificate of Amendment of the Amended and Restated Certificate of Incorporation of the Company, dated June 30, 2004	10-Q	0-20720	August 5, 2004	3.6
3.4	Certificate of Amendment of the Amended and Restated Certificate of Incorporation of the Company, dated November 17, 2010	8-K	001-33093	November 19, 2010	3.1
3.5	Third Amended and Restated Bylaws of the Company	8-K	001-33093	September 10, 2015	3.1
4.1	Specimen stock certificate for shares of the	10-K	001-33093	March 1, 2018	4.1

	common stock of the Company				
4.2	Indenture dated August 18, 2014 between the Company and Wilmington Trust, National Association	8-K	001-33093	August 18, 2014	4.1
4.3	Supplemental Indenture, dated as of February 20, 2018, between the Company and Wilmington Trust, National Association, as trustee	8-K	001-33093	July 30, 2018	4.1
4.4	Second Supplemental Indenture, dated as of May 22, 2018, between the Company and Wilmington Trust, National Association, as trustee	8-K	001-33093	May 22, 2018	4.2
4.5	Indenture, dated as of May 22, 2018, between the Company and Wilmington Trust, National Association, as trustee, including the form of 0.75% Convertible Senior Notes due 2023	8-K	001-33093	May 22, 2018	4.1

10.1#	2002 Stock Incentive Plan (as amended and restated through May 23, 2016)	S-8	333-212775	July 29, 2016	10.1
10.2#	2002 Employee Stock Purchase Plan (as amended effective July 1, 2009)	S-8	333-160132	June 22, 2009	10.2
10.3#	Form of Stock Option Grant Notice and Stock Option Agreement under the Company's 2002 Stock Incentive Plan	10-K	001-33093	February 24, 2014	10.5
10.4#	Form of Stock Issuance Agreement for non-employee directors under the Company's 2002 Stock Incentive Plan	S-1	333-131029	January 13, 2006	10.289
10.5#	Form of Letter Agreement regarding Change of Control Severance Benefits between the Company and its officers	10-K	001-33093	March 16, 2007	10.309
10.6#	Form of Restricted Stock Unit Grant Notice and Restricted Stock Unit Agreement under the Company's 2002 Stock Incentive Plan	10-K	001-33093	March 1, 2018	10.6
10.7#	Form of Restricted Stock Unit Grant Notice and Restricted Stock Unit Agreement under the Company's 2002 Stock Incentive Plan - Performance-Based RSU Form	10-K	001-33093	March 1, 2018	10.7
10.8#	Form of Executive Officer Change in Control Severance Agreement	8-K	001-33093	August 22, 2007	10.1
10.9#	Amended and Restated Severance Plan, dated December 20, 2008	8-K	001-33093	December 24, 2008	10.2
10.10†	Research, Development and License Agreement, dated December 29, 1994, between SmithKline Beecham Corporation and the	S-1 S-3	33-87598 33-87600	December 20, 1994	

	Company .				
10.11†	Amended and Restated Research, Development and License Agreement, dated December 1, 2005, between the Company and Wyeth (formerly American Home Products Corporation)	S-1	333-131029	January 13, 2006	10.287
10.12	Settlement Agreement and Mutual Release, by and between the Company and The Rockefeller University, dated February 11, 2009	10-Q	001-33093	May 11, 2009	10.318
10.13	TR Beta Contingent Value Rights Agreement, dated January 27, 2010, among the Company, Metabasis Therapeutics, Inc., David F. Hale and Mellon Investor Services LLC	8-K	001-33093	January 28, 2010	10.2
10.14	Glucagon Contingent Value Rights Agreement, dated January 27, 2010, among the Company, Metabasis Therapeutics, Inc., David F. Hale and Mellon Investor Services LLC	8-K	001-33093	January 28, 2010	10.3
10.15	General Contingent Value Rights Agreement, dated January 27, 2010, among the Company, Metabasis Therapeutics, Inc., David F. Hale and Mellon Investor Services LLC	8-K	001-33093	January 28, 2010	10.4
10.16	Amendment of General Contingent Value Rights Agreement, dated January 26, 2011, among the Company, Metabasis Therapeutics, Inc., David F. Hale and Mellon Investor Services LLC	8-K	001-33093	January 31, 2011	10.1

10.17†	Captisol® Supply Agreement, dated December 20, 2002, among CyDex, Inc., Hovione LLC, Hovione FarmaCiencia S.A., Hovione Pharmascience Limited and Hovione International Limited	10-K	001-33093	March 3, 2011	10.1
10.18†	1st Amendment to Captisol® Supply Agreement, dated July 29, 2005, among CyDex, Inc., Hovione LLC, Hovione FarmaCiencia S.A., Hovione Pharmascience Limited and Hovione International Limited	10-K	001-33093	March 3, 2011	10.101
10.19	2nd Amendment to Captisol® Supply Agreement, dated March 1, 2007, among CyDex, Inc., Hovione LLC, Hovione FarmaCiencia S.A., Hovione Pharmascience Limited, and Hovione International Limited	10-K	001-33093	March 3, 2011	10.102
10.20†	3rd Amendment to Captisol® Supply Agreement, dated January 25, 2008, among CyDex, Inc., Hovione LLC, Hovione FarmaCiencia S.A., Hovione Pharmascience Limited, and Hovione International Limited	10-K	001-33093	March 3, 2011	10.103

10.21†	4th Amendment to Captisol® Supply Agreement, dated September 28, 2009, among CyDex Pharmaceuticals, Inc., Hovione LLC, Hovione FarmaCiencia S.A., Hovione Pharmascience Limited and Hovione International Limited	10-K	001-33093	March 3, 2011	10.104
10.22†	License Agreement, dated September 3, 1993, between CyDex L.C. and The University of Kansas	10-K	001-33093	March 3, 2011	10.105
10.23†	Second Amendment to License Agreement, dated August 4, 2004, between CyDex, Inc. and The University of Kansas	10-K	001-33093	March 3, 2011	10.107
10.24†	Acknowledgement Agreement, dated February 22, 2008, between CyDex, Inc. and The University of Kansas	10-K	001-33093	March 3, 2011	10.111
10.25†	Exclusive License Agreement, dated June 4, 1996, between Pfizer, Inc. and The University of Kansas	10-K	001-33093	March 3, 2011	10.108
10.26†	Addendum to Nonexclusive License Agreement, dated December 11, 2001, between CyDex, Inc. and Pfizer, Inc.	10-K	001-33093	March 3, 2011	10.11
10.27†	License Agreement, dated January 4, 2006, between CyDex, Inc. and Prism Pharmaceuticals, Inc.	10-K	001-33093	March 3, 2011	10.112
10.28†	Amendment to License Agreement, dated May 12, 2006, between CyDex, Inc. and Prism Pharmaceuticals, Inc.	10-K	001-33093	March 3, 2011	10.113

10.29†	Supply Agreement, dated March 5, 2007, between CyDex, Inc. and Prism Pharmaceuticals, Inc.	10-K	001-33093	March 3, 2011	10.114
10.30†	License and Supply Agreement, dated October 12, 2005, between CyDex Pharmaceuticals, Inc. and Proteolix, Inc.	10-K	000-28298	February 23, 2010	10.22
10.31†	Supply Agreement, dated June 13, 2011 by and between CyDex Pharmaceuticals, Inc. and Merck Sharp & Dohme Corporation	10-Q/A	001-33093	November 2, 2017	10.26
10.32†	License Agreement, by and between CyDex Pharmaceuticals, Inc. and Spectrum Pharmaceuticals, Inc., dated as of March 8, 2013	10-Q	001-33093	May 8, 2013	10.2
10.33†	Supply Agreement, by and between CyDex Pharmaceuticals, Inc. and Spectrum Pharmaceuticals, Inc., dated as of March 8, 2013	10-Q	001-33093	May 8, 2013	10.3
10.34†	Royalty Stream and Milestone Payments Purchase Agreement, dated April 29, 2013, between the Company and Selexis S.A.	10-Q	001-33093	August 1, 2013	10.2
10.35	Amendment of “General” Contingent Value Rights Agreement dated May 20, 2014 among the Company, Metabasis Therapeutics, Inc., David F. Hale and Computershare Inc.	8-K	001-33093	May 22, 2014	10.1
10.36	Amendment of “TR Beta” Contingent Value Rights Agreement dated May 20, 2014 among the Company, Metabasis	8-K	001-33093	May 22, 2014	10.2

	Therapeutics, Inc., David F. Hale and Computershare, Inc.				
10.37†	Master License Agreement dated May 21, 2014 among the Company, Metabasis Therapeutics, Inc. and Viking Therapeutics, Inc.	10-Q	001-33093	August 5, 2014	10.2
10.38	Letter Agreement, dated as of August 12, 2014, between Bank of America, N.A. and the Company regarding the Base Convertible Note Hedge Transaction	8-K	001-33093	August 18, 2014	10.1
10.39	Letter Agreement, dated as of August 12, 2014, between Bank of America, N.A. and the Company regarding the Base Issuer Warrant Transaction	8-K	001-33093	August 18, 2014	10.2
10.40	Letter Agreement, dated as of August 12, 2014, between Deutsche Bank AG, London Branch and the Company regarding the Base Convertible Bond Hedge Transaction	8-K	001-33093	August 18, 2014	10.3
10.41	Letter Agreement, dated as of August 12, 2014, between Deutsche Bank AG, London Branch and the Company regarding the Base Issuer Warrant Transaction	8-K	001-33093	August 18, 2014	10.4

10.42	Letter Agreement, dated as of August 14, 2014, between Bank of America, N.A. and the Company regarding the Additional Convertible Bond Hedge Transaction	8-K	001-33093	August 18, 2014	10.5
10.43	Letter Agreement, dated as of August 14, 2014, between Bank of America, N.A. and the Company regarding the Additional Issuer Warrant Transaction	8-K	001-33093	August 18, 2014	10.6
10.44	Letter Agreement, dated as of August 14, 2014, between Deutsche Bank AG, London Branch and the Company regarding the Additional Convertible Bond Hedge Transaction	8-K	001-33093	August 18, 2014	10.7
10.45	Letter Agreement, dated as of August 14, 2014, between Deutsche Bank AG, London Branch and the Company regarding the Additional Issuer Warrant Transaction	8-K	001-33093	August 18, 2014	10.8
10.46†	First Amendment to Master License Agreement dated September 6, 2014 among the Company, Metabasis Therapeutics, Inc. and Viking Therapeutics, Inc.	10-Q	001-33093	October 31, 2014	10.9
10.47†	Second Amendment to Master License Agreement, dated	10-Q	001-33093	August 5, 2015	10.1

	April 8, 2015, among the Company, Metabasis Therapeutics, Inc. and Viking Therapeutics, Inc.					
10.48†	Development Funding and Royalties Agreement, dated December 13, 2018, by and between Ligand Pharmaceuticals Incorporated and Palvella Therapeutics, Inc.					X
10.49†	Sublicense Agreement between the Company, Pharmacopeia, Inc. and Retrophin LLC dated as of February 16, 2012.	10-Q	001-33093	May 4. 2012	10.1	
10.50†	Amendment No. 4 to Sublicense Agreement, dated September 17, 2015, among the Company, Pharmacopeia, LLC and Retrophin, Inc.	10-Q/A	001-33093	December 23, 2015	10.1	
10.51	Amendment No. 5 to Sublicense Agreement, dated March 20, 2018, among the Company, Pharmacopeia, LLC and Retrophin, Inc.	10-Q	001-33093	May 9. 2018	10.1	
10.52†	Lease, dated November 3, 2015, between the Company and 3911/3931 SVB, LLC	8-K	001-33093	November 10, 2015	10.1	
10.53#	Amended and Restated Director Compensation and Stock Ownership Policy, effective as of March 2014	10-Q	001-33093	November 14, 2016	10.1	
10.54†		8-K/A	001-33093		10.1	

	Interest Purchase Agreement, dated May 3, 2016, between the Company and CorMatrix Cardiovascular, Inc.			May 9, 2016	
10.55	Amended and Restated Interest Purchase Agreement, dated May 31, 2017, between the Company and CorMatrix Cardiovascular, Inc.	10-Q	001-033093	August 9, 2017	10.2
10.56	License Agreement, dated March 5, 2018, between the Company and Roivant Sciences GmbH	10-Q	001-33093	May 9, 2018	10.2
10.57	Letter Agreement, dated as of May 17, 2018, between Barclays Capital Inc. and the Company regarding the Base Convertible Note Hedge Transaction	8-K	001-00393	May 22, 2018	10.1
10.58	Letter Agreement, dated as of May 17, 2018, between Barclays Capital Inc. and the Company regarding the Base Warrant Transaction	8-K	001-00393	May 22, 2018	10.2
10.59	Letter Agreement, dated as of May 17, 2018, between Deutsche Bank AG and the Company regarding the Base Convertible Note Hedge Transaction	8-K	001-00393	May 22, 2018	10.3
10.60	Letter Agreement, dated as of May 17, 2018, between Deutsche Bank AG and the Company	8-K	001-00393	May 22, 2018	10.4

regarding the Base Warrant Transaction

10.61	Letter Agreement, dated as of May 17, 2018, between Goldman Sachs & Co. LLC and the Company regarding the Base Convertible Note Hedge Transaction	8-K	001-00393	May 22, 2018	10.5
10.62	Letter Agreement, dated as of May 17, 2018, between Goldman Sachs & Co. LLC and the Company regarding the Base Warrant Transaction	8-K	001-00393	May 22, 2018	10.6
10.63	Letter Agreement, dated as of May 18, 2018, between Barclays Capital Inc. and the Company regarding the Additional Convertible Note Hedge Transaction	8-K	001-00393	May 22, 2018	10.7
10.64	Letter Agreement, dated as of May 18, 2018, between Barclays Capital Inc. and the Company regarding the Additional Warrant Transaction	8-K	001-00393	May 22, 2018	10.8
10.65	Letter Agreement, dated as of May 18, 2018, between Deutsche Bank AG and the Company regarding the Additional Convertible Note Hedge Transaction	8-K	001-00393	May 22, 2018	10.9
10.66	Letter Agreement, dated as of May 18, 2018, between Deutsche Bank AG and the Company regarding the Additional Warrant Transaction	8-K	001-00393	May 22, 2018	10.1
10.67	Letter Agreement, dated as of May 18, 2018, between Goldman Sachs & Co. LLC and the Company regarding the Additional Convertible Note Hedge Transaction	8-K	001-00393	May 22, 2018	10.11

10.68	Letter Agreement, dated as of May 18, 2018, between Goldman Sachs & Co. LLC and the Company regarding the Additional Warrant Transaction	8-K	001-00393	May 22, 2018	10.12
10.69†	Platform License Agreement, dated March 23, 2015, by and between Open Monoclonal Technology, Inc. and WuXi AppTec Biopharmaceuticals Co., Ltd.	10-Q	001-33093	August 8, 2018	10.13
10.70†	Amendment Number 1 to Platform License Agreement, dated June 11, 2017, by and between Open Monoclonal Technology, Inc. and WuXi Biologics (Hong Kong) Limited (as successor-in-interest to WuXi AppTec Biopharmaceuticals Co., Ltd.)	10-Q	001-33093	August 8, 2018	10.14
10.71†	Amendment Number 2 to Platform License Agreement, dated June 25, 2018, by and between Open Monoclonal Technology, Inc. and WuXi Biologics Ireland Limited (as successor-in-interest to WuXi Biologics (Hong Kong) Limited).	10-Q	001-33093	August 8, 2018	10.15
10.72	Cooperation Agreement, dated August 9, 2018, by and between Vernalis plc and Ligand Holdings UK Ltd.	8-K	001-33093	August 8, 2018	10.1
10.73	Break Fee Agreement, dated August 9, 2018, by and between Vernalis plc and Ligand Holdings UK Ltd.	8-K	001-33093	August 8, 2018	10.1
10.74#	Form of Indemnification Agreement between the Company and each	10-K	001-33093	March 1, 2018	10.60

	of its directors					
10.75#	Form of Indemnification Agreement between the Company and each of its officers	10-K	001-33093	March 1, 2018	10.60	
21.1	Subsidiaries of the Company					X
23.1	Consent of independent registered public accounting firm-Ernst & Young LLP					X
31.1	Certification by Principal Executive Officer, Pursuant to Rules 13a-14(a) and 15d-14(a), as adopted pursuant to Section 302 of the Sarbanes-Oxley Act of 2002.					X
31.2	Certification by Principal Financial Officer, Pursuant to Rules 13a-14(a) and 15d-14(a), as adopted pursuant to Section 302 of the Sarbanes-Oxley Act of 2002.					X

32.1	Certifications by Principal Executive Officer and Principal Financial Officer, Pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002.	X
101.INS	XBRL Instance Document.	
101.SCH	XBRL Taxonomy Extension Schema Document.	
101.CAL	XBRL Taxonomy Extension Calculation Linkbase Document.	
101.DEF	XBRL Taxonomy Extension Definition Linkbase Document.	
101.LAB	XBRL Taxonomy Extension Label Linkbase Document	
101.PRE	XBRL Taxonomy Extension Presentation Linkbase Document.	

† Confidential treatment has been requested for portions of this exhibit. These portions have been omitted and submitted separately to the Securities and Exchange Commission.
# Indicates management contract or compensatory plan.

Item 16. Form 10-K Summary

None

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.

LIGAND PHARMACEUTICALS INCORPORATED

By: /s/ JOHN L. HIGGINS
John L. Higgins,
Chief Executive Officer

Date: February 28, 2019

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

Signature	Title	Date
/s/ JOHN L. HIGGINS **John L. Higgins**	Chief Executive Officer and Director (Principal Executive Officer)	February 28, 2019
/s/ MATTHEW KORENBERG **Matthew Korenberg**	Executive Vice President, Finance and Chief Financial Officer (Principal Financial and Accounting Officer)	February 28, 2019
/s/ TODD C. DAVIS **Todd C. Davis**	Director	February 28, 2019
/s/ SUNIL PATEL **Sunil Patel**	Director	February 28, 2019
/s/ STEPHEN L. SABBA **Stephen L. Sabba**	Director	February 28, 2019
/s/ JOHN W. KOZARICH **John W. Kozarich**	Director	February 28, 2019
/s/ JOHN L. LAMATTINA **John L. Lamattina**	Director	February 28, 2019
	Director	

/s/ JASON M. ARYEH **Jason M. Aryeh**		February 28, 2019
/s/ NANCY R. GRAY **Nancy R. Gray**	Director	February 28, 2019