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

FORM 10-Q

(Mark One)

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

For the quarterly period ended March 31, 2019

OR

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

For the transition period from to

Commission file number: 001-34705

Codexis, Inc.

(Exact name of registrant as specified in its charter)

Delaware	**71-0872999**
(State or other jurisdiction of incorporation or organization)	**(I.R.S. Employer Identification No.)**
200 Penobscot Drive, Redwood City, California	**94063**
(Address of principal executive offices)	**(Zip Code)**

(650) 421-8100

(Registrant's telephone number, including area code)

(Former name, former address and former fiscal year, if changed since last report)

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

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

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

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

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

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

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

Title of Each Class	Trading Symbol(s)	Name of Each Exchange on Which Registered
Common Stock, par value $0.0001 per share	CDXS	The Nasdaq Global Select Market

As of April 30, 2019, there were 54,540,929 shares of the registrant's Common Stock, par value $0.0001 per share, outstanding.

Codexis, Inc.

Quarterly Report on Form 10-Q

For the Quarter Ended March 31, 2019

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PART I. FINANCIAL INFORMATION

Item 1. Financial Statements

Codexis, Inc.
Condensed Consolidated Balance Sheets
(Unaudited)
(In Thousands, Except Per Share Amounts)

	March 31, 2019	December 31, 2018
Assets		
Current assets:		
Cash and cash equivalents	$ 47,322	$ 53,039
Accounts receivable, net of allowances of $34 at March 31, 2019 and December 31, 2018	12,604	11,551
Unbilled receivables, current	1,923	1,916
Inventories	633	589
Prepaid expenses and other current assets	1,232	1,068
Contract assets	—	35
Total current assets	63,714	68,198
Restricted cash	1,785	1,446
Equity securities	484	588
Right-of-use assets - Operating leases, net	25,913	—
Right-of-use assets - Finance leases, net	438	—
Property and equipment, net	4,535	4,759
Goodwill	3,241	3,241
Other non-current assets	1,013	1,051
Total assets	$ 101,123	$ 79,283
Liabilities and Stockholders' Equity		
Current liabilities:		
Accounts payable	$ 2,180	$ 3,050
Accrued compensation	6,469	5,272
Other accrued liabilities	7,127	4,855
Current portion of lease obligations - Operating leases	1,091	—
Current portion of lease obligations - Finance leases	233	—
Deferred revenue	1,554	4,936
Total current liabilities	18,654	18,113
Deferred revenue, net of current portion	3,797	3,352
Long-term lease obligations - Operating leases	26,133	—
Long-term lease obligations - Finance leases	9	61
Lease incentive obligation, net of current portion	—	35
Other long-term liabilities	1,320	1,416
Total liabilities	49,913	22,977
Commitments and Contingencies (Note 11)		
Stockholders' equity:		
Preferred stock, $0.0001 par value per share; 5,000 shares authorized; none issued and outstanding	—	—
Common stock, $0.0001 par value per share; 100,000 shares authorized; 54,541 shares and 54,065 shares issued and outstanding at March 31, 2019 and December 31, 2018, respectively	5	5
Additional paid-in capital	386,815	386,775
Accumulated deficit	(335,610)	(330,474)
Total stockholders' equity	51,210	56,306
Total liabilities and stockholders' equity	$ 101,123	$ 79,283

See accompanying notes to the unaudited condensed consolidated financial statements

Codexis, Inc.

Condensed Consolidated Statements of Operations
(Unaudited)
(In Thousands, Except Per Share Amounts)

	Three Months Ended March 31,	
	2019	**2018**
Revenues:		
Product revenue	$ 7,988	$ 6,163
Research and development revenue	7,595	7,879
Total revenues	15,583	14,042
Costs and operating expenses:		
Cost of product revenue	4,391	3,825
Research and development	8,016	7,178
Selling, general and administrative	8,415	7,746
Total costs and operating expenses	20,822	18,749
Loss from operations	(5,239)	(4,707)
Interest income	231	71
Other expenses, net	(125)	(60)
Loss before income taxes	(5,133)	(4,696)
Provision for (benefit from) income taxes	3	(2)
Net loss	$ (5,136)	$ (4,694)
Net loss per share, basic and diluted	$ (0.09)	$ (0.10)
Weighted average common stock shares used in computing net loss per share, basic and diluted	54,170	48,385

See accompanying notes to the unaudited condensed consolidated financial statements

Codexis, Inc.

Condensed Consolidated Statements of Stockholders' Equity
(Unaudited)
(In Thousands)

	For the Three Months Ended March 31, 2018					
	Common Stock		Additional paid-in Capital	Accumulated Other Comprehensive Income (Loss)	Accumulated Deficit	Total Stockholders' Equity
	Shares	Amount				
Balance at January 1, 2018	48,365	$ 5	$ 340,079	$ (472)	$ (315,065)	$ 24,547
Exercise of stock options	79	—	435	—	—	435
Release of stock awards	778	—	—	—	—	—
Employee stock-based compensation	—	—	1,958	—	—	1,958
Non-employee stock-based compensation	—	—	22	—	—	22
Taxes paid related to net share settlement of equity awards	(297)	—	(3,140)	—	—	(3,140)
Cumulative effect of change in accounting principles [(1)]	—	—	—	472	(4,532)	(4,060)
Net loss	—	—	—	—	(4,694)	(4,694)
Balance at March 31, 2018	48,925	$ 5	$ 339,354	$ —	$ (324,291)	$ 15,068

[(1)] Cumulative effect of change in accounting principles includes: Accounting Standards Update 2014-9 (Topic 606), of $4.1 million and Accounting Standards Update 2016-01 (Subtopic 825-10), of $0.5 million.

	For the Three Months Ended March 31, 2019					
	Common Stock		Additional paid-in Capital	Accumulated Other Comprehensive Income (Loss)	Accumulated Deficit	Total Stockholders' Equity
	Shares	Amount				
Balance at January 1, 2019	54,065	$ 5	$ 386,775	$ —	$ (330,474)	$ 56,306
Exercise of stock options	219	—	776	—	—	776
Release of stock awards	402	—	—	—	—	—
Employee stock-based compensation	—	—	2,063	—	—	2,063
Taxes paid related to net share settlement of equity awards	(145)	—	(2,799)	—	—	(2,799)
Net loss	—	—	—	—	(5,136)	(5,136)
Balance at March 31, 2019	54,541	$ 5	$ 386,815	$ —	$ (335,610)	$ 51,210

Codexis, Inc.
Condensed Consolidated Statements of Cash Flows
(Unaudited, in Thousands)

	Three Months Ended March 31,	
	2019	**2018**
Operating activities:		
Net loss	$ (5,136)	$ (4,694)
Adjustments to reconcile net loss to net cash used in operating activities:		
Depreciation	319	238
Amortization expense - right-of-use assets - operating and finance leases	759	—
Loss on disposal of property and equipment	—	1
Stock-based compensation	2,063	1,980
Unrealized loss (gain) on investment in equity securities	103	(26)
Changes in operating assets and liabilities:		
Accounts receivable, net	(1,053)	3,603
Inventories	(44)	(177)
Prepaid expenses and other current assets	(163)	(427)
Contract assets	35	—
Unbilled receivables	(7)	287
Other non-current assets	38	—
Accounts payable	(999)	(975)
Accrued compensation	1,196	1,381
Other accrued liabilities	3,591	705
Other long term liabilities	(616)	(210)
Deferred revenue	(2,937)	(5,871)
Net cash used in operating activities	(2,851)	(4,185)
Investing activities:		
Purchase of property and equipment	(445)	(16)
Net cash used in investing activities	(445)	(16)
Financing activities:		
Proceeds from exercises of stock options	776	434
Payments of lease obligations - Finance leases	(59)	(58)
Taxes paid related to net share settlement of equity awards	(2,799)	(3,140)
Net cash used in financing activities	(2,082)	(2,764)
Net decrease in cash, cash equivalents and restricted cash	(5,378)	(6,965)
Cash, cash equivalents and restricted cash at the beginning of the period	54,485	32,776
Cash, cash equivalents and restricted cash at the end of the period	$ 49,107	$ 25,811
Supplemental disclosure of cash flow information		
Interest paid	$ 22	$ 22
Income taxes paid	$ —	$ 5
Purchase of property and equipment recorded in accounts payable and accrued expenses	$ 142	$ 15

The following table provides a reconciliation of cash, cash equivalents and restricted cash reported within the unaudited condensed consolidated balance sheets to the total of the same such amounts shown above:

	Three Months Ended March 31,	
	2019	**2018**
Cash and cash equivalents	$ 47,322	$ 24,300
Restricted cash included in non-current assets	1,785	1,511
Total cash, cash equivalents and restricted cash at the end of the period	$ 49,107	$ 25,811

See accompanying notes to the unaudited condensed consolidated financial statements

Note 1. Description of Business

In these notes to the unaudited condensed consolidated financial statements, the "Company," "we," "us," and "our" refers to Codexis, Inc. and its subsidiaries on a consolidated basis.

We discover, develop and sell proteins that deliver value to our clients in a growing set of industries. We view proteins as a vast untapped source of value-creating materials, and we are using our proven technologies, which we have been continuously improving since our inception in 2002, to commercialize an increasing number of novel proteins, both as proprietary Codexis products and in partnership with our customers.

We are a pioneer in the harnessing of computational technologies to drive biology advancements. Since our inception in 2002, we have made substantial investments in the development of our CodeEvolver® protein engineering technology platform, the primary source of our competitive advantage. Our technology platform is powered by proprietary, artificial intelligence-based, computational algorithms that rapidly mine our large and continuously growing library of protein variants' performance attributes. These computational outputs enable increasingly reliable predictions for next generation protein variants to be engineered, enabling delivery of targeted performance enhancements in a time-efficient manner. In addition to its computational prowess, our CodeEvolver® protein engineering technology platform integrates additional modular competencies, including robotic high-throughput screening and genomic sequencing, organic chemistry and process development which are all coordinated to create our novel protein innovations.

Our approach to develop commercially viable biocatalytic manufacturing processes begins by conceptually designing the most cost-effective and practical process for a targeted product. We then develop optimized protein catalysts to enable that process design, using our CodeEvolver® protein engineering platform technology. Engineered protein catalyst candidates - many thousands for each protein engineering project - are then rapidly screened and validated in high throughput screening under relevant manufacturing operating conditions. This approach results in an optimized protein catalyst enabling cost-efficient processes that typically are relatively simple to run in conventional manufacturing equipment. This also allows for the efficient technical transfer of our process to our manufacturing partners.

The successful embodiment of our CodeEvolver® protein engineering technology platform in commercial manufacturing processes requires well-integrated expertise in a number of technical disciplines. In addition to those directly involved in practicing our CodeEvolver® protein engineering platform technology, such as molecular biology, enzymology, microbiology, cellular engineering, metabolic engineering, bioinformatics, biochemistry and high throughput analytical chemistry, our process development projects also involve integrated expertise in organic chemistry, chemical process development, chemical engineering, fermentation process development and fermentation engineering. Our integrated, multi-disciplinary approach to biocatalyst and process development is a critical success factor for our company.

We initially commercialized our CodeEvolver® protein engineering technology platform and products in the pharmaceuticals market, which remains our primary business focus. Our customers, which include several large global pharmaceutical companies, use our technology, products and services in their manufacturing processes and process development.

We have also used the technology to develop protein catalysts for use in the fine chemicals market. The fine chemicals market consists of several large market verticals, including food and food ingredients, animal feed, flavors, fragrances and agricultural chemicals.

We have also begun using the CodeEvolver® protein engineering technology platform to develop early stage, novel biotherapeutic product candidates, both for our customers and for our own business, most notably our lead program for the potential treatment of phenylketonuria ("PKU") in humans. PKU is an inherited metabolic disorder in which the enzyme that converts the essential amino acid phenylalanine into tyrosine is deficient. In October 2017, we entered into a Global Development, Option and License Agreement (the "Nestlé Agreement") with Nestec Ltd. ("Nestlé Health Science") to advance CDX-6114, our enzyme biotherapeutic product candidate for the potential treatment of PKU. In February 2019, Nestlé Health Science exercised its option to obtain an exclusive license to develop and commercialize CDX-6114.

In April 2018, we entered into a strategic agreement (the "Porton Agreement") with Porton Pharma Solutions, Ltd. ("Porton") to license key elements of our CodeEvolver® protein engineering technology platform to Porton's global custom intermediate and active pharmaceutical ingredients ("API") development and manufacturing business. This gives us access to a wide variety of small and medium-sized pharmaceutical customers.

We also use our technology to develop enzymes for customers using next generation sequencing ("NGS") and polymerase chain reaction ("PCR/qPCR") for *in vitro* molecular diagnostic and genomic research applications. Our first enzyme for this application is a DNA ligase which we began marketing to customers in 2018.

Below are brief descriptions of our business segments (See Note 13, "Segment, Geographical and Other Revenue Information"):

Performance Enzymes

We initially commercialized our CodeEvolver® protein engineering technology platform and products in the pharmaceuticals market, and to date this continues to be our largest market served. Our customers, which include many large global pharmaceutical companies, use our technology, products and services in their manufacturing processes and process development. We have also used the technology to develop customized enzymes for use in other industrial markets. These markets consist of several large industrial verticals, including food and food ingredients, animal feed, flavors, fragrances, and agricultural chemicals. We also use our technology to develop enzymes for customers using NGS and PCR/qPCR for *in vitro* molecular diagnostic and molecular biology research applications.

Novel Biotherapeutics

We are also targeting new opportunities in the pharmaceutical industry to discover, improve, and/or develop biotherapeutic drug candidates. We believe that our CodeEvolver® protein engineering platform technology can be used to discover novel biotherapeutic drug candidates that will target human diseases that are in need of improved therapeutic interventions. Similarly, we believe that we can deploy our platform technology to improve specific characteristics of a customer's pre-existing biotherapeutic drug candidate, such as its activity, stability or immunogenicity. Most notable is our lead program for the potential treatment of PKU in humans. PKU is an inherited metabolic disorder in which the enzyme that converts the essential amino acid phenylalanine into tyrosine is deficient. In October 2017, we announced a strategic collaboration with Nestlé Health Science to advance CDX-6114, our own novel orally administrable enzyme therapeutic candidate for the potential treatment of PKU. In July 2018, we announced that we had dosed the first subjects in a first-in-human Phase 1a dose-escalation trial with CDX-6114, which was conducted in Australia. In November 2018, we announced top-line results from the Phase 1a study in healthy volunteers with CDX-6114. In December 2018, Nestlé Health Science became obligated to pay us an additional $1.0 million within 60 days after the achievement of a milestone relating to formulation of CDX-6114. In January 2019, we received notice from the U.S. Food and Drug Administration (the "FDA") that it had completed its review of our investigational new drug application ("IND") for CDX-6114 and concluded that we may proceed with the proposed Phase 1b multiple ascending dose study in healthy volunteers in the United States. In February 2019, Nestlé Health Science exercised its option to obtain an exclusive, worldwide, royalty-bearing, sub-licensable license for the global development and commercialization of CDX-6114 for the management of PKU which triggered a payment of $3.0 million to us. Upon exercising its option, Nestlé Health Science has assumed all responsibilities for future clinical development and commercialization of CDX-6114, with the exception of the completion of an extension study, CDX - 6114-004, which is expected to be completed in the second quarter of 2019.

We have also developed a pipeline of other biotherapeutic drug candidates, which are in preclinical development, and in which we expect to continue to make additional investments with the aim of advancing additional product candidates targeting other therapeutic areas.

Note 2. Basis of Presentation and Summary of Significant Accounting Policies

Basis of Presentation and Principles of Consolidation

The accompanying unaudited condensed consolidated financial statements have been prepared in accordance with generally accepted accounting principles in the United States of America ("GAAP") and the applicable rules and regulations of the Securities and Exchange Commission ("SEC") for interim financial information. Accordingly, they do not include all of the information and notes required by GAAP for complete financial statements. These interim unaudited condensed consolidated financial statements should be read in conjunction with the audited consolidated financial statements and notes thereto contained in our Annual Report on Form 10-K for the year ended December 31, 2018. The condensed consolidated balance sheet at December 31, 2018 has been derived from the audited consolidated financial statements at that date, but does not

include all disclosures, including notes, required by GAAP for complete financial statements. The significant accounting policies used in preparation of the unaudited condensed consolidated financial statements for the three months ended March 31, 2019 are consistent with those discussed in Note 2 to the audited consolidated financial statements in the Company's 2018 Annual Report on Form 10-K and are updated below as necessary.

The unaudited condensed consolidated financial statements have been prepared on the same basis as the audited consolidated financial statements and, in the opinion of management, reflect all adjustments of a normal recurring nature considered necessary to present fairly our financial position as of March 31, 2019, results of our operations for the three months ended March 31, 2019 and 2018, changes in stockholders' equity for the three months ended March 31, 2019 and 2018, and cash flows for the three months ended March 31, 2019 and 2018. The interim results are not necessarily indicative of the results for any future interim period or for the entire year. Accounting Standard Update ("ASU") 2016-02, "Leases (Topic 842)" ("ASC 842) establishes a right-of-use ("ROU") model that requires a lessee to record a right-of-use asset and a lease obligation on the balance sheet for all leases with terms longer than 12 months. See "Recently Adopted Accounting Pronouncements" for details regarding the adoption of ASU 2016-02.

The unaudited interim condensed consolidated financial statements include the accounts of Codexis, Inc. and its wholly owned subsidiaries in the United States, India and the Netherlands. All significant intercompany balances and transactions have been eliminated in consolidation.

Use of Estimates

The preparation of financial statements in conformity with GAAP requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities, disclosures of contingent liabilities at the date of the unaudited condensed consolidated financial statements, and the reported amounts of revenue and expenses during the reporting period. We regularly assess these estimates which primarily affect revenue recognition, accounts receivable, inventories, the valuation of marketable securities, goodwill arising out of business acquisitions, accrued liabilities, stock awards, and the valuation allowances associated with deferred tax assets. Actual results could differ from those estimates and such differences may be material to the unaudited condensed consolidated financial statements.

Segment Reporting

We report two business segments, Performance Enzymes and Novel Biotherapeutics, which are based on our operating segments. Operating segments are defined as components of an enterprise about which separate financial information is available that is evaluated regularly by the chief operating decision maker ("CODM"), or decision making group, in deciding how to allocate resources, and in assessing performance. Our CODM is our Chief Executive Officer. Our business segments are primarily based on our organizational structure and our operating results as used by our CODM in assessing performance and allocating resources for our company. We do not allocate or evaluate assets by segment.

The Novel Biotherapeutics segment focuses on new opportunities in the pharmaceutical industry to discover or improve novel biotherapeutic drug candidates that will target human diseases that are in need of improved therapeutic interventions. The Performance Enzymes segment consists of the existing protein catalyst products and services with focus on pharmaceutical, food, molecular diagnostics, and other industrial markets.

Leases

We determine if an arrangement is a lease at inception. Operating leases are included in right-of-use ("ROU") lease assets, current portion of lease obligations, and long-term lease obligations on our balance sheets.

ROU lease assets represent our right to use an underlying asset for the lease term and lease obligations represent our obligation to make lease payments arising from the lease. Operating ROU lease assets and obligations are recognized at the commencement date based on the present value of the future minimum lease payments over the lease term. As our leases do not provide an implicit rate, we use our incremental borrowing rate based on the information available at the commencement date in determining the present value of lease payments. The lease terms may include options to extend or terminate the lease when it is reasonably certain that the option will be exercised. Lease expense is recognized on a straight-line basis over the lease term. We elected to apply the short-term lease measurement and recognition exemption in which ROU assets and lease obligations are not recognized for short-term leases.

Recent Accounting Pronouncements

Recently adopted accounting pronouncements

In February 2016, the FASB issued ASU 2016-02, "Leases (Topic 842)" (“ASC 842”), which is intended to improve financial reporting of leasing transactions by requiring lessees to recognize leases on balance sheets and disclose key information about leasing arrangements. Topic 842 was subsequently amended by ASU No. 2018-01, "Land Easement Practical Expedient for Transition to Topic 842"; ASU 2018-10, "Codification Improvements to ASC 842, Leases"; and ASU 2018-11, "Leases (Topic 842): Targeted Improvements." The new standard establishes a right-of-use ("ROU") model that requires lessees to record a ROU asset and lease obligations on the balance sheet for all leases with terms longer than 12 months. Leases are classified as either finance or operating, with classification affecting the pattern and classification of expense recognition in the condensed consolidated statement of operations. We adopted the new standard on January 1, 2019 using a modified retrospective approach and effective date method. We also elected the "package of practical expedients," which permit us not to reassess under the new standard its prior conclusions about lease identification, lease classification and initial direct costs. We did not elect the use-of-hindsight or the practical expedient pertaining to land easements; the latter is not applicable to us. Upon adoption, for operating leases, we recognized $26.6 million of ROU assets and $27.6 million of lease obligations, which represents the present value of the lease payments discounted using our incremental borrowing rate ("IBR") of 6.6%. For finance leases, we recognized $0.5 million of ROU assets and $0.3 million of lease obligations which represents the present value of the lease payments discounted using weighted-average implicit rate of 5.0%. These amounts, included the eighth amendment to the lease agreement disclosed in Note 11, "Commitments and Contingencies," were recorded in our unaudited condensed consolidated balance sheets on January 1, 2019.

In February 2018, the FASB issued ASU No. 2018-02, “Income Statement - Reporting Comprehensive Income (Topic 220) - Reclassification of Certain Tax Effects from Accumulated Other Comprehensive Income”. This standard allows a reclassification from accumulated other comprehensive income to retained earnings for stranded tax effects resulting from the Tax Cuts and Jobs Act and requires certain disclosures about stranded tax effects and will be effective for us beginning January 1, 2019 and should be applied either in the period of adoption or retrospectively. We adopted ASU 2018-02 in the first quarter of 2019, and the adoption had no impact on our unaudited condensed consolidated financial statements.

In June 2018, the FASB issued ASU 2018-07, "Compensation-Stock Compensation (Topic 718): Improvements to Non-employee Share-Based Payment Accounting," which expands the scope of Topic 718, Compensation—Stock Compensation (which currently only includes share-based payments to employees) to include share-based payments issued to nonemployees for goods or services. Consequently, the accounting for share-based payments to non-employees and employees will be substantially aligned. The ASU supersedes Subtopic 505-50, Equity—Equity-Based Payments to Non-Employees. The new standard is effective for fiscal years beginning after December 15, 2018, with early adoption permitted. We adopted ASU 2018-07 in the first quarter of 2019, and the adoption had no impact on our unaudited condensed consolidated financial statements.

In July 2018, the FASB issued ASU 2018-09, "Codification Improvements”, which represent changes to clarify, correct errors in, or make minor improvements to the Codification, eliminating inconsistencies and providing clarifications in current guidance. The amendments in this ASU include those made to: Subtopic 220-10, Income Statement-Reporting Comprehensive Income-Overall; Subtopic 470-50, Debt-Modifications and Extinguishments; Subtopic 480-10, Distinguishing Liabilities from Equity-Overall; Subtopic 718-740, Compensation-Stock Compensation-Income Taxes; Subtopic 805-740, Business Combinations-Income Taxes; Subtopic 815-10, Derivatives and Hedging-Overall; Subtopic 820-10, Fair Value Measurement-Overall; Subtopic 940-405, Financial Services-Brokers and Dealers-Liabilities; and Subtopic 962-325, Plan Accounting-Defined Contribution Pension Plans-Investments-Other. The transition and effective date guidance is based on the facts and circumstances of each amendment. Some of the amendments do not require transition guidance and will be effective upon issuance. However, many of the amendments do have transition guidance with effective dates for annual periods beginning after December 15, 2018, for public business entities. We adopted subtopics under ASU 2018-09 that are applicable to our Company which included subtopics 718-740 and 820-10 in the first quarter of 2019, and the adoption had no impact on our unaudited condensed consolidated financial statements.

Recently issued accounting pronouncements not yet adopted

From time to time, new accounting pronouncements are issued by the FASB or other standards setting bodies that are adopted by us as of the specified effective date. Unless otherwise discussed, we believe that the impact of recently issued standards that are not yet effective will not have a material impact on our unaudited condensed consolidated financial statements upon adoption.

In June 2016, the FASB issued ASU 2016-13, "Financial Instruments - Credit Losses (Topic 326): Measurement of Credit Losses on Financial Instruments," which amends the FASB's guidance on the impairment of financial instruments. The standard adds a new impairment model (known as the "current expected credit loss model") that is based on expected losses

rather than incurred losses. ASU 2016-13 is effective for annual reporting periods ending after December 15, 2019, including interim periods within those fiscal years. Early adoption is permitted for fiscal years beginning after December 15, 2018, including interim periods within those fiscal years. We are currently evaluating the impact of adopting ASU 2016-13 on our unaudited condensed consolidated financial statements and related disclosures.

In January 2017, the FASB issued ASU No. 2017-04, "Intangibles - Goodwill and Other (Topic 350): Simplifying the Test for Goodwill Impairment." The amendments eliminate Step 2 from the goodwill impairment test. The annual, or interim, goodwill impairment test is performed by comparing the fair value of a reporting unit with its carrying amount. An impairment charge should be recognized for the amount by which the carrying amount exceeds the reporting unit's fair value; however, the loss recognized should not exceed the total amount of goodwill allocated to that reporting unit. In addition, income tax effects from any tax deductible goodwill on the carrying amount of the reporting unit should be considered when measuring the goodwill impairment loss, if applicable. The amendments also eliminate the requirements for any reporting unit with a zero or negative carrying amount to perform a qualitative assessment and, if it fails that qualitative test, to perform Step 2 of the goodwill impairment test. An entity still has the option to perform the qualitative assessment for a reporting unit to determine if the quantitative impairment test is necessary. The new standard is effective for fiscal years beginning after December 15, 2019, with early adoption permitted. We do not expect the adoption of ASU 2017-04 to have a material impact on our unaudited condensed consolidated financial statements and related disclosures.

In August 2018, the FASB issued ASU 2018-13, "Fair Value Measurement (Topic 820): Disclosure Framework—Changes to the Disclosure Requirements for Fair Value Measurement". The primary focus of ASU 2018-13 is to improve the effectiveness of the disclosure requirements for fair value measurements. The changes affect all companies that are required to include fair value measurement disclosures. In general, the amendments in ASU 2018-13 are effective for all entities for fiscal years and interim periods within those fiscal years, beginning after December 15, 2019. Early adoption is permitted. We do not expect this standard to have any material impact on our unaudited condensed consolidated financial statements.

In November 2018, the FASB issued ASU 2018-18, "Collaborative Arrangements (Topic 808): Clarifying the Interaction Between Topic 808 and Topic 606." ASU 2018-18 provides guidance on how to assess whether certain transactions between collaborative arrangement participants should be accounted for within the revenue recognition standard. The ASU also provides more comparability in the presentation of revenue for certain transactions between collaborative arrangement participants. In general, for public companies, the amendments in this standard are effective for fiscal years beginning after December 15, 2019, and interim periods within those fiscal years. Early adoption is permitted. We do not expect this standard to have any material impact on our unaudited condensed consolidated financial statements.

In November 2018, the FASB issued ASU 2018-19, "Codification Improvements to Topic 326, Financial Instruments-Credit Losses." ASU 2018-19 clarifies that receivables arising from operating leases are not within the scope of the credit losses standard, but rather, should be accounted for in accordance with the leases standard. In general, the amendments in this standard are effective for public business entities that meet the definition of a SEC filer for fiscal years beginning after December 15, 2019, and interim periods within those fiscal years. We do not expect this standard to have any material impact on our unaudited condensed consolidated financial statements.

In January 2019, the FASB issued ASU 2019-01, "Leases (Topic 842): Codification Improvements". These amendments align the guidance for fair value of the underlying asset by lessors that are not manufacturers or dealers in Topic 842 with that of existing guidance (Issue #1). The ASU also requires lessors within the scope of Topic 942, Financial Services—Depository and Lending, to present all "principal payments received under leases" within investing activities (Issue #2). The ASU exempts both lessees and lessors from having to provide certain interim disclosures in the fiscal year in which a company adopts the new leases standard (Issue #3). In general, the amendments in ASU 2019-01 are effective for all entities for fiscal years and interim periods within those fiscal years, beginning after December 15, 2019. Early adoption is permitted. The transition and effective date provisions apply to Issue 1 and Issue 2. They do not apply to Issue 3 because the amendments for that Issue are to the original transition requirements in Topic 842. We are currently evaluating the impact of adopting ASU 2019-01 on our unaudited condensed consolidated financial statements and related disclosures.

Note 3. Revenue Recognition

Disaggregation of Revenue

The following table provides information about disaggregated revenue from contracts with customers, the nature of the products and services and geographic regions, and includes a reconciliation of the disaggregated revenue with reportable segments. The geographic regions that are tracked are the Americas (United States, Canada, Latin America), EMEA (Europe,

Middle East, Africa), and APAC (Australia, New Zealand, Southeast Asia, China).

(in thousands)	Three months ended March 31, 2019			Three months ended March 31, 2018		
	Performance Enzymes	Novel Biotherapeutics	Total	Performance Enzymes	Novel Biotherapeutics	Total
Major products and service:						
Product Revenue	$ 7,988	$ —	$ 7,988	$ 6,163	$ —	$ 6,163
Research and development revenue	2,099	5,496	7,595	4,566	3,313	7,879
Total revenues	$ 10,087	$ 5,496	$ 15,583	$ 10,729	$ 3,313	$ 14,042
Primary geographical markets:						
Americas	$ 2,838	$ —	$ 2,838	$ 3,597	$ —	$ 3,597
EMEA	2,230	5,496	7,726	1,679	3,313	4,992
APAC	5,019	—	5,019	5,453	—	5,453
Total revenues	$ 10,087	$ 5,496	$ 15,583	$ 10,729	$ 3,313	$ 14,042

Contract Balances

The following table presents changes in the contract assets, unbilled receivables, contract costs, and contract liabilities (in thousands):

	January 1, 2019 balance	Additions	Deductions [1]	March 31, 2019 balance
Contract Assets	$ 35	1,813	(1,848)	$ —
Unbilled receivables, current	$ 1,916	423	(416)	$ 1,923
Unbilled receivables, non-current	$ 786	—	—	$ 786
Contract Costs	$ 42	—	(28)	$ 14
Contract Liabilities: Deferred Revenue	$ 8,288	1,386	(4,323)	$ 5,351

[1] The asset or liability balances are presented as a net position per contract and accordingly the deductions column includes the netting effect of presenting each contract on a net position basis as either a net liability or asset.

We had no asset impairment charges related to contract assets in the period.

During the three months ended March 31, 2019, we recognized the following revenues (in thousands):

Revenue recognized in the period from:	Three months ended March 31, 2019
Amounts included in contract liabilities at the beginning of the period:	
Performance obligations satisfied	$ 2,385
Changes in the period:	
Changes in the estimated transaction price allocated to performance obligations satisfied in prior periods	136
Performance obligations satisfied from new activities in the period - contract revenue	13,062
Total revenue	$ 15,583

Performance Obligations

The following table includes estimated revenue expected to be recognized in the future related to performance obligations that are unsatisfied or partially unsatisfied at the end of the reporting period. The estimated revenue does not include contracts with original durations of one year or less, amounts of variable consideration attributable to royalties, or contract renewals that are unexercised as of March 31, 2019. We did not recognize any revenue from performance obligations satisfied in previous periods.

The balances in the table below are partially based on judgments involved in estimating future orders from customers subject to the exercise of material rights pursuant to respective contracts.

(in thousands)	2019	2020	2021 and Thereafter	Total
Product Revenue	$ —	$ 2,409	$ 1,623	$ 4,032
Research and development revenue	1,319	—	—	1,319
Total	$ 1,319	$ 2,409	$ 1,623	$ 5,351

Note 4. Net Loss per Share

Basic net loss per share is computed by dividing the net loss by the weighted-average number of shares of common stock outstanding, less restricted stock awards ("RSAs") subject to forfeiture. Diluted net loss per share is computed by dividing net loss by the weighted average number of shares of common stock outstanding, less RSAs subject to forfeiture, plus all additional common stock shares that would have been outstanding, assuming dilutive potential common stock shares had been issued for other dilutive securities. For periods of net loss, diluted and basic net loss per share are identical since potential common stock shares are excluded from the calculation, as their effect was anti-dilutive.

Anti-Dilutive Securities

In periods of net loss, the weighted average number of shares outstanding related to potentially dilutive securities, prior to the application of the treasury stock method, are excluded from the computation of diluted net loss per common share because including such shares would have an anti-dilutive effect.

The following shares were not included in the computation of diluted net loss per share (in thousands):

	Three months ended March 31,	
	2019	2018
Shares of common stock issuable pursuant to equity awards outstanding under the Equity Incentive Plan	6,750	7,530

Note 5. Collaborative Arrangements

GSK Platform Technology Transfer, Collaboration and License Agreement

In July 2014, we entered into a CodeEvolver® protein engineering platform technology transfer collaboration and license agreement (the "GSK CodeEvolver® Agreement") with GlaxoSmithKline ("GSK"). Pursuant to the terms of the agreement, we granted GSK a non-exclusive license to use the CodeEvolver® protein engineering platform technology to develop novel enzymes for use in the manufacture of GSK's pharmaceutical and health care products.

We received an upfront fee upon the execution of the agreement in July 2014 and milestone payments in each of the years from 2014 through April 2016. We completed the transfer of the CodeEvolver® protein engineering platform technology to GSK in April 2016 and all revenues relating to the technology transfer have been recognized as of April 2016. We have the potential to receive additional cumulative contingent payments that range from $5.75 million to $38.5 million per project based on

GSK's successful application of the licensed technology. We are also eligible to receive royalties based on net sales of GSK's sales of licensed enzyme products that are currently constrained.

Merck Platform Technology Transfer and License Agreement

In August 2015, we entered into a CodeEvolver® platform technology transfer collaboration and license agreement (the "Merck CodeEvolver® Agreement") with Merck, Sharp & Dohme ("Merck") which allows Merck to use the CodeEvolver® protein engineering technology platform in the field of human and animal healthcare.

We received a $5.0 million up-front license fee upon execution of the Merck CodeEvolver® Agreement, and milestone payments in September 2015 and in September 2016, when we completed the transfer of the engineering platform technology. Additionally, we recognized research and development revenues of $1.0 million and $0.9 million for the three months ended March 31, 2019 and 2018, respectively, for various research projects under our collaborative arrangement.

We have the potential to receive payments of up to a maximum of $15.0 million for each commercial active pharmaceutical ingredient ("API") that is manufactured by Merck using one or more novel enzymes developed by Merck using the CodeEvolver® protein engineering technology platform. The API payments, which are currently not recognized in revenue, are based on quantity of API developed and manufactured by Merck and will be recognized as usage-based royalties.

In January 2019, we entered into an amendment to the Merck CodeEvolver® Agreement whereby we will install certain CodeEvolver® protein engineering technology upgrades into Merck's platform license installation and maintain those upgrades for a multi-year term. As of March 31, 2019, none of the technology upgrades have been installed and no revenue has been recognized under the amendment.

Merck Sitagliptin Catalyst Supply Agreement

In February 2012, we entered into a five-year Sitagliptin Catalyst Supply Agreement ("Sitagliptin Catalyst Supply Agreement") with Merck whereby Merck may obtain commercial scale substance for use in the manufacture of Januvia®, its product based on the active ingredient sitagliptin. In December 2015, Merck exercised its option under the terms of the Sitagliptin Catalyst Supply Agreement to extend the agreement for an additional five years through February 2022.

Effective as of January 2016, we and Merck amended the Sitagliptin Catalyst Supply Agreement to prospectively provide for variable pricing based on the cumulative volume of sitagliptin catalyst purchased by Merck and to allow Merck to purchase a percentage of its requirements for sitagliptin catalyst from a specified third-party supplier. Merck received a distinct, functional license to manufacture a portion of its demand beginning January 1, 2018, which we recognized as research and development revenue. We recognized research and development revenue of zero and $1.3 million for the three months ended March 31, 2019 and 2018, respectively.

We have determined that the variable pricing, which provides a discount based on the cumulative volume of sitagliptin catalyst purchased by Merck, provides Merck material rights and we are recognizing product revenues using the alternative method. Under the alternative approach, we estimate the total expected consideration and allocate it proportionately with the expected sales.

The Sitagliptin Catalyst Supply Agreement requires Merck to pay an annual fee for the rights to the sitagliptin technology each year for the term of the Sitagliptin Catalyst Supply Agreement. Amounts of annual license fees are based on contractually agreed prices and are on a declining scale over the term of the contract.

We had a deferred revenue balance from Merck of $2.0 million at March 31, 2019 and $3.6 million at December 31, 2018. In addition, pursuant to the terms of the Sitagliptin Catalyst Supply Agreement, Merck may purchase supply from us for a fee based on contractually stated prices and we recognized $5.3 million and $4.6 million for the three months ended March 31, 2019 and 2018, respectively, in product revenue under this agreement.

Enzyme Supply Agreement

In November 2016, we entered into a supply agreement whereby our customer may purchase quantities of one of our proprietary enzymes for use in its commercial manufacture of a product. Pursuant to the supply agreement, we received an upfront payment of $0.8 million in December 2016, which we accordingly recorded as deferred revenue. Such upfront payment will be recognized over the period of the supply agreement as the customer purchases our proprietary enzyme. We additionally have determined that the volume discounts under the supply agreement provides the customer material rights and we are recognizing revenues using the alternative method. As of March 31, 2019 and December 31, 2018, we had deferred revenue from the supply agreement of $2.0 million.

Research and Development Agreement

In March 2017, we entered into a multi-year research and development services agreement with Tate & Lyle Ingredients Americas LLC ("Tate & Lyle") to develop enzymes for use in the manufacture of Tate & Lyle's zero-calorie TASTEVA® M Stevia sweetener. Under the agreement, we received an upfront payment of $3.0 million, which was recognized ratably over the maximum term of the services period of 21 months. Beginning January 1, 2018, we are recognizing revenue using a single measure of progress that depicts our performance in transferring the services. During the second quarter of 2018, Tate & Lyle opted to obtain additional development services that we completed by June 30, 2018 and we earned milestone payments upon completion of the services. We recognized zero and $1.4 million of revenue for the three months ended March 31, 2019 and 2018, respectively, for research and development services under the research and development agreement. As of March 31, 2019 and December 31, 2018, we had no deferred revenue from the development services agreement.

In April 2019, we entered into a multi-year commercial agreement with Tate & Lyle. (See Note 14, "Subsequent Events," for more details.)

Global Development, Option and License Agreement and Strategic Collaboration Agreement

In October 2017, we entered into a Global Development, Option and License Agreement (the "Nestlé Agreement") with Nestec Ltd. ("Nestlé Health Science") and, solely for the purpose of the integration and the dispute resolution clauses of the Nestlé Agreement, Nestlé Health Science S.A., to advance CDX-6114, our enzyme biotherapeutic product candidate for the potential treatment of PKU.

We received an upfront cash payment of $14.0 million upon the execution of the Nestlé Agreement, a $4.0 million milestone payment after dosing the first subjects in a first-in-human Phase 1a dose-escalation trial with CDX-6114, and a $1.0 million milestone payment upon achievement of a milestone relating to formulation of CDX-6114. The $4.0 million milestone payment that was triggered by the initiation of the trial was received in September 2018 and the $1.0 million milestone payment that was triggered by the achievement of a formulation relating to CDX-6114 was received in February 2019. The upfront payment and the variable consideration relating to the progress payment of $4.0 million and milestone payment of $1.0 million are being recognized over time as the development work is being performed. Revenue is being recognized using a single measure of progress that depicts our performance in transferring control of the services, which is based on the ratio of level of effort incurred to date compared to the total estimated level of effort required to complete all performance obligations under the agreement. We recognized development fees of $1.3 million and $2.7 million for the three months ended March 31, 2019 and 2018, respectively, as research and development revenue. We had deferred revenue related to the development fees attributed to the milestone payment and up-front fees of $0.7 million at March 31, 2019 and $1.9 million at December 31, 2018.

In January 2019, we received notice from the FDA that it had completed its review of our IND for CDX-6114 and concluded that we may proceed with the proposed Phase 1b multiple ascending dose study in healthy volunteers in the United States. In February 2019, Nestlé Health Science exercised its option to obtain an exclusive, worldwide, royalty-bearing, sub-licensable license for the global development and commercialization of CDX-6114 for the management of PKU. As a result of the option exercise, Nestlé Health Science is obligated to pay us $3.0 million which we recognized revenue for three months ended March 31, 2019 as research and development fees. Upon exercising its option, Nestlé Health Science has assumed all responsibilities for future clinical development and commercialization of CDX-6114, with the exception of the completion of an extension study, CDX-6114-004, which is expected to be completed in the second quarter of 2019. Other potential payments from Nestlé Health Science to us under the Nestlé Agreement include (i) development and approval milestones of up to $85.0 million, (ii) sales-based milestones of up to $250.0 million in the aggregate, which aggregate amount is achievable if net sales exceed $1.0 billion in a single year, and (iii) tiered royalties, at percentages ranging from the middle single digits to low double-digits, of net sales of product.

In addition to the Nestlé Agreement, we and Nestlé Health Science concurrently entered into a Strategic Collaboration Agreement (the "Strategic Collaboration Agreement") pursuant to which we and Nestlé Health Science will collaborate to leverage the CodeEvolver® protein engineering technology platform to develop novel enzymes for Nestlé Health Science's established Consumer Care and Medical Nutrition business areas. Under the Strategic Collaboration Agreement, we received an upfront payment of $1.2 million in 2017 and an incremental $0.6 million payment in September 2018 for additional services. We recognized research and development fees of $1.2 million and $0.6 million for the three months ended March 31, 2019 and 2018, respectively. We had deferred revenue of $0.6 million and $0.8 million at March 31, 2019 and December 31, 2018, respectively.

Strategic Collaboration Agreement

In April 2018, we entered into the Porton Agreement with Porton to license key elements of Codexis' biocatalyst technology for use in Porton's global custom intermediate and API development and manufacturing business. Under the Porton Agreement, we are eligible to receive annual collaboration fees and research and development revenues. We received an initial collaboration fee of $0.5 million within 30 days of the effective date of the agreement and as of December 31, 2018, we completed the technical transfer. We recognized no revenue for the three months ended March 31, 2019 and 2018, as research and development revenue. Revenue relating to the functional license provided to Porton was recognized at a point in time when control of the license transferred to the customer.

Note 6. Cash Equivalents and Marketable Securities

Cash equivalents and marketable securities at March 31, 2019 and at December 31, 2018 consisted of the following (in thousands):

	March 31, 2019			
	Adjusted Cost	Gross Unrealized Gains (3)	Gross Unrealized Losses(3)	Estimated Fair Value
Money market funds (1)	$ 28,001	$ —	$ —	$ 28,001
Common shares of CO_2 Solutions (2)	563	—	(79)	484
Total	$ 28,564	$ —	$ (79)	$ 28,485

	December 31, 2018			
	Adjusted Cost	Gross Unrealized Gains(3)	Gross Unrealized Losses(3)	Estimated Fair Value
Money market funds (1)	$ 31,225	$ —	$ —	$ 31,225
Common shares of CO_2 Solutions (2)	563	25	—	588
Total	$ 31,788	$ 25	$ —	$ 31,813

(1) Money market funds are classified in cash and cash equivalents on our unaudited condensed consolidated balance sheets.
(2) Common shares of CO_2 Solutions are classified in equity securities on our unaudited condensed consolidated balance sheets.
(3) As a result of adopting ASU 2016-01, in 2018 and thereafter gross unrealized gains and gross unrealized losses related to our investment in CO_2 Solutions were recognized in other expense, in our unaudited condensed consolidated statements of operations.

As of March 31, 2019, the total cash and cash equivalents balance of $47.3 million was comprised of money market funds of $28.0 million and cash of $19.3 million held with major financial institutions worldwide. As of December 31, 2018, the total cash and cash equivalents balance of $53.0 million was comprised of money market funds of $31.2 million and cash of $21.8 million held with major financial institutions worldwide.

In December 2009, we purchased 10,000,000 common shares of CO_2 Solutions, a company based in Quebec, Canada, whose shares are publicly traded in Canada on TSX Venture Exchange. Our purchase represented approximately 16.6% of CO_2 Solutions' total common shares outstanding at the time of investment and was made in a private placement subject to a four-month statutory resale restriction. This restriction expired on April 15, 2010. Our investment in CO_2 Solutions is recorded at its fair value. See Note 7, "Fair Value Measurements." Through March 31, 2019, we concluded that we did not have the ability to exercise significant influence over CO_2 Solutions' operating and financial policies.

On January 1, 2018, we adopted ASU 2016-01. Upon adoption, we reclassified the $0.5 million net unrealized loss from accumulated other comprehensive loss to our opening accumulated deficit. As of March 31, 2019, we recognized an unrealized loss of $0.1 million related to our investment in CO_2 Solutions in other expense, in the unaudited condensed consolidated statements of operations.

Note 7. Fair Value Measurements

The following tables present the financial instruments that were measured at fair value on a recurring basis at March 31, 2019 and December 31, 2018 by level within the fair value hierarchy (in thousands):

	March 31, 2019			
	Level 1	Level 2	Level 3	Total
Money market funds	$ 28,001	$ —	$ —	$ 28,001
Common shares of CO_2 Solutions	484	—	—	484
Total	$ 28,485	$ —	$ —	$ 28,485

	December 31, 2018			
	Level 1	Level 2	Level 3	Total
Money market funds	$ 31,225	$ —	$ —	$ 31,225
Common shares of CO_2 Solutions	588	—	—	588
Total	$ 31,813	$ —	$ —	$ 31,813

We determine the fair value of Level 1 assets using quoted prices in active markets for identical assets. We estimated the fair value of our investment in 10,000,000 common shares of CO_2 Solutions using the market value of common shares as determined by trading on the TSX Venture Exchange, and we classified our investment in CO_2 Solutions within the fair value hierarchy as Level 1 at March 31, 2019 and December 31, 2018, respectively, using the quoted prices in an active market to determine their fair value.

Note 8. Balance Sheets Details

Inventories

Inventories consisted of the following (in thousands):

	March 31, 2019	December 31, 2018
Raw materials	$ 58	$ 165
Work-in-process	158	47
Finished goods	417	377
Inventories	$ 633	$ 589

Property and Equipment, net

Property and equipment, net consisted of the following (in thousands):

	March 31, 2019	December 31, 2018
Laboratory equipment [1]	$ 21,464	$ 21,328
Leasehold improvements	10,730	10,359
Computer equipment and software	3,663	3,954
Office equipment and furniture	1,442	1,272
Construction in progress [2]	175	939
Property and equipment	37,474	37,852
Less: accumulated depreciation and amortization	(32,939)	(33,093)
Property and equipment, net	$ 4,535	$ 4,759

[1] Fully depreciated laboratory equipment with a cost of $0.1 million and $0.3 million was retired during three months ended March 31, 2019 and the fiscal year ended December 31, 2018, respectively.
[2] Construction in progress includes equipment received but not yet placed into service pending installation.

Goodwill

Goodwill had a carrying value of approximately $3.2 million at March 31, 2019 and December 31, 2018.

Other Accrued Liabilities

Other accrued liabilities consisted of the following (in thousands):

	March 31, 2019	December 31, 2018
Accrued purchases	$ 3,556	$ 1,492
Accrued professional and outside service fees	3,318	2,020
Deferred rent	—	343
Lease incentive obligation	—	425
Other	253	575
Total	$ 7,127	$ 4,855

Note 9. Stock-Based Compensation

Equity Incentive Plans

In March 2010, our board of directors (the "Board") and stockholders approved the 2010 Equity Incentive Award Plan (the "2010 Plan"), which became effective upon the completion of our initial public offering in April 2010. The number of shares of our common stock available for issuance under the 2010 Plan is equal to 1,100,000 shares plus any shares of common stock reserved for future grant or issuance under our 2002 Stock Plan (the "2002 Plan") that remained unissued at the time of completion of the initial public offering. The 2010 Plan also provides for automatic annual increases in the number of shares reserved for future issuance. All grants will reduce the 2010 Plan reserve by one share for every share granted.

The 2010 Plan provides for the grant of incentive stock options, non-statutory stock options, RSUs, RSAs, PSUs, PBOs, stock appreciation rights, and stock purchase rights to our employees, non-employee directors and consultants.

Stock Options

The option exercise price for incentive stock options is at least 100% of the fair value of our common stock on the date of grant and the option exercise price for non-statutory stock options is at least 85% of the fair value of our common stock on the date of grant, as determined by the Board. If, at the time of a grant, the optionee directly or by attribution owns stock possessing more than 10% of the total combined voting power of all of our outstanding capital stock, the exercise price for these options must be at least 110% of the fair value of the underlying common stock. Stock options granted to employees generally have a maximum term of 10 years and vest over a four year period from the date of grant, of which 25% vest at the end of one year, and 75% vest monthly over the remaining three years. We may grant options with different vesting terms from time to time. Unless an employee's termination of service is due to disability or death, upon termination of service, any unexercised vested options will be forfeited at the end of three months or the expiration of the option, whichever is earlier.

Restricted Stock Units (RSUs)

We also grant employees RSUs, which generally vest over either a three year period with one-third of the shares subject to the RSUs vesting on each yearly anniversary of the vesting commencement date or over a four year period with 25% of the shares subject to the RSU vesting on each yearly anniversary of the vesting commencement date, in each case contingent upon such employee’s continued service on such vesting date. RSUs are generally subject to forfeiture if employment terminates prior to the release of vesting restrictions. We may grant RSUs with different vesting terms from time to time.

Performance-contingent Restricted Stock Units (PSUs) and Performance Based Options (PBOs)

The compensation committee of the Board approved, solely in respect of non-executive employees, delegated to our Chief Executive Officer the authority to approve grants of PSUs. The compensation committee of the Board also approved grants of PBOs and PSUs to our executives. The PSUs and PBOs vest based upon both the successful achievement of certain corporate operating milestones in specified timelines and continued employment through the applicable vesting date. When the performance goals are deemed to be probable of achievement for these types of awards, recognition of stock-based compensation expense commences. Once the number of shares eligible to vest is determined, those shares vest in two equal installments with 50% vesting upon achievement and the remaining 50% vesting on the first anniversary of achievement, in each case, subject to the recipient's continued service through the applicable vesting date. If the performance goals are achieved at the threshold level, the number of shares eligible to vest in respect of the PSUs and PBOs would be equal to half the number of PSUs granted and one-quarter the number of shares underlying the PBOs granted. If the performance goals are achieved at the target level, the number of shares eligible to vest in respect of the PSUs and PBOs would be equal to the number of PSUs granted and half of the shares underlying the PBOs granted. If the performance goals are achieved at the superior level, the number of shares eligible to vest in respect of the PSUs would be equal to two times the number of PSUs granted and equal to the number of PBOs granted. The number of shares issuable upon achievement of the performance goals at the levels between the threshold and target levels for the PSUs and PBOs or between the target level and superior levels for the PSUs would be determined using linear interpolation. Achievement below the threshold level would result in no shares being eligible to vest in respect of the PSUs and PBOs.

In the first quarter of 2019, we awarded PSUs ("2019 PSUs") and PBOs ("2019 PBOs"), each of which commence vesting based upon the achievement of various weighted performance goals, including revenue growth, strategic advancement of biotherapeutics, cash balance and strategic plan development. As of March 31, 2019, we estimated that the 2019 PSUs and 2019 PBOs performance goals would be achieved at 100% of the target level, and recognized expenses accordingly.

In 2018, we awarded PSUs ("2018 PSUs") and PBOs ("2018 PBOs"), each of which commence vesting based upon the achievement of various weighted performance goals, including core business revenue growth, cash balance, new licensing collaborations, new research and development service revenue arrangements, technology advancement and novel therapeutic enzymes advancement. In the first quarter of 2019, we determined that the 2018 PSUs and 2018 PBOs performance goals had been achieved at 118% of the target level, and recognized expenses accordingly. Accordingly, one-half of the shares underlying the 2018 PSUs and PBOs vested in the first quarter of 2019 and one-half of the shares underlying the 2018 PSUs and PBOs will vest in the first quarter of 2020, in each case subject to the recipient's continued service on each vesting date.

In 2017, we awarded PSUs ("2017 PSUs") and PBOs ("2017 PBOs"), each of which commence vesting based upon the achievement of various weighted performance goals, including revenue growth, fundraising, service revenue, new platform license revenue, and strategic advancement of biotherapeutics pipeline. In the first quarter of 2018, we determined that the 2017 PSU and PBO performance goals had been achieved at 134.2% of the target level, and recognized expenses accordingly. Accordingly, one-half of the shares underlying the 2017 PSUs and PBOs vested in the first quarter of 2018 and one-half of the shares underlying the 2017 PSUs and PBOs vested in the first quarter of 2019, in each case subject to the recipient's continued service on each vesting date.

In 2016, we awarded PSUs ("2016 PSUs") based upon the achievement of various weighted performance goals, including revenue growth, non-GAAP net income growth, new licensing collaborations, new research and development service revenue arrangements and novel therapeutic enzymes advancement. In the first quarter of 2017, we determined that the 2016 PSU performance goals had been achieved at 142.3% of the target level, and recognized expenses accordingly. Accordingly, one-half of the shares underlying the 2016 PSUs vested in the first quarter of each of 2017 and 2018, in each case subject to the recipient's continued service on each vesting date. No PBOs were awarded in 2016.

Stock-Based Compensation Expense

Stock-based compensation expense is included in the unaudited condensed consolidated statements of operations as follows (in thousands):

	Three Months Ended March 31,	
	2019	2018
Research and development	$ 388	$ 435
Selling, general and administrative	1,675	1,545
Total	$ 2,063	$ 1,980

The following table presents total stock-based compensation expense by security types included in the unaudited condensed consolidated statements of operations for the three months ended March 31, 2019 and 2018 (in thousands):

	Three Months Ended March 31,	
	2019	2018
Stock options	$ 554	$ 472
RSUs and RSAs	461	452
PSUs	391	409
PBOs	657	647
Total	$ 2,063	$ 1,980

As of March 31, 2019, unrecognized stock-based compensation expense, net of expected forfeitures, was $6.1 million related to unvested employee stock options, $1.2 million related to unvested RSUs and RSAs, $1.3 million related to unvested PSUs, and $4.0 million related to unvested PBOs based on current estimates of the level of achievement. Stock-based compensation expense will be recognized through the year of 2022.

Valuation Assumptions

The weighted-average assumptions used to estimate the fair value of employee stock options and PBOs granted were as follows:

	Three Months Ended March 31,	
	2019	2018
Expected term (in years)	5.6	5.6
Volatility	56%	60%
Risk-free interest rate	2.49%	2.70%
Dividend yield	—%	—%
Weighted-average estimated fair value of stock options granted	$ 11.44	$ 5.02

Note 10. Capital Stock

Exercise of Options

For the three months ended March 31, 2019 and 2018, 218,572 and 78,859 shares, respectively, were exercised at a weighted-average exercise price of $3.55 and $6.49 per share, respectively, with net cash proceeds of $0.8 million and $0.4 million, respectively.

Note 11. Commitments and Contingencies

Operating Leases

Our headquarters are located in Redwood City, California, where we occupy approximately 107,200 square feet of office and laboratory space in four buildings within the same business park of Metropolitan Life Insurance Company ("MetLife"). Our lease (“Lease”) with MetLife includes approximately 28,200 square feet of space located at 200 and 220 Penobscot Drive, Redwood City, California (the “Penobscot Space”), approximately 37,900 square feet of space located at 400 Penobscot Drive, Redwood City, California (the “Building 2 Space”), approximately 11,200 square feet of space located at 501 Chesapeake Drive, Redwood City, California (the “501 Chesapeake Space”), and approximately 29,900 square feet of space located at 101 Saginaw Drive, Redwood City, California (the “Saginaw Space”).

We entered into the initial lease with MetLife for a portion of this space in 2004 and the lease has been amended multiple times since then to adjust space and amend the terms of the Lease. The lease amendment ("Seventh Amendment") in October 2016 waived our existing asset retirement obligation for one of our buildings and extended the lease term to January 2022. The various terms for the spaces under the lease have expiration dates that range from January 2020 through January 2022.

Beginning in February 2014, we have subleased certain office and laboratory space to different subtenants with separate options to extend the subleases. These subleases will expire in November 2019.

In February 2019, we entered into the eighth amendment to the Lease ("Eighth Amendment") with MetLife to extend the lease terms for the Penobscot Space, the Building 2 Space and the Chesapeake Space for another 88 months. The lease on the Saginaw Space will expire in January 2020. The lease terms for the Penobscot Space and Building 2 Space have an expiration date of May 2027. The lease term for the 501 Chesapeake Space has an expiration date of May 2029.

We incurred $3.6 million of capital improvement costs related to the facilities leased from MetLife through December 31, 2012. During 2011 and 2012, we requested and received $3.1 million of reimbursements from the landlord for the tenant improvement and HVAC allowances for the completed construction. The reimbursements were recorded once cash was received and are amortized on a straight line basis over the term of the lease as a reduction in rent expense. The remaining lease incentive obligations were zero and $0.5 million at March 31, 2019 and December 31, 2018, respectively. Prior to adoption of ASC 842, lease incentive obligation were reflected as liabilities on the unaudited condensed consolidated balance sheets. Upon adoption of ASC 842, lease incentive obligations were cleared to zero to create our right-of-use assets related to operating lease, reflected on the unaudited condensed consolidated balance sheets. Rent expense for the Redwood City properties is recognized on a straight-line basis over the term of the lease.

We are required to restore certain areas of the Redwood City facilities that we are renting to their original form. We are expensing the asset retirement obligation over the terms of the respective leases. We review the estimated obligation each reporting period and make adjustments if our estimates change. We recorded asset retirement obligations of $0.2 million as of March 31, 2019 and December 31, 2018, respectively, which are included in other liabilities on the unaudited condensed consolidated balance sheets. Accretion expense related to our asset retirement obligations was nominal in the three months ended March 31, 2019 and March 31, 2018.

Pursuant to the terms of the amended lease agreement, we exercised our right to deliver a letter of credit in lieu of a security deposit. The letter of credit is collateralized by deposit balances held by the bank in the amount of $1.1 million and $0.7 million as of March 31, 2019 and December 31, 2018, respectively. These deposits are recorded as restricted cash on the unaudited condensed consolidated balance sheets.

Rent expense was $1.2 million and $0.8 million during the three months ended March 31, 2019 and 2018, respectively, partially offset by sublease income of $0.2 million and $0.3 million, respectively.

Finance Leases

In December 2016, we entered into a three-year financing lease agreement with a third party supplier for the purchase of laboratory equipment that was partially financed through a finance lease of approximately $0.4 million. The lease became effective upon delivery of the equipment, which occurred in February 2017, and the term of the lease is three years from the effective date. This financing agreement was accounted for as a capital lease due to the bargain purchase option at the end of the lease.

In April 2017, we entered into a three-year financing lease agreement with a third party supplier for the purchase of information technology equipment for approximately $0.3 million. The effective date of the lease was May 19, 2017 and the term of the lease is three years. This financing agreement was accounted for as a finance lease due to the bargain purchase option at the end of the lease.

Adoption of ASC 842

On January 1, 2019, we adopted ASC 842, using a modified retrospective approach and effective date method per adoption of ASU 2018-11. We completed the full analysis by January, 2019 and we evaluated the right-of-use (ROU) assets and lease obligations using the incremental borrowing rate (IBR) at December 31, 2018 because the implicit rate is not readily determinable in the lease agreement. Upon adoption of ASC 842, all existing leases will be classified as either operating lease or finance lease. All existing leases that were classified as capital leases in accordance with Topic 840 will be classified as finance leases. We recorded $26.6 million of ROU assets and $27.6 million of lease obligations for operating leases and $0.5 million of ROU assets and $0.3 million of lease obligations for finance leases in the balance sheet at the beginning of 2019.

Practical Expedients, Elections, and Exemptions

We used a practical expedient available under ASC 842-10-65-1(f) that permits us not to reassess whether any expired or existing contracts are or contain leases; not to reassess the lease classification for any expired or existing leases (for example, all existing leases that were classified as operating leases in accordance with ASC 840 will be classified as operating leases, and

all existing leases that were classified as capital leases in accordance with ASC 840 will be classified as finance leases); and not to reassess initial direct costs for any existing leases.

On January 1, 2019, we also made an accounting policy election (by class of underlying asset to which the right of use relates) to apply accounting to leases that meet ASC 842's definition of a short-term lease (i.e., the short-term lease exemption). A short-term lease is defined as a lease that, at the commencement date, has a lease term of 12 months or less and does not include an option to purchase the underlying asset that the lessee is reasonably certain to exercise.

The following table shows the reconciliation of right-of-use assets and lease obligations, with balances reflecting the adoption of ASC 842, related to both operating leases and finance leases and gives effect to the modified retrospective adoption and effective date method of the lease guidance on January 1, 2019 (in thousands):

	Operating leases	Finance Leases
Right-of-use assets, balance at December 31, 2018	$ —	$ —
Changes in the period:		
Right-of-use assets created upon adoption of ASC 842	26,617	493
Right-of-use assets, balance at January 1, 2019	$ 26,617	$ 493
Lease obligations, balance at December 31, 2018	$ —	$ —
Changes in the period:		
Lease obligations created upon adoption of ASC 842	27,562	302
Lease obligations, balance at January 1, 2019	$ 27,562	$ 302

Lease related expenses under non-cancellable finance and operating leases and under non-cancellable subleases as follows (in thousands except discount rate and lease term):

	Three months ended March 31, 2019
Lease costs	
Finance lease cost:	
Amortization of right-of-use assets	$ 54
Interest on lease obligations	4
Operating lease cost	1,178
Sublease income	(211)
Total lease cost	$ 1,025
Other information	
Weighted-average remaining lease term (in years):	
Finance leases	1.0
Operating leases	8.3
Weighted-average discount rate:	
Finance leases	5.0%
Operating leases	6.6%
Cash paid for amounts included in the measurement of lease obligations	
Operating cash flows from operating leases	$ 812
Operating cash flows from finance leases	$ 4
Financing cash flows from finance leases	$ 59

As of March 31, 2019, under ASC 842, maturity analysis of annual undiscounted cash flows of the non-cancellable finance and operating leases as follows (in thousands):

Years ending December 31,	Finance Leases	Operating Leases
2019 (remaining 9 months)	$ 189	$ 2,469
2020	61	2,816
2021	—	4,197
2022	—	4,285
2023	—	4,589
2024 and thereafter	—	18,220
Total minimum lease payments [1]	$ 250	$ 36,576
Less: imputed interest	(8)	(9,352)
Lease Obligations	$ 242	$ 27,224

[1] Minimum payments have not been reduced by future minimum sublease rentals of $0.7 million to be received under non-cancellable subleases at March 31, 2019.

As of December 31, 2018, under ASC 840, maturity analysis of annual undiscounted cash flows of the non-cancellable capital and operating leases as follows (in thousands):

Years ending December 31,	Capital Leases	Operating Leases
2019	$ 252	$ 3,280
2020	61	712
2021	—	490
2022	—	41
2023	—	—
Total minimum lease payments [1]	313	$ 4,523
Less: amount representing interest	(10)	
Present value of capital lease obligations	303	
Less: current portion	(242)	
Long-term portion of capital leases	$ 61	

[1] Minimum payments have not been reduced by future minimum sublease rentals of $0.9 million to be received under non-cancellable subleases.

Other Commitments

We enter into supply and service arrangements in the normal course of business. Supply arrangements are primarily for fixed-price manufacture and supply. Service agreements are primarily for the development of manufacturing processes and certain studies. Commitments under service agreements are subject to cancellation at our discretion which may require payment of certain cancellation fees. The timing of completion of service arrangements is subject to variability in estimates of the time required to complete the work.

The following table provides quantitative data regarding our other commitments. Future minimum payments reflect amounts that we expect to pay including potential obligations under services agreements subject to risk of cancellation by us (in thousands):

Other Commitment Agreement Type	Agreement Date	Future Minimum Payment
Manufacture and supply agreement with expected future payment date of December 2022	April 2016	$ 1,310
Service agreement for clinical trial	December 2017	455
Total other commitments		$ 1,765

Credit Facility

Effective June 30, 2017, we entered into a credit facility (the "Credit Facility") consisting of term loans ("Term Debt") totaling up to $10.0 million, and advances ("Advances") under a revolving line of credit ("Revolving Line of Credit") totaling up to $5.0 million with an accounts receivable borrowing base of 80% of eligible accounts receivable. At March 31, 2019, we have not drawn from the Credit Facility. In September 2018, we entered into a Fourth Amendment to the Credit Facility whereby the draw period on the term debt was extended to September 30, 2019. In January 2019, we entered into a Fifth Amendment to the Credit Facility to allow for Codexis to obtain a letter of credit of up to $1.1 million to secure its obligations under the Lease with MetLife. We may draw on the Term Debt at any time prior to September 30, 2019, subject to customary conditions for funding including, among others, that no event of default exists. We may draw on the Revolving Line of Credit at any time prior to the maturity date. On October 1, 2022, any loans for Term Debt mature and the Revolving Line of Credit terminates. Term Debt bears interest through maturity at a variable rate based on the London Interbank Offered Rate plus 3.60%. Advances under the Revolving Line of Credit bear interest at a variable annual rate equal to the greater of (i) 1.00% above the prime rate and (ii) 5.00%.

The Credit Facility allows for interest-only payments on Term Debt throughNovember 1, 2020. Monthly payments of principal and interest on the Term Debt are required following the applicable amortization date. We may elect to prepay in full the Term Debt and Advances under the Revolving Line of Credit at any time.

Our obligations under the Credit Facility are secured by a lien on substantially all of our personal property other than our intellectual property. The Credit Facility includes a number of customary covenants and restrictions which require us to comply with certain financial covenants including achieving consolidated product revenues levels at minimum levels as set forth in the Credit Facility unless we maintain certain minimum cash levels with the lender in an amount equal to or greater than six times the sum of the average six-month trailing operating cash flow net outlay plus the average monthly principal due and payable in the immediately succeedingthree-month period. The Credit Facility places various restrictions on our transferring collateral, incurring additional indebtedness, engaging in mergers or acquisitions, paying dividends or making other distributions, making investments, creating liens, and selling assets and permitted assets to be held at foreign subsidiaries above specified caps, in each case subject to certain exceptions. A failure to comply with these covenants could permit the lender to exercise remedies against us and the collateral securing the Credit Facility, including foreclosure of our properties securing the Credit Facility and our cash. At March 31, 2019, we were in compliance with the covenants for the Credit Facility.

Legal Proceedings

We are not currently a party to any material pending litigation or other material legal proceedings.

In February 2018, we and EnzymeWorks, Inc. (U.S.), Suzhou Hanmei Biotechnology Co. Ltd, d/b/a EnzymeWorks, Inc. (China) (collectively, "EnzymeWorks"), Junhua Tao, and Andrew Tao reached a settlement concerning the lawsuit filed by us in February 2016 against EnzymeWorks, Junhua Tao, and Andrew Tao in the United States District Court for the Northern District of California. The parties have entered into a settlement agreement, the terms of which are confidential. The parties have also stipulated to a judgment of patent infringement of all asserted patents against EnzymeWorks, and a permanent injunction barring any future infringement. The remaining claims against EnzymeWorks, and all claims against Junhua Tao, and Andrew Tao including trade secret misappropriation, breach of contract and voidable transfer have been dismissed with prejudice. EnzymeWorks appealed the sanctions levied against them by Judge Orrick to the Federal Circuit and filed its opening brief on May 30, 2018. On July 9, 2018, Codexis filed its response brief, and EnzymeWorks filed its reply on July 30, 2018. On February 8, 2019, the Federal Circuit panel of judges assigned to the case issued an opinion affirming the lower court's ruling and remanding the case to the lower court on jurisdictional grounds to vacate the order to which the parties had earlier stipulated. EnzymeWorks has 90 days from the decision in which to appeal.

Indemnifications

We are required to recognize a liability for the fair value of any obligations we assume upon the issuance of a guarantee. We have certain agreements with licensors, licensees, and collaborators that contain indemnification provisions. In such provisions, we typically agree to indemnify the licensor, licensee and collaborator against certain types of third party claims. The maximum amount of the indemnifications is not limited. We accrue for known indemnification issues when a loss is probable and can be reasonably estimated. There were no accruals for expenses related to indemnification issues for any periods presented.

Note 12. Related Party Transactions

AstraZeneca PLC

Pam P. Cheng, a member of our board of directors, joined AstraZeneca PLC as Executive Vice President, Operations and Information Technology in June 2015. We sell biocatalyst products to AstraZeneca PLC and its controlled purchasing agents and contract manufacturers.

We recognized de minimis revenue and $0.3 million of product revenue in the three months ended March 31, 2019 and 2018, respectively, from transactions with AstraZeneca PLC and its controlled purchasing agents and contract manufacturers. At March 31, 2019 and December 31, 2018, we had zero and $0.2 million of accounts receivables from AstraZeneca, PLC, and its controlled purchasing agents and contract manufacturers, respectively.

Note 13. Segment, Geographical and Other Revenue Information

Segment Information

As discussed in Note 2, "Basis of Presentation and Summary of Significant Accounting Policies," beginning in 2018, we identified our biotherapeutics business as a standalone business segment. Our two reportable business segments as of January 1, 2018, consisted of Performance Enzymes and Novel Biotherapeutics.

We report corporate-related expenses such as legal, accounting, information technology, and other costs that are not otherwise included in our reportable business segments as "Corporate costs." All items not included in income (loss) from operations are excluded from the business segments.

We manage our assets on a total company basis, not by business segment, as the majority of our operating assets are shared or commingled. Our CODM does not review asset information by business segment in assessing performance or allocating resources, and accordingly, we do not report asset information by business segment.

Performance Enzymes

We initially commercialized our CodeEvolver® protein engineering technology platform and products in the pharmaceuticals market, and to date this continues to be our largest market served. Our customers, which include many large global pharmaceutical companies, use our technology, products and services in their manufacturing processes and process development. We have also used the technology to develop customized enzymes for use in other industrial markets. These markets consist of several large industrial verticals, including food and food ingredients, animal feed, flavors, fragrances, and agricultural chemicals. We also use our technology to develop enzymes for customers using NGS and PCR/qPCR for in vitro molecular diagnostic and molecular biology research applications.

Novel Biotherapeutics

We are also targeting new opportunities in the pharmaceutical industry to discover, improve, and/or develop biotherapeutic drug candidates. We believe that our CodeEvolver® protein engineering platform technology can be used to discover novel biotherapeutic drug candidates that will target human diseases that are in need of improved therapeutic interventions. Similarly, we believe that we can deploy our platform technology to improve specific characteristics of a customer's pre-existing biotherapeutic drug candidate, such as its activity, stability or immunogenicity. Most notable is our lead program for the potential treatment of PKU in humans. PKU is an inherited metabolic disorder in which the enzyme that converts the essential amino acid phenylalanine into tyrosine is deficient. In October 2017, we announced a strategic collaboration with Nestlé Health Science to advance CDX-6114, our own novel orally administrable enzyme therapeutic candidate for the potential treatment of PKU. In July 2018, we announced that we had dosed the first subjects in a first-in-human Phase 1a dose-escalation trial with CDX-6114, which was conducted in Australia. In November 2018, we announced top-line results from the Phase 1a study in healthy volunteers with CDX-6114. In December 2018, Nestlé Health Science became obligated to pay us an additional $1.0 million within 60 days after the achievement of a milestone relating to formulation of CDX-6114. In January 2019, we received notice from the U.S. Food and Drug Administration (the "FDA") that it had completed its review of our investigational new drug application ("IND") for CDX-6114 and concluded that we may proceed with the proposed Phase 1b multiple ascending dose study in healthy volunteers in the United States. In February 2019, Nestlé Health Science exercised its option to obtain an exclusive license for the global development and commercialization of CDX-6114 for the management of PKU. The exercise of the option triggered a $3 million milestone payment which we recognized in the first quarter of 2019. Upon exercising its option, Nestlé Health Science has assumed all responsibilities for future clinical development and commercialization of CDX-6114, with the exception of the completion of an extension study, CDX - 6114-004, which is expected to be completed in the second quarter of 2019. For the three months ended March 31, 2019 and 2018, all revenues related to the Novel Biotherapeutics segment were generated from our collaborations with Nestlé Health Science.

We have also developed a pipeline of other biotherapeutic drug candidates, which are in preclinical development, and in which we expect to continue to make additional investments with the aim of advancing additional product candidates targeting other therapeutic areas.

Our CODM regularly reviews our segments and the approach provided by management for performance evaluation and resource allocation.

Operating expenses that directly support the segment activity are allocated based on segment headcount, revenue contribution or activity of the business units within the segments, based on the corporate activity type provided to the segment. The expense allocation excludes certain corporate costs that are separately managed from the segments. This provides the CODM with more meaningful segment profitability reporting to support operating decisions and allocate resources.

The following table provides financial information by our reportable business segments along with a reconciliation to consolidated loss before income taxes (in thousands):

	Three months ended March 31, 2019			Three months ended March 31, 2018		
	Performance Enzymes	Novel Biotherapeutics	Total	Performance Enzymes	Novel Biotherapeutics	Total
Revenues:						
Product revenue	$ 7,988	$ —	$ 7,988	$ 6,163	$ —	$ 6,163
Research and development revenue	2,099	5,496	7,595	4,566	3,313	7,879
Total revenues	10,087	5,496	15,583	10,729	3,313	14,042
Costs and operating expenses:						
Cost of product revenue	4,391	—	4,391	3,825	—	3,825
Research and development[1]	4,442	3,317	7,759	5,066	1,932	6,998
Selling, general and administrative	2,101	517	2,618	2,096	146	2,242
Total segment costs and operating expenses	10,934	3,834	14,768	10,987	2,078	13,065
Income (loss) from operations	$ (847)	$ 1,662	$ 815	$ (258)	$ 1,235	$ 977
Corporate costs[2]			(5,575)			(5,435)
Depreciation and amortization			(373)			(238)
Loss before income taxes			$ (5,133)			$ (4,696)

[1] Research and development expenses exclude depreciation.
[2] Corporate costs include unallocated selling, general and administrative expense, interest income, and other income and expenses.

The following table provides stock-based compensation expense included in income (loss) from operations by segment (in thousands):

	Three months ended March 31, 2019			Three months ended March 31, 2018		
	Performance Enzymes	Novel Biotherapeutics	Total	Performance Enzymes	Novel Biotherapeutics	Total
Stock-based compensation	$ 636	$ 141	$ 777	$ 333	$ 63	$ 396

Significant Customers

Customers that each contributed 10% or more of our total revenues were as follows:

	Percentage of Total Revenues For the three months ended March 31,	
	2019	**2018**
Customer A	41%	48%
Customer B	35%	24%
Customer C	*	10%

Customers that each contributed 10% or more of our total accounts receivable had the following balances as of the periods presented:

	Percentage of Accounts Receivables as of	
	March 31, 2019	**December 31, 2018**
Customer A	33%	37%
Customer B	30%	17%
Customer D	17%	*
Customer E	*	11%
Customer F	*	16%

* *Less than 10% of the period presented*

Geographical Information

Geographic revenues are identified by the location of the customer and consist of the following (in thousands):

	Three Months Ended March 31,	
	2019	**2018**
Revenues		
Americas	$ 2,838	$ 3,597
EMEA	7,726	4,992
APAC	5,019	5,453
Total revenues	$ 15,583	$ 14,042

Identifiable long-lived assets by location and goodwill by reporting unit were as follows:

Long-lived assets:	**March 31, 2019**	**December 31, 2018**
United States	$ 30,886	$ 4,759

	As of March 31, 2019 and December 31, 2018		
	Performance Enzymes	**Novel Biotherapeutics**	**Total**
Goodwill	$ 2,463	$ 778	$ 3,241

Note 14. Subsequent Events

Platform Technology Transfer and License Agreement

In May 2019, we entered into a Platform Technology Transfer and License Agreement (the "Agreement") with Novartis Pharma AG ("Novartis"). The Agreement allows Novartis to use Codexis' proprietary CodeEvolver® protein engineering platform technology (the "CodeEvolver Platform Technology") in the field of human healthcare. Under the Agreement, we will transfer the CodeEvolver Platform Technology to Novartis over approximately 20 months starting with the date on which we commence the technology transfer (the "Technology Transfer Period"). As a part of this technology transfer, our company will provide to Novartis Codexis' proprietary enzymes, proprietary protein engineering protocols and methods, and proprietary software algorithms. In addition, teams of Codexis and Novartis scientists will participate in technology training sessions and collaborative research projects at Codexis' laboratories in Redwood City, California and at a designated Novartis laboratory in Basel, Switzerland. Upon completion of technology transfer, Novartis will have the CodeEvolver Platform Technology installed at its designated laboratory.

Novartis will pay Codexis up to $14 million over approximately the next 22 months, $5 million of which will be paid shortly after the Effective Date of the Agreement, and an additional $4 million of which is subject to satisfactory completion of the first technology transfer milestone and $5 million of which is subject to satisfactory completion of the second technology transfer milestone. In consideration for the continued disclosure and license of improvements to the Codexis technology and materials during a multi-year period that begins on the conclusion of the Technology Transfer Period ("Improvements Term"), Novartis will pay Codexis annual payments which amount to an additional $8 million. Codexis also has the potential to receive quantity-dependent, usage payments for each API that is manufactured by Novartis using one or more enzymes that have been developed or are in development using the CodeEvolver Platform Technology during the period that begins on the conclusion of the Technology Transfer Period and ends on the expiration date of the last to expire licensed patent. These product-related usage payments, if any, will be paid by Novartis to Codexis for each quarter that Novartis manufactures API using a CodeEvolver®-developed enzyme. The usage payments will be based on the total volume of API produced using the CodeEvolver®-developed enzyme. These usage payments can begin in the clinical stage, and will extend throughout the commercial life of each API.

Commercial Agreement

In April 2019, we entered into a multi-year commercial agreement with Tate & Lyle Ingredients Americas LLC ("Tate & Lyle") under which Tate & Lyle has received an exclusive license to use a suite of Codexis novel performance enzymes in the manufacture of Tate & Lyle's zero-calorie stevia sweetener, TASTEVA® M, and other stevia products. Under the agreement, Codexis will supply Tate & Lyle with its requirements for these enzymes over a multiple year period.

ITEM 2. MANAGEMENT'S DISCUSSION AND ANALYSIS OF FINANCIAL CONDITION AND RESULTS OF OPERATIONS

The following management's discussion and analysis of our financial condition and results of operations should be read in conjunction with the unaudited condensed consolidated financial statements and the related notes thereto included elsewhere in this Quarterly Report on Form 10-Q and the audited consolidated financial statements and notes thereto and management's discussion and analysis of financial condition and results of operations for the year ended December 31, 2018 included in our Annual Report on Form 10-K for the year ended December 31, 2018, as filed with the SEC on March 1, 2019 (the "Annual Report"). This Quarterly Report on Form 10-Q contains forward-looking statements within the meaning of Section 21E of the Securities Exchange Act of 1934, as amended (the "Exchange Act"). These statements include, but are not limited to, expectations regarding our strategy, business plans, financial performance and developments relating to our industry. These statements are often identified by the use of words such as may, will, expect, believe, anticipate, intend, could, should, estimate or continue, and similar expressions or variations. Such forward-looking statements are subject to risks, uncertainties and other factors that could cause actual results and the timing of certain events to differ materially from future results expressed or implied by such forward-looking statements. Factors that could cause or contribute to such differences include, but are not limited to, those set forth in Part II, Item 1A of this Quarterly Report on Form 10-Q and Part I, Item 1A of our Annual Report, as incorporated herein and referenced in Part II, Item 1A of this Quarterly Report on Form 10-Q and elsewhere in this report. The forward-looking statements in this Quarterly Report on Form 10-Q represent our views as of the date of this Quarterly Report on Form 10-Q. We anticipate that subsequent events and developments will cause our views to change. However, while we may elect to update these forward-looking statements at some point in the future, we have no current intention of doing so except to the extent required by applicable law. You should, therefore, not rely on these forward-looking statements as representing our views as of any date subsequent to the date of this Quarterly Report on Form 10-Q.

Business Overview

We discover, develop and sell proteins that deliver value to our clients in a growing set of industries. We view proteins as a vast untapped source of value-creating materials, and we are using our proven technologies, which we have been continuously improving since our inception in 2002, to commercialize an increasing number of novel proteins, both as proprietary Codexis products and in partnership with our customers.

We are a pioneer in the harnessing of computational technologies to drive biology advancements. Since our inception in 2002, we have made substantial investments in the development of our CodeEvolver® protein engineering technology platform, the primary source of our competitive advantage. Our technology platform is powered by proprietary, artificial intelligence-based, computational algorithms that rapidly mine our large and continuously growing library of protein variants' performance attributes. These computational outputs enable increasingly reliable predictions for next generation protein variants to be engineered, enabling delivery of targeted performance enhancements in a time-efficient manner. In addition to its computational prowess, our CodeEvolver® protein engineering technology platform integrates additional modular competencies, including robotic high-throughput screening and genomic sequencing, organic chemistry and process development which are all coordinated to create our novel protein innovations.

Our approach to developing commercially viable biocatalytic manufacturing processes begins by conceptually designing the most cost-effective and practical process for a targeted product. We then develop optimized protein catalysts to enable that process design using our CodeEvolver® protein engineering platform technology. Engineered protein catalyst candidates - many thousands for each protein engineering project - are then rapidly screened and validated in high throughput screening under relevant manufacturing operating conditions. This approach results in an optimized protein catalyst enabling cost-efficient processes that typically are relatively simple to run in conventional manufacturing equipment. This also allows for the efficient technical transfer of our process to our manufacturing partners.

The successful embodiment of our CodeEvolver® protein engineering technology platform in commercial manufacturing processes requires well-integrated expertise in a number of technical disciplines. In addition to those directly involved in practicing our CodeEvolver® protein engineering platform technology, such as molecular biology, enzymology, microbiology, cellular engineering, metabolic engineering, bioinformatics, biochemistry and high throughput analytical chemistry, our process development projects also involve integrated expertise in organic chemistry, chemical process development, chemical engineering, fermentation process development and fermentation engineering. Our integrated, multi-disciplinary approach to biocatalyst and process development is a critical success factor for our company.

We initially commercialized our CodeEvolver® protein engineering technology platform and products in the pharmaceuticals market, which remains our primary business focus. Our customers, which include several large global

pharmaceutical companies, use our technology, products and services in their manufacturing processes and process development.

We have also used the technology to develop protein catalysts for use in the fine chemicals market. The fine chemicals market consists of several large market verticals, including food and food ingredients, animal feed, flavors, fragrances and agricultural chemicals.

We have also begun using the CodeEvolver® protein engineering technology platform to develop early stage, novel biotherapeutic product candidates, both for our customers and for our own business, most notably our lead program for the potential treatment of phenylketonuria ("PKU") in humans. PKU is an inherited metabolic disorder in which the enzyme that converts the essential amino acid phenylalanine into tyrosine is deficient. In October 2017, we entered into a Global Development, Option and License Agreement (the "Nestlé Agreement") with Nestec Ltd. ("Nestlé Health Science"), to advance CDX-6114, our enzyme biotherapeutic product candidate for the potential treatment of PKU. In February 2019, Nestlé Health Science exercised its option to obtain an exclusive license to develop and commercialize CDX-6114.

In April 2018, we entered into a strategic agreement (the "Porton Agreement") with Porton Pharma Solutions, Ltd. ("Porton") to license key elements of our CodeEvolver® protein engineering technology platform to Porton's global custom intermediate and active pharmaceutical ingredients ("API") development and manufacturing business. This gives us access to a wide variety of small and medium-sized pharmaceutical customers.

We are also using our technology to develop enzymes for customers using next generation sequencing ("NGS") and polymerase chain reaction ("PCR/qPCR") for in vitro molecular diagnostic and genomic research applications. Our first enzyme for this application is a DNA ligase which we began marketing to customers in 2018.

In May 2019, we entered into a Platform Technology Transfer and License Agreement (the "Agreement") with Novartis Pharma AG ("Novartis"). The Agreement allows Novartis to use Codexis' proprietary CodeEvolver® protein engineering platform technology (the "CodeEvolver Platform Technology") in the field of human healthcare. For further details, see Note 14, "Subsequent Events," in the Notes to Unaudited Condensed Consolidated Financial Statements included in this Quarterly Report on Form 10-Q.

Business Segments

We manage our business as two business segments: Performance Enzymes and Novel Biotherapeutics.

Performance Enzymes

We initially commercialized our CodeEvolver® protein engineering technology platform and products in the pharmaceuticals market, and to date this continues to be our largest market served. Our customers, which include many large global pharmaceutical companies, use our technology, products and services in their manufacturing processes and process development. We have also used the technology to develop customized enzymes for use in other industrial markets. These markets consist of several large industrial verticals, including food and food ingredients, animal feed, flavors, fragrances, and agricultural chemicals. We also use our technology to develop enzymes for customers using NGS and PCR/qPCR for in vitro molecular diagnostic and molecular biology research applications. In April 2018, we entered into the Porton Agreement related to our strategic collaboration with Porton to license key elements of our world-leading biocatalyst technology for use in Porton's global custom intermediate and API development and manufacturing business.

Novel Biotherapeutics

We are also targeting new opportunities in the pharmaceutical industry to discover, improve, and/or develop biotherapeutic drug candidates. We believe that our CodeEvolver® protein engineering platform technology can be used to discover novel biotherapeutic drug candidates that will target human diseases that are in need of improved therapeutic interventions. Similarly, we believe that we can deploy our platform technology to improve specific characteristics of a customer's pre-existing biotherapeutic drug candidate, such as its activity, stability or immunogenicity. Most notable is our lead program for the potential treatment of PKU in humans. PKU is an inherited metabolic disorder in which the enzyme that converts the essential amino acid phenylalanine into tyrosine is deficient. In October 2017, we announced a strategic collaboration with Nestlé Health Science to advance CDX-6114, our own novel orally administrable enzyme therapeutic candidate for the potential treatment of PKU. In July 2018, we announced that we had dosed the first subjects in a first-in-human Phase 1a dose-escalation trial with CDX-6114, which was conducted in Australia. In November 2018, we announced top-line results from the Phase 1a study in healthy volunteers with CDX-6114. In December 2018, Nestlé Health Science became obligated to pay us an additional $1.0 million within 60 days after the achievement of a milestone relating to formulation of CDX-6114. In January 2019, we received

notice from the U.S. Food and Drug Administration (the “FDA”) that it had completed its review of our investigational new drug application (“IND”) for CDX-6114 and concluded that we may proceed with the proposed Phase 1b multiple ascending dose study in healthy volunteers in the United States. In February 2019, Nestlé Health Science exercised its option to obtain an exclusive, worldwide, royalty-bearing, sub-licensable license for the global development and commercialization of CDX-6114 for the management of PKU. As a result of the option exercise, we earned a milestone and recognized $3.0 million in revenues in the first quarter of 2019. Upon exercising its option, Nestlé Health Science has assumed all responsibilities for future clinical development and commercialization of CDX-6114, with the exception of the completion of an extension study, CDX - 6114-004, which is expected to be completed in the second quarter of 2019.

We have also developed a pipeline of other biotherapeutic drug candidates, which are in preclinical development, and in which we expect to continue to make additional investments with the aim of advancing additional product candidates targeting other therapeutic areas.

For further description of our business segments, see Note 13, "Segment, Geographical and Other Revenue Information," in the Notes to Unaudited Condensed Consolidated Financial Statements included in this Quarterly Report on Form 10-Q.

Results of Operations Overview

Revenues increased to $15.6 million for the first quarter of 2019 from $14.0 million in the first quarter of 2018, primarily due to higher product revenue. Product revenue for the first quarter of 2019 increased by $1.8 million to $8.0 million from $6.2 million in the first quarter of 2018 primarily due to higher customer demand for enzymes for both generic and branded products.

Research and development revenue decreased by $0.3 million to $7.6 million from $7.9 million in the first quarter of 2018 due to recognition of a functional license to Merck in the prior year and prior year completion of services to Tate & Lyle for their sweetener product. The revenue recognition of a functional license fee from Nestlé Health Science partially offset the decrease in research and development revenue.

Product gross margins were 45% for the first quarter of 2019, compared to 38% in the same period in 2018, due to improved sales mix. Our profit margins are affected by many factors including the costs of internal and third-party fixed and variable costs, including materials and supplies, labor, facilities and other overhead costs. Profit margin data are used as a management performance measure to provide additional information regarding our results of operations on a consolidated basis.

Research and development expense increased by $0.8 million, or 12%, to $8.0 million for the first quarter of 2019, compared to the first quarter of 2018, primarily due to an increase in costs associated with higher headcount, higher allocable expenses, increases in lab supplies and stock compensation offset by lower outside services.

Selling, general and administrative expense increased by $0.7 million, or 9%, to $8.4 million for the first quarter of 2019, compared to the first quarter of 2018, primarily due to an increase in costs associated with facilities and headcount, higher consultant fees and stock compensation, which were partially offset by decreases in allocable expenses, lower outside services and accounting fees.

Net loss for the first quarter of 2019 was $5.1 million, representing a net loss of $0.09 per basic and diluted share. This compares to a net loss of $4.7 million, representing a net loss of $0.10 per basic and diluted share for the first quarter of 2018. The increase in net loss for the first quarter of 2019 over the same period of the prior year is primarily related to higher operating expenses.

Cash and cash equivalents decreased by $5.7 million to $47.3 million as of March 31, 2019 compared to $53.0 million as of December 31, 2018. Net cash used in operating activities decreased to $2.9 million in the three months ended March 31, 2019 compared to $4.2 million in the three months ended March 31, 2018. We believe that based on our current level of operations, our existing cash, cash equivalents, and marketable securities will provide adequate funds for ongoing operations, planned capital expenditures and working capital requirements for at least the next 12 months.

In June 2017, we entered into a loan and security agreement that allows us to borrow up to $10.0 million under a term loan, and up to $5.0 million under a revolving credit facility with 80% of certain eligible accounts receivable as a borrowing base (the "Credit Facility"). Obligations under the Credit Facility are secured by a lien on substantially all of our personal property other than our intellectual property. In September 2018, we entered into a Fourth Amendment to the Credit Facility whereby the draw period on the term debt was extended to September 30, 2019. In January 2019, we entered into a Fifth Amendment to the Credit Facility to allow for Codexis to obtain a letter of credit of up to $1.1 million to secure its obligations under the Lease with MetLife. We may draw on the Term Debt at any time prior to September 30, 2019, subject to customary conditions for funding including, among others, that no event of default exists. As of March 31, 2019, no amounts were borrowed under the Credit Facility and we were in compliance with the covenants for the Credit Facility. See Note 11, "Commitments and Contingencies," in the Notes to Unaudited Condensed Consolidated Financial Statements included in this Quarterly Report on Form 10-Q.

Below is an overview of our results of operations by business segments:

Performance Enzymes

Revenues decreased by $0.6 million, or 6%, to $10.1 million for the three months ended March 31, 2019, compared to the first quarter of 2018 primarily due to the inclusion of a functional license to Merck and research service revenue for Tate & Lyle in the year-ago period partially offset by an increase in product revenue with higher customer demand for enzymes for both generic and branded products.

Product gross margins were 45% in the three months ended March 31, 2019, compared to 38% in the corresponding period in 2018 due to improved sales mix.

Research and development expense decreased by $0.6 million, or 12%, to $4.4 million for the first quarter of 2019, compared to the first quarter of 2018, primarily due to lower outside services.

Selling, general and administrative expense was flat at $2.1 million for the first quarter of 2019, compared to the first quarter of 2018, primarily due to lower allocable costs offset by an increase in facilities expense.

Novel Biotherapeutics

Revenues increased by $2.2 million, or 66%, to $5.5 million for the three months ended March 31, 2019, compared to the first quarter of 2018 primarily due to revenue recognition of a functional license fee from Nestlé Health Science partially offset by lower CDX-6114 development service revenues.

Research and development expense increased by $1.4 million, or 72%, to $3.3 million for the first quarter of 2019, compared to the first quarter of 2018, primarily due to an increase in costs associated with higher headcount partially offset by lower outside services.

Selling, general and administrative expense increased by $0.4 million, or 254%, to $0.5 million for the first quarter of 2019, compared to the first quarter of 2018, primarily due to increases in costs related to higher headcount, outside services and stock compensation.

GSK Platform Technology Transfer, Collaboration and License Agreement

In July 2014, we entered into a CodeEvolver® protein engineering platform technology transfer collaboration and license agreement (the "GSK CodeEvolver® Agreement") with GlaxoSmithKline ("GSK"). Pursuant to the terms of the agreement, we granted GSK a non-exclusive license to use the CodeEvolver® protein engineering platform technology to develop novel enzymes for use in the manufacture of GSK's pharmaceutical and health care products.

We received an upfront fee upon the execution of the agreement in July 2014 and milestone payments in each of the years from 2014 through April 2016. We completed the transfer of the CodeEvolver® protein engineering platform technology to GSK in April 2016 and all revenues relating to the technology transfer have been recognized as of April 2016. We have the potential to receive additional cumulative contingent payments that range from $5.75 million to $38.5 million per project based on GSK’s successful application of the licensed technology. We are also eligible to receive royalties based on net sales of GSK’s sales of licensed enzyme products that are currently not being recognized.

Merck Platform Technology Transfer and License Agreement

In August 2015, we entered into a CodeEvolver® platform technology transfer collaboration and license agreement (the "Merck CodeEvolver® Agreement") with Merck, Sharp & Dohme ("Merck"), which allows Merck to use the CodeEvolver® protein engineering technology platform in the field of human and animal healthcare.

We received a $5.0 million up-front license fee upon execution of the Merck CodeEvolver® Agreement, and milestone payments in September 2015 and in September 2016, when we completed the transfer of the engineering platform technology. Additionally, we recognized research and development revenues of $1.0 million and $0.9 million for the three months ended March 31, 2019 and 2018, respectively, for various research projects under our collaborative arrangement.

We have the potential to receive payments of up to a maximum of $15.0 million for each commercial active pharmaceutical ingredient ("API") that is manufactured by Merck using one or more novel enzymes developed by Merck using the CodeEvolver® protein engineering technology platform. The API payments, which are currently not recognized as revenue, are based on quantity of API developed and manufactured by Merck and will be recognized as usage-based royalties.

In January 2019, we entered into an amendment to the Merck CodeEvolver® Agreement whereby we will install certain CodeEvolver® protein engineering technology upgrades into Merck’s platform license installation and maintain those upgrades for a multi-year term. As of March 31, 2019, none of the technology upgrades have been installed and no revenue has been recognized under the amendment.

Global Development, Option and License Agreement and Strategic Collaboration Agreement

In October 2017, we entered into a Global Development, Option and License Agreement (the "Nestlé Agreement") with Nestec Ltd. ("Nestlé Health Science") and, solely for the purpose of the integration and the dispute resolution clauses of the Nestlé Agreement, Nestlé Health Science S.A., to advance CDX-6114, our enzyme biotherapeutic product candidate for the potential treatment of PKU.

We received an upfront cash payment of $14.0 million upon the execution of the Nestlé Agreement, a $4.0 million milestone payment after dosing the first subjects in a first-in-human Phase 1a dose-escalation trial with CDX-6114, and a $1.0 million milestone payment upon achievement of a milestone relating to formulation of CDX-6114. The $4.0 million milestone payment that was triggered by the initiation of the trial was received in September 2018 and the $1.0 million milestone payment that was triggered by the achievement of a formulation relating to CDX-6114 was received in February 2019. The upfront payment and the variable consideration relating to the progress payment of $4.0 million and milestone payment of $1.0 million are being recognized over time as the development work is being performed. Revenue is being recognized using a single measure of progress that depicts our performance in transferring control of the services, which is based on the ratio of level of effort incurred to date compared to the total estimated level of effort required to complete all performance obligations under the agreement. We recognized development fees of $1.3 million and $2.7 million for the three months ended March 31, 2019 and 2018, respectively, as research and development revenue. We had deferred revenue related to the development fees attributed to the milestone payment and up-front fees of $0.7 million at March 31, 2019 and $1.9 million at December 31, 2018.

In January 2019, we received notice from the FDA that it had completed its review of our IND for CDX-6114 and that it had concluded that we may proceed with the proposed Phase 1b multiple ascending dose study in healthy volunteers in the United States. In February 2019, Nestlé Health Science exercised its option to obtain an exclusive, worldwide, royalty-bearing, sub-licensable license for the global development and commercialization of CDX-6114 for the management of PKU which triggered a payment of $3.0 million to us. We recognized revenue of $3.0 million for three months ended March 31, 2019 as research and development fees. Upon exercising its option, Nestlé Health Science has assumed all responsibilities for future clinical development and commercialization of CDX-6114, with the exception of the completion of an extension study, CDX-6114-004, which is expected to be completed in the second quarter of 2019. Other potential payments from Nestlé Health Science to us under the Nestlé Agreement include (i) development and approval milestones of up to $85.0 million, (ii) sales-based milestones of up to $250.0 million in the aggregate, which aggregate amount is achievable if net sales exceed $1.0 billion in a single year, and (iii) tiered royalties, at percentages ranging from the middle single digits to low double-digits, of net sales of product.

In addition to the Nestlé Agreement, we and Nestlé Health Science concurrently entered into a Strategic Collaboration Agreement (the "Strategic Collaboration Agreement") pursuant to which we and Nestlé Health Science will collaborate to leverage the CodeEvolver® protein engineering technology platform to develop novel enzymes for Nestlé Health Science’s established Consumer Care and Medical Nutrition business areas. Under the Strategic Collaboration Agreement, we received an upfront payment of $1.2 million in 2017 and an incremental $0.6 million payment in September 2018 for additional services. We recognized research and development fees of $1.2 million and $0.6 million for the three months ended March 31, 2019 and 2018, respectively. We had deferred revenue of $0.6 million and $0.8 million at March 31, 2019 and December 31, 2018, respectively.

Strategic Collaboration Agreement

In April 2018, we entered into the Porton Agreement with Porton to license key elements of Codexis’ biocatalyst technology for use in Porton’s global custom intermediate and API development and manufacturing business. Under the Porton Agreement, we are eligible to receive annual collaboration fees and research and development revenues. We received an initial collaboration fee of $0.5 million within 30 days of the effective date of the agreement and as of December 31, 2018, we completed the technical transfer. We recognized no revenue for the three months ended March 31, 2019 and 2018 as research and development revenue. We have the potential to receive performance payments based on products produced by Porton using our company's technology under the license agreement.

Results of Operations

The following table shows the amounts from our unaudited condensed consolidated statements of operations for the periods presented (in thousands):

	Three months ended March 31,		Change	
	2019	2018	$	%
Revenues:				
Product revenue	$ 7,988	$ 6,163	$ 1,825	30%
Research and development revenue	7,595	7,879	(284)	(4)%
Total revenues	15,583	14,042	1,541	11%
Costs and operating expenses:				
Cost of product revenue	4,391	3,825	566	15%
Research and development	8,016	7,178	838	12%
Selling, general and administrative	8,415	7,746	669	9%
Total costs and operating expenses	20,822	18,749	2,073	11%
Loss from operations	(5,239)	(4,707)	(532)	(11)%
Interest income	231	71	160	225%
Other expenses, net	(125)	(60)	(65)	(108)%
Loss before income taxes	(5,133)	(4,696)	(437)	(9)%
Provision for (benefit from) income taxes	3	(2)	5	250%
Net loss	$ (5,136)	$ (4,694)	$ (442)	(9)%

Revenues

Our revenues are comprised of product revenue and research and development revenue as follows:

- Product revenue consist of sales of protein catalysts, pharmaceutical intermediates, and Codex® Biocatalyst Panels and Kits.
- Research and development revenue include license, technology access and exclusivity fees, research services fees, milestone payments, royalties, optimization and screening fees.

The following table shows the amounts of our product revenue and research and development revenue from our unaudited condensed consolidated statements of operations for the periods presented (in thousands):

	Three months ended March 31,		Change	
(In Thousands)	2019	2018	$	%
Product revenue	$ 7,988	$ 6,163	$ 1,825	30%
Research and development revenue	7,595	7,879	(284)	(4)%
Total revenues	$ 15,583	$ 14,042	$ 1,541	11%

Revenues typically fluctuate on a quarterly basis due to the variability in our customers' manufacturing schedules and the timing of our customers' clinical trials. In addition, we have limited internal capacity to manufacture enzymes. As a result, we are dependent upon the performance and capacity of third party manufacturers for the commercial scale manufacturing of the enzymes used in our pharmaceutical and fine chemicals business.

We accept purchase orders for deliveries covering periods from one day up to approximately one year from the date on which the order is placed. However, a majority of the purchase orders can be revised or cancelled by the customer without penalty. Considering these industry practices and our experience, we do not believe the total of customer purchase orders outstanding (backlog) provides meaningful information that can be relied on to predict actual sales for future periods.

Total revenues increased by $1.5 million in the three months ended March 31, 2019, compared to the same period in 2018, primarily due to higher product revenue.

Product revenue increased by $1.8 million in the three months ended March 31, 2019, compared to the same period in 2018, primarily due to higher customer demand for enzymes for both generic and branded products.

Research and development revenue decreased by $0.3 million in the three months ended March 31, 2019, compared to the corresponding periods in 2018 primarily due to the recognition of a functional license provided to Merck in the prior year and lower development revenue from Tate & Lyle resulting from the prior year completion of the development work for their sweetener product. The recognition of functional license fee revenue from Nestlé Health Science partially offset the decrease in research and development revenue.

Cost and Operating Expenses

Our cost and operating expenses are comprised of cost of product revenue, research and development expense, and selling, general and administrative expense. The following table shows the amounts of our cost of product revenue, research and development expense, and selling, general and administrative expense from our unaudited condensed consolidated statements of operations for the periods presented (in thousands):

	Three months ended March 31,		Change	
(In Thousands)	**2019**	**2018**	**$**	**%**
Cost of product revenue	$ 4,391	$ 3,825	$ 566	15%
Research and development	8,016	7,178	838	12%
Selling, general and administrative	8,415	7,746	669	9%
Total costs and operating expenses	$ 20,822	$ 18,749	$ 2,073	11%

Cost of Product Revenue and Product Gross Margin

Our revenues from product revenue are derived entirely from our Performance Enzymes segment. Revenues from the Novel Biotherapeutics segment are from collaborative research and development activities and not from product revenue.

The following table shows the amounts of our product revenue, cost of product revenue, product gross profit and product gross margin from our unaudited condensed consolidated statements of operations for the periods presented (in thousands):

	Three months ended March 31,		Change	
(In Thousands)	**2019**	**2018**	**$**	**%**
Product revenue	$ 7,988	$ 6,163	$ 1,825	30%
Cost of product revenue	4,391	3,825	566	15%
Product gross profit	$ 3,597	$ 2,338	$ 1,259	54%
Product gross margin (%)	45%	38%		

Cost of product revenue comprises both internal and third-party fixed and variable costs, including materials and supplies, labor, facilities and other overhead costs associated with our product revenue.

Product gross margins were 45% in the three months ended March 31, 2019, compared to 38% in the corresponding periods in 2018 due to improved sales mix.

Research and Development Expenses

Research and development expenses consist of costs incurred for internal projects as well as collaborative research and development activities. These costs primarily consist of (i) employee-related costs, which include salaries and other personnel-related expenses (including stock-based compensation), (ii) various allocable expenses, which include occupancy-related costs, supplies, and depreciation of facilities and laboratory equipment, and (iii) external costs. Research and development expenses are expensed when incurred.

Research and development expenses increased by $0.8 million, or 12%, during the three months ended March 31, 2019, compared to the same period in 2018 primarily due to an increase in costs associated with higher headcount, higher facilities expenses, increases in lab supplies and stock compensation offset by lower outside services.

Selling, General and Administrative Expenses

Selling, general and administrative expenses consist of employee-related costs, which include salaries and other personnel-related expenses (including stock-based compensation), hiring and training costs, consulting and outside services expenses (including audit and legal costs), marketing costs, building lease costs, and depreciation and amortization expense.

Selling, general and administrative expenses increased by $0.7 million, or 9%, during the three months ended March 31, 2019 compared to the same period in 2018 primarily due to an increase in costs associated with facilities and headcount, higher consultant fees and stock compensation, which were partially offset by decreases in facilities expenses, lower outside services and accounting fees.

Interest Income and Other Expense

	Three months ended March 31,		Change	
(In Thousands)	**2019**	**2018**	**$**	**%**
Interest income	$ 231	$ 71	$ 160	225%
Other expense, net	(125)	(60)	65	108%
Total other income (expense)	$ 106	$ 11	$ 95	864%

Interest Income

Interest income increased by $0.2 million for the three months ended March 31, 2019, compared to the same periods in 2018 primarily due to higher interest rates on higher levels of cash and cash equivalents.

Other Expense

Other expense increased by $0.1 million for the three months ended March 31, 2019, compared to the same periods in 2018, primarily due to an unrealized loss of $0.1 million related to our investment in CO_2 Solutions and expenses due to fluctuations in foreign currency.

Provision for and Benefit from Income Taxes

We recognized an income tax provision of $3 thousand and income tax benefit of $2 thousand for the three months ended March 31, 2019 and 2018, respectively. The increase in income tax provision was due to the release of uncertain tax positions related to foreign interest and penalties. We continue to maintain a full valuation allowance against our net deferred tax assets as we believe that it is more likely than not that the majority of our deferred tax assets will not be realized.

Net loss

The net loss for the first quarter of 2019 was $5.1 million, representing a net loss of $0.09 per basic and diluted share. This compares to a net loss of $4.7 million, representing a net loss of $0.10 per basic and diluted share for the first quarter of 2018. The increase in net loss for the three months ended March 31, 2019 compared to the same period of the prior year is primarily related to higher operating expenses.

Results of Operations by Segment (in thousands, except percentages)

Revenue by segment

	Three months ended March 31,						Change			
	2019			2018			Performance Enzymes		Novel Biotherapeutics	
	Performance Enzymes	Novel Biotherapeutics	Total	Performance Enzymes	Novel Biotherapeutics	Total	$	%	$	%
Revenues:										
Product revenue	$ 7,988	$ —	$ 7,988	$ 6,163	$ —	$ 6,163	$ 1,825	30 %	$ —	—%
Research and development revenue	2,099	5,496	7,595	4,566	3,313	7,879	(2,467)	(54)%	2,183	66%
Total revenues	$ 10,087	$ 5,496	$ 15,583	$ 10,729	$ 3,313	$ 14,042	$ (642)	(6)%	$ 2,183	66%

Revenues from the Performance Enzymes segment decreased by $0.6 million, or 6%, to $10.1 million for the three months ended March 31, 2019, compared to $10.7 million for the three months ended March 31, 2018 primarily due to the inclusion of a functional license to Merck in the prior year, $1.4 million of development revenue from Tate & Lyle in the prior year period, partially offset by an increase of $1.8 million in product revenue with higher customer demand for enzymes for both generic and branded products.

Revenues from the Novel Biotherapeutics segment increased by $2.2 million, or 66%, to $5.5 million for the three months ended March 31, 2019, compared to $3.3 million for the three months ended March 31, 2018 due mainly to revenue recognition of a functional license granted to Nestlé Health Science for CDX-6114 for the treatment of PKU. Revenues from the Novel Biotherapeutics segment are derived from research and development revenue relating to the development of our CDX-6114 product candidate in collaboration with Nestlé Health Science, as set forth in the Nestlé Agreement.

Cost and Operating Expenses by Segment

	Three months ended March 31,						Change			
	2019			2018			Performance Enzymes		Novel Biotherapeutics	
	Performance Enzymes	Novel Biotherapeutics	Total	Performance Enzymes	Novel Biotherapeutics	Total	$	%	$	%
Cost of product revenue	$ 4,391	$ —	$ 4,391	$ 3,825	$ —	$ 3,825	$ 566	15 %	$ —	—%
Research and development[1]	4,442	3,317	7,759	5,066	1,932	6,998	(624)	(12)%	1,385	72%
Selling, general and administrative[1]	2,101	517	2,618	2,096	146	2,242	5	— %	371	254%
Total segment costs and operating expenses	$ 10,934	$ 3,834	14,768	$ 10,987	$ 2,078	13,065	$ (53)	— %	$ 1,756	85%
Corporate costs			5,681			5,446				
Depreciation and amortization			373			238				
Total costs and operating expenses			$ 20,822			$ 18,749				

[1] Research and development expenses and Selling, general and administrative expenses exclude depreciation and amortization of finance leases.

For a discussion of product cost of revenue, see "*Results of Operations*".

Research and development expense in the Performance Enzymes segment decreased $0.6 million, or 12%, to $4.4 million in the first quarter of 2019, compared to the first quarter of 2018. The decrease was primarily due to lower outside services.

Selling, general and administrative expense in the Performance Enzymes segment increased by $5 thousand, or 0%, to $2.1 million in the first quarter of 2019, compared to the first quarter of 2018, primarily due to lower allocable costs offset by an increase in facilities.

Research and development expense in the Novel Biotherapeutics segment increased by $1.4 million, or 72%, to $3.3 million in the first quarter of 2019, compared to the first quarter of 2018. The increase was primarily due to an increase in biotherapeutics projects and an increase of costs associated with higher headcount partially offset by lower outside services.

Selling, general and administrative expense in the Novel Biotherapeutics segment increased by $0.4 million, or 254%, to $0.5 million for the three months ended March 31, 2019 and 2018, respectively. The increase was primarily due to an increase in costs related to higher headcount, outside services and stock compensation.

Liquidity and Capital Resources

Liquidity is the measurement of our ability to meet working capital needs and to fund capital expenditures. We have historically funded our operations primarily through cash generated from operations, stock option exercises and public offerings of our common stock. We also have the ability to borrow up to $15.0 million under our Credit Facility. We actively manage our cash usage and investment of liquid cash to ensure the maintenance of sufficient funds to meet our working capital needs. The majority of our cash and cash equivalents are held in U.S. banks, and our foreign subsidiaries maintain a limited amount of cash in their local banks to cover their short-term operating expenses.

The following tables summarize our cash and cash equivalents and working capital as of March 31, 2019 and December 31, 2018, as well as our statements of cash flows for the three months ended March 31, 2019 and 2018:

(In Thousands)	March 31, 2019	December 31, 2018
Cash and cash equivalents	$ 47,322	$ 53,039
Working capital	$ 45,060	$ 50,085

	Three months ended March 31,	
(In Thousands)	2019	2018
Net cash used in operating activities	$ (2,851)	$ (4,185)
Net cash used in investing activities	(445)	(16)
Net cash used in financing activities	(2,082)	(2,764)
Net decrease in cash, cash equivalents and restricted cash	$ (5,378)	$ (6,965)

We have historically experienced negative cash flows from operations as we continue to invest in key technology development projects and improvements to our CodeEvolver® protein engineering technology platform, and expand our business development and collaborations with new customers. Our cash flows from operations will continue to be affected principally by sales and gross margins from licensing our technology to major pharmaceutical companies, product revenue and collaborative research and development services provided to customers, as well as our headcount costs, primarily in research and development. Our primary source of cash flows from operating activities is cash receipts from licensing our technology to major pharmaceutical companies, and our customers for purchases of products and/or collaborative research and development services. Our largest uses of cash from operating activities are for employee-related expenditures, rent payments, inventory purchases to support our product revenue and non-payroll research and development costs.

We are eligible to earn milestone and other contingent payments for the achievement of defined collaboration objectives and certain royalty payments under our collaboration agreements. Our ability to earn these milestone and contingent payments and the timing of achieving these milestones is primarily dependent upon the outcome of our collaborators' research and development activities and is uncertain at this time.

We are actively collaborating with new and existing customers in the pharmaceutical and food industries. We believe that we can utilize our current products and services, and develop new products and services, to increase our revenues and gross margins in future periods.

As of March 31, 2019, we had cash and cash equivalents of $47.3 million and $15.0 million available to borrow under the Credit Facility. Our liquidity is dependent upon our cash and cash equivalents, cash flows provided by operating activities and the continued availability of borrowings under the Credit Facility.

We believe that based on our current level of operations, our existing cash and cash equivalents will provide adequate funds for ongoing operations, planned capital expenditures and working capital requirements for at least the next 12 months.

However, we may need additional capital if our current plans and assumptions change. Our need for additional capital will depend on many factors, including the financial success of our business, the spending required to develop and commercialize new and existing products, the effect of any acquisitions of other businesses, technologies or facilities that we may make or develop in the future, our spending on new market opportunities, and the potential costs for the filing, prosecution, enforcement and defense of patent claims, if necessary. If our capital resources are insufficient to meet our capital requirements, and we are unable to enter into or maintain collaborations with partners that are able or willing to fund our development efforts or commercialize any products that we develop or enable, we will have to raise additional funds to continue the development of our technology and products and complete the commercialization of products, if any, resulting from our technologies. In addition, we may choose to raise additional capital due to market conditions or strategic considerations even if we believe we have sufficient funds for our current or future operating plans. If future financings involve the issuance of equity securities, our existing stockholders would suffer dilution. If we raise debt financing or enter into additional credit facilities, we may be subject to restrictive covenants that limit our ability to conduct our business. We may not be able to raise sufficient additional funds on terms that are favorable to us, if at all. If we fail to raise sufficient funds and fail to generate sufficient revenues to achieve planned gross margins and to control operating costs, our ability to fund our operations, take advantage of strategic opportunities, develop products or technologies, or otherwise respond to competitive pressures could be significantly limited. If this happens, we may be forced to delay or terminate research or development programs or the commercialization of products resulting from our technologies, curtail or cease operations or obtain funds through collaborative and licensing arrangements

that may require us to relinquish commercial rights, or grant licenses on terms that are not favorable to us. If adequate funds are not available, we will not be able to successfully execute our business plan or continue our business.

Cash Flows from Operating Activities

Cash used in operating activities was $2.9 million net for the three months ended March 31, 2019, which resulted from a net loss of $5.1 million for the three months ended March 31, 2019 adjusted for non-cash charges for depreciation of $0.3 million, amortization expense of $0.8 million and stock-based compensation of $2.1 million. Additional cash used by changes in operating assets and liabilities was $1.0 million. Changes in operating assets and liabilities included an increase of $1.1 million in accounts receivable, a decrease of $1.0 million of accounts payable, and a decrease of $2.9 million in deferred revenue.

Cash used in operating activities was $4.2 million net for the three months ended March 31, 2018, which resulted from a net loss of $4.7 million for the three months ended March 31, 2018 adjusted for non-cash charges for depreciation and amortization of $0.2 million and stock-based compensation of $2.0 million. Additional cash used by changes in operating assets and liabilities was $1.7 million. Changes in operating assets and liabilities included decreases of $3.6 million in accounts receivable due mainly to collections from customers and $5.9 million increase in deferred revenue, primarily due to recent recognition of revenue under ASC 606.

Cash Flows from Investing Activities

Cash used in investing activities was $0.4 million and $16 thousand for the three months ended March 31, 2019 and 2018, respectively, which was primarily attributable to purchase of property and equipment.

Cash Flows from Financing Activities

Cash used in financing activities was $2.1 million for the three months ended March 31, 2019 which represents $0.8 million of proceeds from exercises of stock options offset by $2.8 million for taxes paid related to net share settlement of equity awards.

Cash used in financing activities was $2.8 million for the three months ended March 31, 2018 which included $0.4 million proceeds from exercises of stock options offset by $3.1 million for taxes paid related to net share settlement of equity awards.

Contractual Obligations

The following table summarizes our significant contractual obligations at March 31, 2019 (in thousands):

	Payments due by period			
(In Thousands)	**Total**	**Less than 1 year**	**1-3 years**	**>4 years**
Finance lease obligations	$ 250	$ 240	$ 10	$ —
Operating leases obligations [1]	36,576	2,823	7,648	26,105
Total	$ 36,826	$ 3,063	$ 7,658	$ 26,105

[1] Represents future minimum lease payments under non-cancellable operating leases in effect as of March 31, 2019 for our facilities in Redwood City, California. The minimum lease payments above do not include common area maintenance charges or real estate taxes. In addition, amounts have not been reduced by future minimum sublease rentals of $0.7 million to be received under non-cancellable subleases.

Other Commitments

We have other commitments related to supply and service arrangements entered into the normal course of business. For additional information about other commitments, see Note 11, "Commitments and Contingencies" in the accompanying notes to the unaudited condensed consolidated financial statements. Future minimum payments reflect amounts those obligations are expected to have on our liquidity and cash flows in future period and include obligations subject to risk of cancellation by us (in thousands):

Other Commitment Agreement Type	Agreement Date	Future Minimum Payment
Manufacture and supply agreement with expected future payment date of December 2022	April 2016	$ 1,310
Service agreement for clinical trial	December 2017	455
Total other commitments		$ 1,765

On June 30, 2017, we entered into a credit facility consisting of term loans totaling up to $10.0 million, and advances under a revolving line of credit totaling up to $5.0 million with an accounts receivable borrowing base of 80% of certain eligible accounts receivable. In September 2018, we entered into a Fourth Amendment to the Credit Facility whereby the draw period on the term debt was extended to September 30, 2019, subject to customary conditions for funding including, among others, that no event of default exists. The credit facility terminates October 1, 2022. Term debt loans bear interest through maturity at a variable rate based on the London Interbank Offered Rate plus 3.60%. Advances under the revolving line of credit bear interest at a variable annual rate equal to the greater of (i) 1.00% above the prime rate and (ii) 5.00%. No amounts were drawn down under the credit facility as of March 31, 2019. For additional information about our credit facility, see Note 11, "Commitments and Contingencies" in the accompanying notes to the unaudited condensed consolidated financial statements.

Off-Balance Sheet Arrangements

As of March 31, 2019, we did not have any off-balance sheet arrangements, as defined in Item 303(a)(4) of Regulation S-K as promulgated by the SEC.

Critical Accounting Policies and Estimates

The preparation of financial statements in conformity with generally accepted accounting principles requires management to make judgments, estimates and assumptions in the preparation of our consolidated financial statements and accompanying notes. Actual results could differ from those estimates. There have been no material changes to our critical accounting policies or estimates during the three months ended March 31, 2019 from those discussed in our Annual Report on Form 10-K for the year ended December 31, 2018, filed with the SEC on March 1, 2019, except for our critical accounting policies and estimates on leases as a result of our adoption of ASU 2016-02, "*Leases (Topic 842)"* ("ASC 842"), which is detailed below.

Leases

On January 1, 2019, we adopted the provisions of ASU 2016-02, "Leases (Topic 842) ("ASC 842"), which replaces prior lease guidance ("ASC 840"). This guidance establishes a right-of-use ("ROU") model that requires a lessee to record a ROU asset and lease obligations on the balance sheet for all leases with terms longer than 12 months. Leases are classified as either finance or operating, with classification affecting the pattern and classification of expense recognition in our unaudited condensed consolidated statement of operations. We adopted the new standard on January 1, 2019 using a modified retrospective approach and effective date method.

Contract

A contract is or contains a lease if the contract conveys the right to control the use of identified property, plant, or equipment (an identified asset) for a period of time in exchange for consideration. A period of time may be described in terms of the amount of use of an identified asset.

Operating lease and Finance lease

The FASB decided that lessees should apply a dual model. Under the FASB model, lessees will classify a lease as either a finance lease or an operating lease, while a lessor will classify a lease as either a sales-type, direct financing, or operating lease. A lease may meet the lessee finance lease criteria even when control of the underlying asset is not transferred to the lessee (e.g. when the lessor obtains a residual value guarantee from a party other than the lessee). Such leases should be classified as a direct finance lease by the lessor and as an operating lease by the lessee. The dual model does not affect a lessee's initial recognition of assets and liabilities on its balance sheet, but differentiates how a lessee should recognize lease expense in the income statement.

Discount Rate

Lessees and lessors should discount lease payments at the lease commencement date using the rate implicit in the lease. If the information necessary to determine the rate implicit in the lease is not readily available, a lessee should use its incremental borrowing rate.

Lease and nonlease components

We made an accounting policy election to not separate lease and nonlease components. Therefore, a reallocation for nonlease components is not required in transition.

Fixed lease payments

Fixed lease payments are payments required under the lease. They can be either a fixed amount paid at various intervals in a lease or they can be payments that change over time at known amounts. The exercise price of a purchase option should be included in the calculation of lease payments for purposes of lease classification and measurement when exercise is reasonably certain.

Variable lease payments

Variable lease payments are payments made by a lessee to a lessor for the right to use an underlying asset that vary because of changes in facts or circumstances occurring after the commencement date, other than the passage of time. Variable lease payments that depend on an index or a rate should be included in the calculation of lease payments when classifying a lease and in the measurement of the lease obligations. Variable lease payments other than those that depend on an index or a rate should not be included in lease payments for purposes of classification and measurement of the lease, unless those payments are in substance fixed lease payments.

Leasehold improvements

Payments made by lessees for improvements to the underlying asset should be recorded as prepaid rent and included in fixed lease payments if the payment relates to an asset of the lessor.

Lease incentives

Lease incentives are included in the calculation of consideration in the contract, which must be allocated when multiple components exist. However, irrespective of the allocation, lease incentives always reduce the consideration in the contract for a lessee and lessor.

ITEM 3. QUANTITATIVE AND QUALITATIVE DISCLOSURES ABOUT MARKET RISK

Market Risk Management

Our cash flows and earnings are subject to fluctuations due to changes in foreign currency exchange rates, interest rates and other factors. These market risk exposures are disclosed in Part II, Item 7A of our Annual Report on Form 10-K for the year ended December 31, 2018, filed with the SEC on March 1, 2019.

Interest Rate Sensitivity

On June 30, 2017, we entered into a credit facility agreement consisting of term loans totaling up to $10.0 million, and advances under a revolving line of credit totaling up to $5.0 million. Draws on the term debt bear interest at a variable rate based on the London Interbank Offered Rate plus 3.60%. Advances under the revolving line of credit bear interest at a variable annual rate equal to the greater of (i) 1.00% above the prime rate and (ii) 5.00%. Increases in these variable interest rates will increase our future interest expense and decrease our results of operations and cash flows. In September 2018, the draw period on the term debt was extended to September 30, 2019. No amounts were drawn down under the credit facility as of March 31, 2019. Our exposure to interest rates risk relates to our 2017 Credit Facility with variable interest rates, where an increase in interest rates may result in higher borrowing costs. Since we have no outstanding borrowings under our 2017 Credit Facility as of March 31, 2019, the effect of a hypothetical 10% change in interest rates would not have any impact on our interest expense.

Equity Price Risk

As described in Note 6, "Cash Equivalents and Marketable Securities" and Note 7, "Fair Value Measurements" to the unaudited condensed consolidated financial statements, we have an investment in common shares of CO_2 Solution Inc., a company based in Quebec, Canada ("CO_2 Solutions"), whose shares are publicly traded in Canada on the TSX Venture Exchange. As of March 31, 2019, the fair value of our investment in CO_2 Solutions' common stock was $0.5 million.

This investment is exposed to fluctuations in both the market price of CO_2 Solutions' common shares and changes in the exchange rate between the United States dollar and the Canadian dollar. The effect of a 10% adverse change in the market price of CO_2 Solution's common shares as of March 31, 2019 would have been a loss of approximately $48 thousand, recognized as a component of other expense in our unaudited condensed consolidated statements of operations. The effect of a 10% unfavorable change in the exchange rate between the United States dollar and the Canadian dollar as of March 31, 2019 would have been a loss of approximately $48 thousand, recognized as a component of other expense in our unaudited condensed consolidated statements of operations.

ITEM 4. CONTROLS AND PROCEDURES

Evaluation of Disclosure Controls and Procedures

We maintain disclosure controls and procedures and internal controls that are designed to provide reasonable assurance that information required to be disclosed in our Exchange Act reports is recorded, processed, summarized, and reported within the time periods specified in the SEC's rules and forms and that such information is accumulated and communicated to our management, including our principal executive officer and our principal financial and accounting officer, as appropriate, to allow timely decisions regarding required disclosure.

Our management, including our principal executive officer and our principal financial and accounting officer, evaluated the effectiveness of our disclosure controls and procedures as defined by Rules 13a-15(e) and 15d-15(e) of the Exchange Act. Based on this review, our principal executive officer and our principal financial and accounting officer concluded that these disclosure controls and procedures were effective as of March 31, 2019 at the reasonable assurance level.

Changes in Internal Control over Financial Reporting

There were no changes in our internal control over financial reporting identified in connection with the evaluation required by paragraph (d) of Exchange Act Rules 13a-15 or 15d-15 that occurred during our last fiscal quarter that have materially affected, or are reasonably likely to materially affect, our internal control over financial reporting. We implemented internal controls to ensure we adequately evaluated our lease contracts and properly assessed the impact of ASU 2016-02, "Leases (Topic 842)", to facilitate its adoption on January 1, 2019. There were no significant changes to our internal control over financial reporting due to the adoption of this new standard.

Inherent Limitations on Effectiveness of Controls

In designing and evaluating the disclosure controls and procedures, management recognizes that any controls and procedures, even if determined effective and no matter how well designed and operated, can provide only reasonable assurance of achieving the desired control objectives to prevent or detect misstatements. In addition, the design of disclosure controls and procedures must reflect the fact that there are resource constraints and that management is required to apply judgment in evaluating the benefits of possible controls and procedures relative to their costs. 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.

PART II. OTHER INFORMATION

ITEM 1. LEGAL PROCEEDINGS

We are not currently a party to any material pending litigation or other material legal proceedings.

In February 2018, we and EnzymeWorks, Inc. (U.S.), Suzhou Hanmei Biotechnology Co. Ltd, d/b/a EnzymeWorks, Inc. (China) (collectively, "EnzymeWorks"), Junhua Tao, and Andrew Tao reached a settlement concerning the lawsuit filed by us in February 2016 against EnzymeWorks, Junhua Tao, and Andrew Tao in the United States District Court for the Northern District of California. The parties have entered into a settlement agreement, the terms of which are confidential. The parties have also stipulated to a judgment of patent infringement of all asserted patents against EnzymeWorks, and a permanent injunction barring any future infringement. The remaining claims against EnzymeWorks, and all claims against Junhua Tao, and Andrew Tao including trade secret misappropriation, breach of contract and voidable transfer have been dismissed with prejudice. EnzymeWorks appealed the sanctions levied against them by Judge Orrick to the Federal Circuit and filed its opening brief on May 30, 2018. On July 9, 2018, Codexis filed its response brief, and EnzymeWorks filed its reply on July 30, 2018. On February 8, 2019, the Federal Circuit panel of judges assigned to the case issued an opinion affirming the lower court's ruling and remanding the case to the lower court on jurisdictional grounds to vacate the order to which the parties had earlier stipulated. EnzymeWorks has 90 days from the decision in which to appeal.

ITEM 1A. RISK FACTORS

We have included in Part I, Item 1A of our Annual Report on Form 10-K for the year ended December 31, 2018, a description of certain risks and uncertainties that could affect our business, future performance or financial condition (the "Risk Factors"). During the three months ended March 31, 2019, there were no material changes from the disclosure provided in the Form 10-K for the year ended December 31, 2018 with respect to the Risk Factors. Investors should consider the Risk Factors prior to making an investment decision with respect to our stock.

ITEM 2. UNREGISTERED SALES OF EQUITY SECURITIES AND USE OF PROCEEDS

Effective June 30, 2017, we entered into a credit facility consisting of a term debt note for loans totaling up to $10.0 million, and advances under a revolving line of credit totaling up to $5.0 million. Covenants in the credit facility limit our ability to pay dividends or make other distributions. For additional information see Note 11, "Commitments and Contingencies" in the accompanying notes to the unaudited condensed consolidated financial statements.

ITEM 3. DEFAULTS UPON SENIOR SECURITIES

None.

ITEM 4. MINE SAFETY DISCLOSURES

Not applicable.

ITEM 5. OTHER INFORMATION

Not applicable.

ITEM 6. EXHIBITS

3.1		Amended and Restated Certificate of Incorporation of Codexis, Inc. filed with the Secretary of the State of the State of Delaware on April 27, 2010 and effective as of April 27, 2010 (incorporated by reference to Exhibit 3.1 to the Company's Quarterly Report on Form 10-Q for the quarter ended March 31, 2010, filed on May 28, 2010).
3.2		Certificate of Designations of Series A Junior Participating Preferred Stock of Codexis, Inc., filed with the Secretary of State of the State of Delaware on September 4, 2012 (incorporated by reference to Exhibit 3.1 to the Company's Current Report on Form 8-K, filed on September 4, 2012).
3.3		Amended and Restated Bylaws of Codexis, Inc. effective as of April 27, 2010 (incorporated by reference to Exhibit 3.2 to the Company's Quarterly Report on Form 10-Q for the quarter ended March 31, 2010, filed on May 28, 2010).
4.1		Reference is made to Exhibits 3.1 through 3.3.
10.1	†	Amendment No. 2 to Platform Technology Transfer and License Agreement by and between Merck and the Company dated as of January 1, 2019.
10.2		Fifth Amendment to Loan and Security Agreement effective as of January 23, 2019 by and between the Company and Western Alliance Bank.
10.3	†	Eighth Amendment to Lease, effective as of February 8, 2019, by and between the Company and Metropolitan Life Insurance Company.
31.1		Certification of Principal Executive Officer Required Under Rule 13a-14(a) and 15d-14(a) of the Securities Exchange Act of 1934, as amended.
31.2		Certification of Principal Financial Officer Required Under Rule 13a-14(a) and 15d-14(a) of the Securities Exchange Act of 1934, as amended.
32.1		Certification of Principal Executive Officer and Principal Financial Officer Required Under Rule 13a-14(b) of the Securities Exchange Act of 1934, as amended, and 18 U.S.C. §1350.
101		The following materials from the Company's Quarterly Report on Form 10-Q for the quarter ended March 31, 2019, formatted in Extensible Business Reporting Language (XBRL) includes: (i) Unaudited Condensed Consolidated Balance Sheets at March 31, 2019 and December 31, 2018, (ii) Unaudited Condensed Consolidated Statements of Operations for the Three Months Ended March 31, 2019 and 2018, (iii) Unaudited Condensed Consolidated Statements of Stockholders' Equity for the Three Months Ended March 31, 2019 and 2018, (iv) Unaudited Condensed Consolidated Statements of Cash Flows for the Three Months Ended March 31, 2019 and 2018, and (v) Notes to Unaudited Condensed Consolidated Financial Statements.

† Portions of the exhibit, marked by brackets, have been omitted because the omitted information is (i) not material and (ii) would be competitively harmful if publicly disclosed.

SIGNATURES

Pursuant to the requirements 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.

Codexis, Inc.

Date: May 8, 2019

By: /s/ John J. Nicols

John J. Nicols
President and Chief Executive Officer
(principal executive officer)

Date: May 8, 2019

By: /s/ Gordon Sangster

Gordon Sangster
Chief Financial Officer
(principal financial and accounting officer)

[***] Certain information in this document, indicated by brackets, has been excluded pursuant to Regulation S-K, Item 601(b)(10)(iv). Such excluded information is not material and would likely cause competitive harm to the registrant if publicly disclosed.

AMENDMENT NO. 2 TO PLATFORM TECHNOLOGY

TRANSFER AND LICENSE AGREEMENT

This **AMENDMENT NO. 2 TO PLATFORM TECHNOLOGY TRANSFER AND LICENSE AGREEMENT** ("Amendment No. 2") is effective as of January 1, 2019 (the "Amendment No. 2 Effective Date") by and between CODEXIS, INC., a Delaware corporation, having a place of business at 200 Penobscot Drive, Redwood City, CA 94063 ("CODEXIS") and MERCK SHARP AND DOHME CORP., having a place of business at One Merck Drive, Whitehouse Station, NJ 08889-0100. ("MERCK").

W I T N E S S E T H:

WHEREAS, MERCK and CODEXIS are Parties to that certain Platform Technology Transfer and License Agreement dated as of August 3, 2015, as amended by that certain Amendment No. 1 to Platform Technology Transfer and License Agreement dated as of October 10, 2018 (collectively, the "Agreement"); and

WHEREAS, the Parties desire to further amend the Agreement to modify the terms of the Agreement as more fully set forth below;

NOW, THEREFORE, in consideration of the foregoing premises and the mutual promises, covenants and conditions contained in this Agreement, the Parties agree as follows:

1. As of the Amendment No. 2 Effective Date, Section 1.33 of the Agreement is amended to read in its entirety as follows:

   '1.31 "**Codexis Software**" means, collectively, the software components listed in Exhibit 1.31.

2. As of the Amendment No. 2 Effective Date, Section 3.2.5 is added to the Agreement as follows:

   "3.2.5 **Codexis Software Additional Terms**. As of the Amendment No. 2 Effective Date, the Software Additional Terms listed in Exhibit 3.2.5 shall apply to the Codexis Software for the Exhibit 3.2.5 Term (as defined in Exhibit 3.2.5).

3. As of the Amendment No. 2 Effective Date, CODEXIS shall be entitled to issue the press release set forth in Exhibit 3.

4. All other terms and conditions of the Agreement remain unchanged.

IN WITNESS WHEREOF, the Parties have caused this Amendment No. 2 to be executed by their respective duly authorized officers as of the Amendment No. 2 Effective Date.

Codexis, Inc.	**Merck Sharp and Dohme Corp.**
By: /s/ John Nicols	By: /s/ Karen L. MacNaul
Name: John Nicols	Name: Karen L. MacNaul
	Title: Executive Director, Business Development and Licensing-MRL
Title: President and CEO	On behalf of Joseph P. Miletic, M.D, PhD., SVP, Discovery Research, MRL

Exhibit 1.31

Codexis Software means the current versions (as of December 31, 2018) of the following software programs (as implemented by Codexis in its own business operations):

[***] Software

1. [***]
2. [***]
3. [***]

Other Software

1. [***]
2. [***]
3. [***]
4. [***]
5. [***]
6. [***]
7. [***]
8. [***]

Exhibit 3.2.5

Codexis Software Additional Terms

TERM

The term of the Parties' rights and obligations under this Exhibit 3.2.5 shall commence on the Amendment No. 2 Effective Date and shall expire on 3rd anniversary of the Amendment No. 2 Effective Date ("**Exhibit 3.2.5 Term**").

PAYMENT

In consideration of the rights and obligations of the Parties under Amendment No. 2 and this Exhibit 3.2.5, MERCK shall pay to CODEXIS the following sums:

a) a non-refundable, non-creditable payment of US$[***] within [***] ([***]) days after the completion of the Initial Technology Transfer and Installation; and

b) a non-refundable, non-creditable payment of US$[***] within [***] ([***]) days after the 1st anniversary of the Amendment No. 2 Effective Date; and

c) a non-refundable, non-creditable payment of US$[***] within [***] ([***]) days after completion of the Enhancements as under Section 2.1 and Section 2.2 of this Exhibit 3.2.5 but only in the event such Enhancements installed on or before [***] include [***]; and

d) a non-refundable, non-creditable payment of US$[***] within [***] ([***]) days after the 2nd anniversary of the Amendment No. 2 Effective Date; and

e) a non-refundable, non-creditable payment of US$[***] within [***] ([***]) days after completion of the Enhancements as under Section 2.1 and Section 2.2 of this Exhibit 3.2.5 but only in the event such Enhancements installed on or before [***] include [***]; and

The following provisions apply exclusively to the Codexis Software during the Exhibit 3.2.5 Term:

Definitions:

"**Call Ticket**" means a request for Support Services submitted to CODEXIS under this Exhibit 3.2.5, each being uniquely identifiable.

"Documentation" means the operating manuals and user instructions in printed form or read-only electronic form, if any, supplied by CODEXIS to MERCK to aid the use of the Codexis Software.

"**Enhancement**" means a change or addition, other than a Maintenance Modification, to the Codexis Software and related Documentation, including (a) releases of new software programs (to be added to Exhibit 1.3.1) and (b) releases of new major versions of existing software programs (already listed in Exhibit 1.3.1) that improve functions, add new functions, screens or data sources or significantly improve performance by virtue of changes in system

design or coding, that, in the case of both (a) and (b), CODEXIS implements (in its sole discretion) in CODEXIS' own internal commercial operations. A "**major version**" means an enhancement of a prior version of the Codexis Software that would be considered by the software industry community as the next generation of such Codexis Software, which is usually evidenced by an increment in the version number of the Codexis Software. By way of illustration, versions 2.0 and 3.0 are incremental major versions, whereas versions 2.1 and 2.2 are not.

"Critical Error" means any error, problem, or defect resulting from or constituting an incorrect functioning of the Codexis Software if such an error, problem, or defect prevents the use of the Codexis Software in the manner it was intended.

"Critical Fix" means a temporary bypass/workaround and/or patch of a Critical Error performed and/or implemented so as to cause the Codexis Software to continue performing functionally.

"Error" means either a Critical Error or a Non-Critical Error.

"Error Acknowledgement" means providing acknowledgement of an Error by issuing a Call Ticket.

"**Error Correction**" means the completion of all activities, including, but not limited to Fixes and Problem Resolution, necessary to diagnose, resolve and/or provide a solution for a reported Error.

"**Maintenance Modification**" means any modifications or revisions to the Codexis Software and/or Documentation that correct Critical Errors, support new releases to the operating systems with which the Codexis Software is designed to operate, support new input/output devices, or provide other incidental changes, updates and corrections.

"**Non-Critical Fix**" means a temporary bypass/workaround and/or patch of a Non-Critical Error performed and/or implemented so as to cause the Codexis Software to continue performing functionally in material conformance with the Documentation.

"**Non-Critical Error"** means any error, problem, or defect resulting from or constituting an incorrect functioning of the Codexis Software, or an incorrect statement or diagram in the Documentation, which error, problem, or defect does not prevent the use of the Codexis Software in the manner it was intended.

"Problem Resolution" means identification of the root cause of an Error and object code fix, or new Update and supporting Documentation necessary to effectuate Error Correction.

"**Question**" means a technical question relating to the function of the Codexis Software or non-technical question relating to the Maintenance Services provided under this Exhibit 3.2.5.

"Services" means the services described in this Exhibit 3.2.5 with respect to the Codexis Software, including (without limitation) the Maintenance Services and the Support Services, in each case which CODEXIS is obliged to perform for MERCK under this Exhibit 3.2.5.

"Standard of Care" means the standard of care with which CODEXIS shall perform the Services. CODEXIS shall perform the Services in [***].

"Updates" means any updates (including, without limitation, bug fixes, patches, maintenance modifications and, when and if due, Enhancements) to the Codexis Software made available to MERCK by CODEXIS.

1. **TECHNOLOGY TRANSFER AND INSTALLATION OF THE CODEXIS SOFTWARE**

1.1 Initial Technology Transfer and Installation. On or before [***], Codexis will provide to MERCK a one-time transfer and installation of the Codexis Software on a dedicated server at the MERCK Designated Lab. The transfer and installation shall be performed in approximately the same manner as the Codexis Software was installed on the dedicated server at the MERCK Designated Lab under the Technology Transfer Plan and the Party's shall cooperate with each other in good faith to facilitate such transfer and installation. During the [***] day period starting with the date CODEXIS completes transfer and installation, MERCK shall have the right to conduct such functional testing of the Codexis Software as it may desire.

1.2 Acceptance. The Amendment No. 2 initial technology transfer under Section 1.1 of this Amendment No. 2 and any subsequent installation of Enhancements under Section 2.1 of this Amendment No. 2 will be deemed complete upon the completion of the applicable Codexis Software installation at the MERCK Designated Lab. If the completion of the applicable Codexis Software installation at the MERCK Designated Lab does not occur by the installation date set forth in Section 1.1 or Section 2.1 of Amendment No. 2, and the delay in the completion of the Codexis Software installation at the MERCK Designated Lab is proximately caused [***], then the installation date set forth in Section 1.1 or Section 2.1 of Amendment No. 2 shall be extended by the period of time equal to [***] provided, however, in no event will the installation date set forth in Section 1.1 or Section 2.1 of Amendment No. 2 be extended pursuant to this Section 1.1 or Section 2.1 of Amendment No. 2 beyond [***] from the installation date set forth in Section 1.1 or Section 2.1 of Amendment No. 2 where any such extension is proximately caused [***]. If the installation date set forth in Section 1.1 or Section 2.2 of Amendment No. 2 is not achieved on or before [***] from the installation date set forth in Section 1.1 or Section 2.1 of Amendment No. 2 where such non-achievement is proximately caused [***], the applicable payment set forth in the PAYMENT section of this Exhibit 3.2.5 shall be paid to Codexis in the manner set forth in Exhibit 3.2.5. In the event either Party reasonably disputes whether or not the installation date set forth in Section 1.1 or Section 2.1 of Amendment No. 2, the Parties will submit such dispute for resolution in accordance with Article 13 of the Agreement.

2. **TECHNOLOGY TRANSFER AND INSTALLATION OF ENHANCEMENTS**

2.1 Enhancements. On or before [***] and each [***] thereafter during the Term, CODEXIS will provide to MERCK, if and when available, a one-time transfer and installation of any Enhancements that have (i) been implemented by CODEXIS in its own commercial business operations during the previous [***] and (ii) have been cleared by CODEXIS for release to MERCK and its other licensees in accordance with Section 5.5(a) of this Exhibit 3.2.5. The transfer and installation of the Enhancements shall be performed in approximately the same manner as the Codexis Software was installed on the dedicated server at the MERCK Designated Lab under the Technology Transfer Plan and the Party's shall cooperate with each other in good faith to facilitate such transfer and installation.

2.2 Enhancements Requiring Payment. If any Enhancement includes one or more new software program(s) which are not already installed at the Merck Designated Lab under the Agreement at the time of such installation and which installation would trigger a non-refundable, non-creditable payment of US$[***] to CODEXIS under the PAYMENT section, then CODEXIS shall, not later than [***] and each [***] thereafter during the Term, notify MERCK in writing of the new software program(s) to be offered in the Enhancement and provide MERCK reasonable information regarding the new software program(s) and their functions. MERCK shall have [***] calendar days from its receipt of CODEXIS' written notice to notify CODEXIS that MERCK either accepts or rejects the installation of all or any of the new software programs. If MERCK notifies CODEXIS that MERCK accepts the installation of one or more new software program(s) offered by CODEXIS pursuant to such Enhancement, then CODEXIS will install such new software program(s) in accordance with Section 2.1 and CODEXIS will invoice MERCK for the non-refundable non-creditable payment of US$[***] under the PAYMENT section. If MERCK either notifies CODEXIS that MERCK rejects the installation of all new software program(s) pursuant to such Enhancement, or fails to provide a written notice to CODEXIS of MERCK's election during such thirty (30) calendar day period, then CODEXIS will not install such new software program(s) in accordance with Section 2.1 and CODEXIS will not invoice MERCK for the non-refundable, non-creditable payment of US$[***] under the PAYMENT section. If two or more new software programs are offered by CODEXIS in an Enhancement, and MERCK accepts the installation of one or more such new software programs but MERCK also rejects the installation of one or more other such new software programs, the installation by CODEXIS of one or more new software programs accepted by MERCK will trigger the payment of the non-refundable non-creditable payment of US$[***] and [***]. If MERCK either notifies CODEXIS that MERCK rejects the installation of all new software program(s) pursuant to an Enhancement, or fails to provide a written notice to CODEXIS of MERCK's election during such [***] calendar day period, then, if MERCK should desire to accept, in a subsequent Enhancement offering, the installation of one or more of the previously rejected new software program(s), then MERCK shall pay CODEXIS the non-refundable, non-creditable payment of US$[***] under the PAYMENT section for the installation of one or all of the previously rejected new software program(s) in addition to any US$[***] payment due as a result of any new software program(s) offered as part of the subsequent Enhancement Offering.

3. CODEXIS SOFTWARE SUPPORT AND MAINTENANCE

3.1 Included Services. With respect to the Codexis Software, CODEXIS shall provide to MERCK the Services, including (a) the Support Services and (b) the Maintenance Services, in each case as provided for in this Exhibit 3.2.5.

3.2 MERCK Support Liaisons. MERCK may designate up to two (2) technical contacts ("**MERCK Support Liaisons**") to request Support Services, Maintenance Services or Training Services. MERCK will notify CODEXIS if MERCK wishes to remove or add or change Support Liaisons or if a Support Liaison terminates employment with MERCK. MERCK initially designates the following persons as its Support Liaisons:

	Name	Email
	[***]	[***]
	[***]	[***]

3.3 Codexis Project Manager. The Codexis Project Manager shall be a single point of contact for reporting progress, delivering documentation, and resolving technical issues. CODEXIS may, upon written notice to MERCK, appoint one or more alternate Codexis Project Managers to receive requests from MERCK Support Liaisons for Services.

3.4 Project Managers.

Party	Name	Email
CODEXIS	[***]	[***]
MERCK	[***]	[***]

A Party may change the identity and contact information of its Project Manager by written notice to the other party.

4. **SUPPORT SERVICES**

4.1 Hours of operation. CODEXIS shall exercise commercially reasonable efforts to provide Support Services on those days that CODEXIS' Redwood City, CA offices are open for business (generally Monday through Friday, Codexis scheduled holidays and closures excepted) and during CODEXIS' normal business hours which are 9:00 AM to 4:00 PM Pacific time. MERCK recognizes that CODEXIS does not and is not required to maintain a support

center to provide Services and that CODEXIS shall only be required to use commercially reasonable efforts to receive, acknowledge, schedule and answer MERCK's requests for Services on a timely basis.

4.2 Requests for Support Services. All requests for Support Services shall be submitted by e-mail to the Codexis Project Manager. Requests for Support Services may be submitted by either the MERCK Project Manager or the MERCK Support Liaisons.

5. MAINTENANCE SERVICES

5.1 Critical Errors.

(a) If MERCK discovers that the Codexis Software fails to function in accordance with the Documentation and that such failure is a Critical Error, the MERCK Support Liaison shall notify the Codexis Project Manager by e-mail or telephone of the Critical Error in question and provide CODEXIS (so far as MERCK is reasonably able) with a documented example of such Critical Error.

(b) CODEXIS shall thereupon promptly use commercially reasonable efforts correct the Critical Error in accordance with the Standard of Care. Upon correcting the Critical Error, CODEXIS shall deliver to MERCK the correct version of the Object Code of the Codexis Software and appropriate amendments to the Documentation specifying the nature of the correction and providing instructions for the proper use of the corrected version of the Codexis Software. CODEXIS shall provide MERCK with reasonable technical assistance to enable MERCK to implement the use of the corrected version of the Codexis Software.

5.1 Non-Critical Errors.

(a) If MERCK discovers that the Codexis Software fails to function in accordance with the Documentation, or there is an issue with the Documentation, but such failure or issue is a Non-Critical Error, the MERCK Support Liaison shall notify the Codexis Project Manager by e-mail (only) of the Non-Critical Error in question and provide CODEXIS (so far as MERCK is reasonably able) with a documented example of such Non-Critical Error.

(b) Upon receipt of MERCK's notice of a Non-Critical Error, the Codexis Project Manager will log the issue. CODEXIS will then prioritize the Non-Critical Error for corrective action, and, if warranted, use commercially good faith efforts to address the issue in the next release or Update of the Codexis Software or Documentation.

(c) CODEXIS makes no warranty that Non-Critical Errors will be corrected or resolved, and that Non-Critical Errors will be addressed according to any particular timetable. The resolution of Non-Critical Errors brought to its attention by MERCK will be addressed by CODEXIS in accordance with the Standard of Care.

5.2 Product maintenance services and support requirements. CODEXIS shall also provide and/or perform the following Maintenance Services in support of the Codexis Software:

(a) provide version control and release Documentation for the Codexis Software;

(b) promptly provide MERCK with all releases that CODEXIS may release for the Codexis Software;

(c) make any and all necessary and corresponding changes to any and all Codexis Software as required by any Maintenance Modification and/or enhancement to maintain its compliance with the Specifications, Documentation and warranties set out in the Agreement;

(d) provide MERCK with technical support for all Call Tickets assigned to CODEXIS;

(e) perform CODEXIS' standard component, Product and system integration and test activities for the Product as necessary; and

(f) provide appropriate quality control/quality assurance testing of the Codexis Software during the Term.

All requests for Maintenance Services will be made by the MERCK Support Liaison and sent by e-mail to the Codexis Project Manager.

5.3 Updates. CODEXIS shall deliver to MERCK any Updates which CODEXIS shall from time to time incorporate in its own business operations and MERCK shall have the option whether or not to use such Updates. CODEXIS shall deliver to MERCK the Object Code of the new Updates together with any amendments to the Documentation which shall be necessary to enable proper use of the improved facilities and functions of the Updates. If MERCK notifies CODEXIS of any failure of the new Updates to function in accordance with the Documentation then CODEXIS shall at its option either correct such Updates and re-issue it (as if it were a new Update).

5.4 Enhancements.

(a) MERCK recognizes that prior to releasing Enhancements to its licensees, including MERCK, CODEXIS will beta test such Enhancements in its own business operations to determine whether there are any issues associated with the Enhancements and obtain feedback from its own personnel utilizing the software. Following this period of beta testing, and once CODEXIS has determined in good faith that the Enhancements are ready for delivery to and installation by its licensees, including MERCK, as Enhancements, CODEXIS will provide the Enhancement to MERCK in accordance with the Standard of Care, with accompanying Documentation, as appropriate, at no additional charge and provide reasonable assistance to MERCK in MERCK's installation and operation of the Enhancement. Upon delivery to MERCK, any such Enhancement will be considered "Codexis Software" for purposes of this Exhibit 3.2.5.

(b) Notwithstanding anything contained in this Exhibit 3.2.5 to the contrary, MERCK shall be under no obligation to install any Enhancement made available by CODEXIS. However, MERCK recognizes that CODEXIS will only be able to provide Support Services and Maintenance Services for the then current version of the Codexis Software as being used by CODEXIS in its own business operations. CODEXIS will not be required to supply Support Services or Maintenance Services for older versions of the Codexis Software, including bug fixes and the correction of Errors.

1. **ADDITIONAL PROVISIONS**

1.1 Cost of Services. For each Contract Year during the Term of this Exhibit 3.2.5, the first [***] incurred by CODEXIS in the supplying the Services shall be [***]. For each Contract Year during the Term of this Exhibit 3.2.5, all man hours above the [***] incurred by CODEXIS in

supplying the Services shall be [***]. MERCK shall pay all CODEXIS invoices for Services within [***] of MERCK's receipt of CODEXIS' invoice.

1.2 Notice by MERCK to Codexis. MERCK will provide to CODEXIS reasonable notice of all requests for Services.

1.3 Other Service Obligations in the Agreement. This Exhibit 3.2.5 and the obligations of the Parties hereunder are in addition to and without prejudice to any other services obligations contained in the Agreement (without reference to Exhibit 3.2.5).

Exhibit 3

Press Release

Codexis Secures Multi-Year Technology Upgrade Package for its CodeEvolver® Protein Engineering Platform License with Merck.

REDWOOD CITY, Calif. (Release Date, 2019) – Codexis, Inc. (NASDAQ: CDXS), a leading protein engineering company, announces the signing of a new agreement with Merck, through a subsidiary. Under the terms of the agreement, Codexis will install certain CodeEvolver® protein engineering technology upgrades into Merck's platform license installation and will maintain those upgrades for a multi-year term. Financial terms of the agreement are undisclosed.

"We are thrilled to work with Merck to upgrade and improve the productivity of their licensed CodeEvolver® protein engineering technology platform," stated John Nicols, Codexis President and CEO. "CodeEvolver® continues to benefit from Codexis' focused investments, enabling novel protein discovery to hit new targets at a continuously increasing speed."

In August 2015 Codexis announced the signing of a CodeEvolver® platform technology license agreement with Merck. Under this agreement, Codexis has granted Merck a non-exclusive license to use the CodeEvolver® protein engineering platform technology to develop novel enzymes for use in the manufacture of pharmaceutical products.

About Codexis, Inc.

Codexis is a leading protein engineering company that applies its proprietary CodeEvolver® technology to develop proteins for a variety of applications, including as biocatalysts for the commercial manufacture of pharmaceuticals, fine chemicals and industrial enzymes, and enzymes as biotherapeutics and for use in molecular diagnostics. Codexis' proven technology enables improvements in protein performance, meeting customer needs for rapid, cost-effective and sustainable manufacturing in multiple commercial-scale implementations of biocatalytic processes. For more information, see www.codexis.com.

Forward-Looking Statements

To the extent that statements contained in this press release are not descriptions of historical facts regarding Codexis, they are forward-looking statements reflecting the current beliefs and expectations of management made pursuant to the safe harbor provisions of the Private Securities Litigation Reform Act of 1995. You should not place undue reliance on these forward-looking statements because they involve known and unknown risks, uncertainties and other factors that are, in some cases, beyond Codexis' control and that could materially affect actual results. Additional information about factors that could materially affect actual results can be found in Codexis' Annual Report on Form 10-K filed with the Securities and Exchange Commission ("SEC") on March 15, 2018 and Form 10-Q filed November 9, 2018, including under the caption "Risk Factors" and in Codexis' other periodic reports filed with the

SEC. Codexis expressly disclaims any intent or obligation to update these forward-looking statements, except as required by law.

Contacts:

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FIFTH AMENDMENT TO LOAN AND SECURITY AGREEMENT

THIS FIFTH AMENDMENT to Loan and Security Agreement (this "**Amendment**") is made effective as of January 23, 2019 (the "**Amendment Date**") and made by and among **WESTERN ALLIANCE BANK**, an Arizona corporation ("**Bank**") and **CODEXIS, INC.**, a Delaware corporation ("**Borrower**").

WHEREAS, Bank and Borrower have entered into that certain Loan and Security Agreement, dated as of June 30, 2017 (as amended, supplemented, restated or otherwise modified from time to time, the "**Loan Agreement**"); and

WHEREAS, Bank and Borrower desire to amend certain provisions of the Loan Agreement as provided herein and subject to the terms and conditions set forth herein;

NOW, THEREFORE, in consideration of the promises, covenants and agreements contained herein, and other good and valuable consideration, the receipt and adequacy of which are hereby acknowledged, Bank and Borrower hereby agree as follows:

1. Capitalized terms used herein but not otherwise defined shall have the respective meanings given to them in the Loan Agreement.

2. Section 1.1 of the Loan Agreement is hereby amended by amending and restating clause (i) of the definition of "Permitted Indebtedness" therein as follows:

(i) letters of credit in the ordinary course of business in connection with the leasing of real property in an aggregate amount not to exceed One Million One Hundred Thousand Dollars ($1,100,000);

3. Limitation of Amendment.

a. The amendment set forth above is effective for the purposes set forth herein and shall be limited precisely as written and shall not be deemed to (a) be a consent to any amendment, waiver or modification of any other term or condition of any Loan Document, or (b) otherwise prejudice any right, remedy or obligation which the Bank or Borrower may now have or may have in the future under or in connection with any Loan Document, as amended hereby.

b. This Amendment shall be construed in connection with and as part of the Loan Documents and all terms, conditions, representations, warranties, covenants and agreements set forth in the Loan Documents, except as herein amended, are hereby ratified and confirmed and shall remain in full force and effect.

4. To induce the Bank to enter into this Amendment, Borrower hereby represents and warrants to the Bank as follows:

a. Immediately after giving effect to this Amendment (a) the representations and warranties contained in Article 5 of the Loan Agreement are true, accurate and complete in all material respects as of the date hereof (except to the extent such representations and warranties relate to an earlier date, in which case they are true and correct in all material respects as of such date), and (b) no Event of Default has occurred and is continuing;

b. Borrower has the power and due authority to execute and deliver this Amendment and to perform its obligations under the Loan Agreement, as amended by this Amendment;

c. The organizational documents of Borrower delivered to the Bank on the Closing Date, and updated pursuant to subsequent deliveries by the Borrower to the Bank, if any, remain true, accurate and complete and have not been amended, supplemented or restated and are and continue to be in full force and effect;

d. The execution and delivery by Borrower of this Amendment and the performance by Borrower of its obligations under the Loan Agreement, as amended by this Amendment, do not and will not contravene (i) any law or regulation binding on or affecting Borrower, (ii) any contractual restriction with a Person binding on Borrower, (iii) any order, judgment or decree of any court or other governmental or public body or authority, or subdivision thereof, binding on Borrower, or (iv) the organizational documents of Borrower;

e. The execution and delivery by Borrower of this Amendment and the performance by Borrower of its obligations under the Loan Agreement, as amended by this Amendment, do not require any order, consent, approval, license, authorization or validation of, or filing, recording or registration by Borrower with, or exemption by any governmental or public body or authority, or subdivision thereof, binding on Borrower, except as already has been obtained or made; and

f. This Amendment has been duly executed and delivered by Borrower and is the binding obligation of Borrower, enforceable against Borrower in accordance with its terms, except as such enforceability may be limited by bankruptcy, insolvency, reorganization, liquidation, moratorium or other similar laws of general application and by general equitable principles.

5. Except as expressly set forth herein, the Loan Agreement shall continue in full force and effect without alteration or amendment. This Amendment and the Loan Documents represent the entire agreement about this subject matter and supersede prior negotiations or agreements.

6. This Amendment shall be deemed effective as of the Amendment Date upon the due execution and delivery to the Bank of this Amendment by each party hereto and the payment by Borrower to the Bank of fee due under Section 2.6(g) of the Loan Agreement as amended hereby.

7. This Amendment may be executed in any number of counterparts, each of which shall be deemed an original, and all of which, taken together, shall constitute one and the same instrument.

8. This Amendment and the rights and obligations of the parties hereto shall be governed by and construed in accordance with the laws of the State of California.

[*Balance of Page Intentionally Left Blank*]

IN WITNESS WHEREOF, the parties hereto have caused this Fifth Amendment to Loan and Security Agreement to be executed as of the date first set forth above.

BORROWER:

CODEXIS, INC., A DELAWARE CORPORATION

By /Gordon Sangster/
Name: Gordon Sangster
Title: Senior Vice President and CFO

BANK:

WESTERN ALLIANCE BANK, AN ARIZONA CORPORATION

By /Bill Wickline/
Name: Bill Wickline
Title: SVP, Director of Portfolio Management

[***] Certain information in this document, indicated by brackets, has been excluded pursuant to Regulation S-K, Item 601(b)(10)(iv). Such excluded information is not material and would likely cause competitive harm to the registrant if publicly disclosed.

EIGHTH AMENDMENT TO LEASE

This Eighth Amendment to Lease (" **Amendment**") is made effective, and dated for reference purposes, as of February 8, 2019 (the " **Effective Date**") by and between METROPOLITAN LIFE INSURANCE COMPANY, a New York corporation (" **Landlord**"), and CODEXIS, INC., a Delaware corporation (" **Tenant**"), with reference to the following facts ("**Recitals**"):

A. Landlord and Tenant are the parties to that certain lease which is comprised of the following (collectively, the "**Existing Lease**"): that certain Lease, dated October __ [sic], 2003, entered into by and between Tenant, as tenant and Landlord, as landlord ("**Original Lease**"); as amended by that certain First Amendment to Lease dated as of June 1, 2004, that certain Second Amendment to Lease (the " **Second Amendment**") dated as of March 9, 2007, that certain Third Amendment to Lease (the "**Third Amendment**") dated as of March 31, 2008, that certain Fourth Amendment to Lease dated as of September 17, 2010, that certain Fifth Amendment to Lease (the "**Fifth Amendment**") dated March 16, 2011, that certain Sixth Amendment to Lease (the " **Sixth Amendment**") dated September 27, 2012 and that certain Seventh Amendment to Lese dated October 11, 2016, for certain premises (the " **Premises**") containing approximately **107,021** rentable square feet, comprised of the following: (i) approximately 11,020 rentable square feet commonly known as 501 Chesapeake Drive, Redwood City, California (the "**Chesapeake Space**"), (ii) approximately 10,597 rentable square feet commonly known as 200 Penobscot Drive, Redwood City, California (the "**200 Penobscot Space**"), (iii) approximately 17,627 rentable square feet commonly known as 220 Penobscot Drive, Redwood City, California (the "**220 Penobscot Space**"); (iv) approximately 37,856 rentable square feet commonly known as 400 Penobscot Drive, Redwood City, California (the "**400 Penobscot Space**"), and (v) approximately 29,921 rentable square feet commonly known as 101 Saginaw Drive, Redwood City, California (the "**101 Saginaw Space**"), in the Project (commonly known as Seaport Centre in Redwood City, California), all as more particularly described in the Existing Lease.

B. Landlord and Tenant desire to provide for (i) the extension of the Term solely as to the Chesapeake Space, the 200 Penobscot Space, the 220 Penobscot Space and the 400 Penobscot Space; and (ii) other amendments of the Existing Lease as more particularly set forth below.

NOW, THEREFORE, in consideration of the foregoing, and of the mutual covenants set forth herein and of other good and valuable consideration, the receipt and adequacy of which are hereby acknowledged, the parties hereto agree as follows:

Section 1. SCOPE OF AMENDMENT; DEFINED TERMS . Except as expressly provided in this Amendment, the Existing Lease shall remain in full force and effect. Should any inconsistency arise between this Amendment and the Existing Lease as to the specific matters which are the subject of this Amendment, the terms and conditions of this Amendment shall control. All capitalized terms used in this Amendment and not defined herein shall have the meanings set forth in the Existing Lease unless the context clearly requires otherwise; provided, however, that the term "Lease" as used herein and, from and after the Effective Date, in the Existing Lease shall refer to the Existing Lease as modified by this Amendment. The "200 Penobscot Space", the "220 Penobscot Space" and the "400 Penobscot Space" are sometimes collectively referred to as the "**Penobscot Space**".

Section 2. EXTENSION OF TERM FOR THE CHESAPEAKE SPACE AND THE PENOBSCOT SPACE . Landlord and Tenant acknowledge and agree that, notwithstanding any provision of the Existing Lease to the contrary, (a) the current Term, solely with respect to the Chesapeake Space, pursuant to the Existing Lease will expire on January 31, 2022, and that the Term of the Lease solely for the Chesapeake Space is hereby extended for the period of eighty-eight (88) months (the "**Chesapeake Fourth Extended Term**") commencing on February 1, 2022 (the " **Chesapeake Fourth Extension Date**") and expiring May 31, 2029 (hereafter, the " **Chesapeake Fourth Extended Expiration Date**"), unless sooner terminated pursuant to the terms of the Lease; and (b) the current Term, solely with respect to the Penobscot Space, pursuant to the Existing Lease will expire January 31, 2020, and that the Term of the Lease solely for the Penobscot Space is hereby extended for the period of eighty-eight (88) months (the "**Penobscot Extended Term**") commencing on February 1, 2020 (the "**Penobscot Extension Date**") and expiring May 31, 2027 (hereafter,

the "**Penobscot Expiration Date**"). Landlord and Tenant acknowledge and agree that this Amendment provides all rights and obligations of the parties with respect to the Extended Term, whether or not in accordance with any other provisions, if any, of the Existing Lease regarding renewal or extension; provided, however, that (x) with respect to the Chesapeake Space, Tenant shall continue to have one (1) option to extend the Term of the Lease for an additional term of five (5) years in accordance with the terms and conditions of Section 7(b) of the Sixth Amendment, and (y) with respect to the Penobscot Space, Tenant shall continue to have one (1) option to extend the Term of the Lease for an additional term of five (5) years in accordance with the terms and conditions of Section 12(b) of the Fifth Amendment, provided, however, Tenant shall have the right to exercise such option to extend in this subclause (y) as to the 400 Penobscot Space only, as to the combined 200 and 220 Penobscot Space only, or as to the Penobscot Space in its entirety.

Section 3. MONTHLY BASE RENT FOR CHESAPEAKE FOURTH EXTENDED TERM . Notwithstanding any provision of the Existing Lease to the contrary, commencing on the Chesapeake Fourth Extension Date and continuing through the Chesapeake Fourth Extended Expiration Date, the amount of Monthly Base Rent payable by Tenant for the Chesapeake Space shall be as follows:

Period from/to	Monthly Base Rent
February 1, 2022 – January 31, 2023	$53,193.54*
February 1, 2023 – January 31, 2024	$54,789.35
February 1, 2024 – January 31, 2025	$56,433.03
February 1, 2025 – January 31, 2026	$58,126.02
February 1, 2026 – January 31, 2027	$59,869.80
February 1, 2027 – January 31, 2028	$61,665.89
February 1, 2028 – May 31, 2029	$63,515.87

*Notwithstanding anything in the foregoing to the contrary, provided that a Default (as defined in Section 11.01 of the Original Lease) by Tenant (other than the first Default in any twelve (12) month period unless such Default continues beyond three (3) business days after written notice thereof) has not previously occurred, Landlord agrees to forbear in the collection of and abate the Monthly Base Rent solely for the Chesapeake Space due and payable for the period beginning on February 1, 2022 and continuing through April 30, 2022, totaling not more than One Hundred Fifty-Nine Thousand Five Hundred Eighty and 62/100 Dollars ($159,580.62) in the aggregate (collectively, "**Chesapeake Space Abated Rent**"); provided, further, that in the event of a Default by Tenant at any time prior to the last day of May, 2029 (the "**Chesapeake Outside Month**"), a fraction of all previously Chesapeake Space Abated Rent, the numerator of which shall be the number of months remaining from and including the month in which such Default occurs until and including the Chesapeake Outside Month, and the denominator of which shall be the number of months from and including the month in which the Chesapeake Fourth Extension Date occurs until and including the Chesapeake Outside Month, shall be immediately due and payable in full at that time without the necessity of further notice or action by Landlord (provided, however, that such fraction of the Chesapeake Space Abated Rent shall not be immediately due and payable with respect to the first Default in any twelve (12) month period unless such Default continues beyond three (3) business days after written notice thereof).

Section 4. MONTHLY BASE RENT FOR PENOBSCOT EXTENDED TERM . Notwithstanding any provision of the Existing Lease to the contrary, commencing on the Penobscot Extension Date and continuing through the Penobscot Extended Expiration Date, the amount of Monthly Base Rent payable by Tenant for the Penobscot Space shall be as follows:

Period from/to	Monthly Base Rent
February 1, 2020 – January 31, 2021	$300,664.00*
February 1, 2021 – January 31, 2022	$309,683.92
February 1, 2022 – January 31, 2023	$318,974.44
February 1, 2023 – January 31, 2024	$328,543.67
February 1, 2024 – January 31, 2025	$338,399.98
February 1, 2025 – January 31, 2026	$348,551.98
February 1, 2026 – May 31, 2027	$359,008.54

*Notwithstanding anything in the foregoing to the contrary, provided that a Default by Tenant (other than the first Default in any twelve (12) month period unless such Default continues beyond three (3) business days after written notice thereof) has not previously occurred, Landlord agrees to forbear in the collection of and abate the Monthly Base Rent solely for the Penobscot Space due and payable for the period beginning on February 1, 2020 and continuing through May 31, 2020, totaling not more than One Million Two Hundred Two Thousand Six Hundred Fifty-Six and 00/100 Dollars ($1,202,656.00) in the aggregate (collectively, "**Penobscot Space Abated Rent**"); provided, further, that in the event of a Default by Tenant at any time prior to the last day of May, 2027 (the "**Penobscot Outside Month**"), a fraction of all previously Penobscot Space Abated Rent, the numerator of which shall be the number of months remaining from and including the month in which such Default occurs until and including the Penobscot Outside Month, and the denominator of which shall be the number of months from and including the month in which the Penobscot Extension Date occurs until and including the Penobscot Outside Month, shall be immediately due and payable in full at that time without the necessity of further notice or action by Landlord (provided, however, that such fraction of the Penobscot Space Abated Rent shall not be immediately due and payable with respect to the first Default in any twelve (12) month period unless such Default continues beyond three (3) business days after written notice thereof).

Section 5. LETTER OF CREDIT. Landlord and Tenant acknowledge and agree that Tenant has provided Landlord with a Letter of Credit in the amount of Seven Hundred Seven Thousand Four Hundred Fifty-Six and 00/100 Dollars ($707,456.00) pursuant to Section 5.02 of the Original Lease, as amended by Section 4 of the Second Amendment, Section 5 of the Third Amendment and Section 9 of the Fifth Amendment. Within ten (10) business days following the Effective Date, Tenant shall deliver to Landlord an amendment or replacement of the Letter of the Credit to increase the amount thereof by an additional Three Hundred Fifty-Four Thousand One Hundred Sixteen and 62/100 Dollars ($354,116.62) for a total of One Million Sixty-One Thousand Five Hundred Seventy-Two and 62/100 Dollars ($1,061,572.62). The Letter of Credit shall be maintained in effect until the later of (a) the Chesapeake Fourth Extended Expiration Date, and (b) the extended expiration date if the Option to Extend is exercised.

Section 6. TENANT'S SHARE. During the Chesapeake Fourth Extended Term and the Penobscot Extended Term, Tenant shall pay all Rent Adjustments, including Tenant's Share of Operating Expenses. Notwithstanding any provisions of the Existing Lease to the contrary, during the Chesapeake Fourth Extended Term and the Penobscot Extended Term, Tenant's Share is as follows:

(a) Chesapeake Space: 3.65% of Phase I and 2.05% of the Project.

(b) 200 Penobscot Space and 220 Penobscot Space (combined): 9.35% of Phase I and 5.25% of the Project.

(c) 400 Penobscot Space: 12.54% of Phase I and 7.04% of the Project.

Section 7. "AS IS" CONDITION.

(a) Notwithstanding any provision of the Existing Lease to the contrary, Tenant hereby leases and accepts the Chesapeake Space for the Chesapeake Fourth Extended Term and the Penobscot Space for the Penobscot Extended Term in its "AS IS" condition existing on the Effective Date, without any express or implied representations or warranties of any kind by Landlord, its brokers, manager or agents, or the employees of any of them regarding the Premises; and Landlord shall not have any obligation to construct or install any tenant improvements or alterations or to pay for any such construction or installation, except as expressly set forth in Subsection (b) below and except for Landlord's continuing obligations under the Lease.

(b) Tenant to perform the work and make the installations in Chesapeake Space and the Penobscot Space as set forth in the Workletter set forth in Exhibit A hereto (the "**Workletter**") (such work may be referred to as " **Tenant Alterations**").

Section 8. SURRENDER OF 101 SAGINAW SPACE. Landlord and Tenant acknowledge and agree that the current Term for the 101 Saginaw Space pursuant to the Existing Lease will expire January 31, 2020, and therefore, Tenant shall vacate and deliver to Landlord exclusive possession of the 101 Saginaw Space on or before January 31, 2020, including, without limitation, removal of all personal property and trade fixtures of Tenant, pursuant to the same provisions and requirements of the Existing Lease, and Tenant shall be obligated to restore the Tenant Alterations in the 101 Saginaw Space in accordance with Exhibit B hereto.

Section 9. OFFER RIGHT.

(a) Landlord hereby grants Tenant a one-time right to lease the Offer Space (defined below) if and to the extent such space is Available (defined below) during the period beginning on the date of execution of this Lease and expiring [***]. months [***]. (the "**Offer Period**"), upon and subject to the terms and conditions of this Section (the "**Offer Right**"), and provided that at the time of exercise of such right: (i) Tenant must be conducting regular, active, ongoing business in, and be in occupancy (and occupancy by a subtenant, licensee or other party permitted or suffered by Tenant shall not satisfy such condition) of at least seventy percent (70%) of the rentable square footage of the Chesapeake Space and the Penobscot Space at the time of exercise of such right; and (ii) there has been no material adverse change in Tenant's financial position from such position as of the Effective Date, as certified by Tenant's chief financial officer, and as supported by Tenant's certified financial statements, copies of which shall be delivered to Landlord with Tenant's written notice exercising its right hereunder, and to Landlord's reasonable satisfaction. Without limiting the generality of the foregoing, Landlord may reasonably conclude there has been a material adverse change if Tenant's chief financial officer does not certify there has been no such change. Notwithstanding the foregoing, so long as Tenant is a publicly traded company on an "over-the-counter" market or any recognized national or international securities exchange, Tenant shall not be required to provide certified financial statements by its chief financial officer (and shall not be required to provide a certification by its chief financial officer that there has been no material adverse change in Tenant's financial position) so long as Tenant's current public annual report (in compliance with applicable securities laws) for such applicable year is available to Landlord in the public domain.

(b) "**Offer Space**" shall mean the leasable space consisting of approximately 15,[***] rentable square feet and referred to as [***]. The term "**Available**" shall mean that the space in question is either: (1) vacant and free and clear of the tenant in the Offer Space as of the Effective Date, [***] (the "**Current Tenant**"); or (2) space as to which Landlord has received a proposal, or Landlord is making a proposal, for a lease or rights of any nature applicable in the future when such space would be free and clear of the Current Tenant. The parties acknowledge and agree that Landlord shall be free at any time during the term of the lease with the Current Tenant to enter into an extension or renewal of the term for the Offer Space with the Current Tenant.

(c) Nothing herein shall be deemed to limit or prevent Landlord from marketing, discussing or negotiating with any other party for a lease of, or rights of any nature as to, any part of the Offer Space, but

during the Offer Period before Landlord makes any written proposal to any other party (other than the Current Tenant) for any Offer Space which becomes Available (including giving a written response to any proposal or offer received from another party), or contemporaneously with making any such proposal, and in any event within thirty (30) days after such space becomes vacant and free and clear of the Current Tenant, Landlord shall give Tenant written notice ("**Landlord's Notice**"), which notice identifies the space Available, its rentable area, Landlord's estimate of the projected date such space will be vacant and deliverable to Tenant, Landlord's estimate of the applicable Fair Market Rental Rate, as defined in Exhibit C hereto ("**Landlord's Estimate**"), and if applicable, base year or base amount (if different from that for the rest of the Premises) with respect to Operating Expenses. For the period of five (5) business days after Landlord gives Landlord's Notice (the "**Election Notice Period**"), Tenant shall have the right to give Landlord irrevocable written notice (" **Election Notice**") of Tenant's election to lease all (and not less than all) the Offer Space identified in Landlord's Notice.

(d) In the event Tenant duly and timely delivers its Election Notice to Landlord, such exercise shall thereby create and constitute a binding lease of the Offer Space by and to Tenant, subject to suspension or termination of such right pursuant to Subsection (h) below, upon and subject to the same terms and conditions contained in the Lease except as follows: (i) Tenant shall accept the Offer Space in its then "AS IS" condition, but broom clean and free of all tenants or occupants, without any obligation of Landlord to repaint, remodel, improve or alter such space for Tenant's occupancy or to provide Tenant any allowance therefor except to the extent tenants leasing space in Comparable Transactions receive an allowance pursuant to the definition of Fair Market Rental Rate, provided, however, Landlord, by notice given to Tenant within thirty (30) days after receipt of Tenant's Election Notice, may elect to provide, in lieu of such allowance for alterations to the Offer Space, a rent credit equal to the amount of the allowance that would have otherwise been given, credited toward the rents applicable only to the Offer Space and due starting after such rent obligation commences; (ii) Landlord shall deliver the Offer Space to Tenant no later than thirty (30) days after the later of the date on which Landlord regains possession of such space or the date on which Landlord receives Tenant's Election Notice; (iii) upon such delivery, the Offer Space shall be part of the Premises under the Lease, such that the term "Premises" in the Lease thereafter shall mean both the space leased immediately prior to such delivery and the Offer Space, and shall be leased for the remaining Penobscot Extended Term (subject to a separate option to extend the Term of the Lease with respect to the Offer Space for an additional term of five (5) years (which option to extend shall be under the same terms and conditions of Section 12(b) of the Fifth Amendment); (iv) starting on such delivery date, with respect to the Offer Space Tenant shall pay Monthly Base Rent equal to the Fair Market Rental Rate, with Fair Market Rental Rate defined and determined as set forth herein and in Exhibit C; (v) starting on such delivery date, with respect to the Offer Space Tenant shall additionally pay Tenant's Share of Operating Expenses or increases in Operating Expenses, as applicable under the Lease, with Tenant's Share recalculated to reflect addition of the Offer Space; (vi) starting on such delivery date, Tenant shall additionally pay other charges payable by Tenant for utilities and otherwise with respect to the Offer Space; and (vii) the Letter of Credit shall be increased to an amount that is the same percentage or proportion of Rent (after including Rent for the Offer Space) as the prior amount of Letter of Credit was in relation to prior Rent.

(e) Landlord's Estimate set forth in Landlord's Notice shall be conclusive and binding as the Monthly Base Rent payable for the Offer Space in Landlord's Notice unless Tenant notifies Landlord in Tenant's Election Notice that Tenant elects to lease the subject Offer Space but disputes Landlord's Estimate and specifies in detail the reasons therefor and states Tenant's good faith estimate of the Fair Market Rental Rate. If the dispute is not resolved within ten (10) business days after Landlord receives Tenant's Election Notice as described above, then the Fair Market Rental Rate shall be determined in accordance with the terms of Exhibit C.

(f) Promptly after final determination of the Fair Market Rental Rate, Landlord shall prepare a memorandum confirming the specific dates, amounts and terms of the lease of the subject Offer Space in accordance with the terms and conditions of this Offer Right, in the form of an amendment to the Lease. Tenant shall execute such amendment within ten (10) business days after receipt of the proposed amendment and Landlord shall execute it promptly days after Landlord's receipt from Tenant. Notwithstanding any of

the foregoing to the contrary, the failure of Landlord to prepare such amendment or of either party to execute an amendment shall not affect the validity and effectiveness of the lease of the Offer Space in accordance with the terms and conditions of this Offer Right.

(g) If Tenant either fails or elects not to exercise its Offer Right as to the Offer Space covered by Landlord's Notice by not giving its Election Notice within the Election Notice Period, then Tenant's Offer Right shall terminate, and be null and void, as to the subject space identified in the applicable Landlord's Notice (but not as to any Offer Space subject to this Offer Right which has not become Available and been included in a Landlord's Notice), and at any time thereafter Landlord shall be free to lease and/or otherwise grant options or rights to the subject space on any terms and conditions whatsoever free and clear of the Offer Right.

(h) During any period that Tenant does not occupy at least [***]. ([***].%) of the rentable square footage of the Chesapeake Space and the Penobscot Space at the time of exercise of such right or that there is an uncured Default by Tenant under the Lease, or any state of facts which with the passage of time or the giving of notice, or both, would constitute such a Default, the Offer Right shall not apply and shall be ineffective and suspended, and Landlord shall not be obligated to give a Landlord's Notice as to any space which becomes Available during such suspension period, and Landlord shall not be obligated to negotiate (or enter any amendment) with respect to any Offer Space which was the subject of a pending Landlord's Notice for which an amendment has not been fully executed, and during such suspension period Landlord shall be free to lease and/or otherwise grant options or rights to such space on any terms and conditions whatsoever free and clear of the Offer Right. The Offer Right shall terminate upon any of the following: (1) the termination of the Lease upon the occurrence of a Tenant default or otherwise; (2) Landlord's recovery of possession of the Premises upon the occurrence of a Tenant default or otherwise; (3) rejection of the Lease in any bankruptcy proceeding; or (4) the failure of Tenant timely to exercise, give any notices, perform or agree, within any applicable time period specified above, with respect to any Offer Space which was the subject of any Landlord's Notice (subject to the terms of subsection (g) above).

(i) The Offer Right is personal to Codexis, Inc., a Delaware corporation, and may not be used by, and shall not be transferable or assignable (voluntarily or involuntarily) to any person or entity other than an Affiliate which is an assignee of the Lease and which has satisfied the requirements of Sections 10.01 and 10.05 of the Original Lease.

Section 10. LIMITATION OF LANDLORD'S LIABILITY. Notwithstanding any provision of the Existing Lease to the contrary (including, without limitation, Section 26.08 of the Original Lease), Tenant agrees, on its behalf and on behalf of its successors and assigns, that any liability or obligation of Landlord in connection with this Lease shall only be enforced against Landlord's equity interests in the Project up to a maximum of Five Million Dollars ($5,000,000.00) and in no event against any other assets of the Landlord, or Landlord's officers or directors or partners, and that any liability of Landlord with respect to the Lease shall be so limited and Tenant shall not be entitled to any judgment in excess of such amount.

Section 11. TIME OF ESSENCE. Without limiting the generality of any other provision of the Existing Lease, time is of the essence to each and every term and condition of this Amendment.

Section 12. BROKERS. Notwithstanding any other provision of the Existing Lease to the contrary, Tenant represents that in connection with this Amendment it is represented by JLL ("**Tenant's Broker**") and, except for Tenant's Broker and Landlord's Broker identified below, Tenant has not dealt with any real estate broker, sales person, or finder in connection with this Amendment, and no such person initiated or participated in the negotiation of this Amendment. Tenant hereby indemnifies and agrees to protect, defend and hold Landlord and Newmark Cornish & Carey ("**Landlord's Broker**") harmless from and against all claims, losses, damages, liability, costs and expenses (including, without limitation, attorneys' fees and expenses) by virtue of any broker, agent or other person claiming a commission or other form of compensation by virtue of alleged representation of, or dealings or discussions with, Tenant with respect to the subject matter of this Amendment, except for Landlord's Broker or Tenant's Broker. Tenant is not obligated to pay or fund any amount to

Landlord's Broker and Tenant's Broker, and Landlord hereby agrees to pay such commission, if any, to which Landlord's Broker or Tenant's Broker is entitled in connection with the subject matter of this Amendment pursuant to Landlord's separate written agreement with Landlord's Broker and/or Tenant's Broker, as applicable. The provisions of this Section shall survive the expiration or earlier termination of the Lease.

Section 13. ATTORNEYS' FEES. Each party to this Amendment shall bear its own attorneys' fees and costs incurred in connection with the discussions preceding, negotiations for and documentation of this Amendment. Tenant shall be liable for, and shall pay upon demand, all costs and expenses, including reasonable attorneys' fees, incurred by Landlord in enforcing Tenant's performance of its obligations under this Lease, or resulting from a Default by Tenant (regardless of whether suit is initiated), or incurred by Landlord in any litigation, negotiation or transaction in which Tenant causes Landlord, without Landlord's fault, to become involved or concerned (including in any action or participation in or in connection with any case or proceeding under the Bankruptcy Code, 11 United States Code Sections 101 et seq., or any successor statutes, in establishing or enforcing the right to indemnification, in appellate proceedings, or in connection with the enforcement or collection of any judgment obtained in any such suit or proceeding). Section 11.03 of the Original Lease is hereby deleted in its entirety and of no further force and effect.

Section 14. EFFECT OF HEADINGS; RECITALS: EXHIBITS. The titles or headings of the various parts or sections hereof are intended solely for convenience and are not intended and shall not be deemed to or in any way be used to modify, explain or place any construction upon any of the provisions of this Amendment. Any and all Recitals set forth at the beginning of this Amendment are true and correct and constitute a part of this Amendment as if they had been set forth as covenants herein. Exhibits, schedules, plats and riders hereto which are referred to herein are a part of this Amendment.

Section 15. ENTIRE AGREEMENT; AMENDMENT. This Amendment taken together with the Existing Lease, together with all exhibits, schedules, riders and addenda to each, constitutes the full and complete agreement and understanding between the parties hereto and shall supersede all prior communications, representations, understandings or agreements, if any, whether oral or written, concerning the subject matter contained in this Amendment and the Existing Lease, as so amended, and no provision of the Lease as so amended may be modified, amended, waived or discharged, in whole or in part, except by a written instrument executed by all of the parties hereto.

Section 16. OFAC. Landlord advises Tenant hereby that the purpose of this Section is to provide to the Landlord information and assurances to enable Landlord to comply with the law relating to OFAC.

Tenant hereby represents, warrants and covenants to Landlord, either that (i) Tenant is regulated by the SEC, FINRA or the Federal Reserve (a " **Regulated Entity**") or (ii) neither Tenant nor any person or entity that directly or indirectly (a) controls Tenant or (b) has an ownership interest in Tenant of twenty-five percent (25%) or more, appears on the list of Specially Designated Nationals and Blocked Persons ("**OFAC List**") published by the Office of Foreign Assets Control ("**OFAC**") of the U.S. Department of the Treasury.

If, in connection with the Lease, there is one or more guarantors of Tenant's obligations under the Lease, then Tenant further represents, warrants and covenants either that (i) any such guarantor is a Regulated Entity or (ii) neither guarantor nor any person or entity that directly or indirectly (a) controls such guarantor or (b) has an ownership interest in such guarantor of twenty-five percent (25%) or more, appears on the OFAC List.

Tenant covenants that during the term of the Lease to provide to Landlord information reasonably requested by Landlord including without limitation, organizational structural charts and organizational documents which Landlord may deem to be necessary ("**Tenant OFAC Information**") in order for Landlord to confirm Tenant's continuing compliance with the provisions of this Section. Tenant represents and warrants that the Tenant OFAC Information it has provided or to be provided to Landlord or Landlord's Broker in connection with the execution of this Amendment is true and complete.

Section 17. RATIFICATION. Tenant represents to Landlord that: (a) the Existing Lease is in full force and effect and has not been modified except as provided by this Amendment; (b) as of the Effective Date,

there are no uncured defaults or unfulfilled obligations on the part of Landlord or Tenant; and (c) Tenant is currently in possession of the entire Premises as of the Effective Date, and neither the Premises, nor any part thereof, is occupied by any subtenant or other party other than Tenant (except for any subleases that have been consented to by Landlord in writing).

Section 18. AUTHORITY. Each party represents and warrants to the other that it has full authority and power to enter into and perform its obligations under this Amendment, that the person executing this Amendment is fully empowered to do so, and that no consent or authorization is necessary from any third party. Landlord may request that Tenant provide Landlord evidence of Tenant's authority.

Section 19. DISCLOSURE REGARDING CERTIFIED ACCESS SPECIALIST. Pursuant to California Civil Code Section 1938, Landlord hereby notifies Tenant that as of the date of this Amendment, the Premises have not undergone inspection by a "Certified Access Specialist" ("**CASp**") to determine whether the Premises meet all applicable construction-related accessibility standards under California Civil Code Section 55.53. Landlord hereby discloses pursuant to California Civil Code Section 1938 as follows: "A Certified Access Specialist (CASp) can inspect the subject premises and determine whether the subject premises comply with all of the applicable construction-related accessibility standards under state law. Although state law does not require a CASp inspection of the subject premises, the commercial property owner or lessor may not prohibit the lessee or tenant from obtaining a CASp inspection of the subject premises for the occupancy or potential occupancy of the lessee or tenant, if requested by the lessee or tenant. The parties shall mutually agree on the arrangements for the time and manner of the CASp inspection, the payment of the fee for the CASp inspection, and the cost of making any repairs necessary to correct violations of construction-related accessibility standards within the premises." Landlord and Tenant hereby acknowledge and agree that in the event that Tenant elects to perform a CASp inspection of the Premises hereunder (the "**Inspection**"), such Inspection shall be (a) performed at Tenant's sole cost and expense, (b) limited to the Premises and (c) performed by a CASp who has been approved or designated by Landlord prior to the Inspection. Any Inspection must be performed in a manner which minimizes the disruption of business activities in the Building, and at a time reasonably approved by Landlord. Landlord reserves the right to be present during the Inspection. Tenant agrees to: (i) promptly provide to Landlord a copy of the report or certification prepared by the CASp inspector upon request (the "**Report**"), and (ii) keep the information contained in the Report confidential, except to the extent required by Law, or to the extent disclosure is needed in order to complete any necessary modifications or improvements required to comply with all applicable accessibility standards under state or federal Law, as well as any other repairs, upgrades, improvements, modifications or alterations required by the Report or that may be otherwise required to comply with applicable Laws or accessibility requirements (the "**Access Improvements**"). Tenant shall be solely responsible for the cost of Access Improvements to the Premises or the Building necessary to correct any such violations of construction-related accessibility standards identified by such Inspection as required by Law, which Access Improvements may, at Landlord's option, be performed in whole or in part by Landlord at Tenant's expense, payable as additional rent within ten (10) days following Landlord's demand.

Section 20. ENERGY UTILITY USAGE. If Tenant is billed directly by a public utility with respect to Tenant's energy usage at the Premises, then, upon written request, Tenant shall provide monthly energy utility usage for the Premises to Landlord for the period of time requested by Landlord (in electronic or paper format) or, at Landlord's option, provide any written authorization or other documentation required for Landlord to request information regarding Tenant's energy usage with respect to the Premises directly from the applicable utility company.

SECTION 1. EXISTING TENANT ADDITIONS. Tenant shall not be required to remove any Tenant Additions existing in the Chesapeake Space or the Penobscot Space as of the Effective Date except for any Tenant Additions containing Hazardous Materials, Tenant's trade fixtures, personal property and cabling and wiring installed for any of the foregoing.

SECTION 2. NO CANNABIS. Tenant shall not bring upon the Premises or any portion of the Project or use the Premises or permit the Premises or any portion thereof to be used for the growing, manufacturing, administration, distribution (including without limitation, any retail sales), possession, use or consumption of any cannabis, marijuana or cannabinoid product or compound, regardless of the legality or illegality of the same.

SECTION 3. COUNTERPARTS. This Amendment may be executed in duplicates or counterparts, or both, and such duplicates or counterparts together shall constitute but one original of the Amendment, and the signature of any party to any counterpart shall be deemed a signature to, and may be appended to, any other counterpart. Each duplicate and counterpart shall be equally admissible in evidence, and each original shall fully bind each party who has executed it.

[Signature Page Follows]

IN WITNESS WHEREOF, the parties hereto have executed this Amendment as of the latest date set forth below.

TENANT:

CODEXIS, INC.,
a Delaware corporation

By: /s/ John J. Nicols

Print Name: John J. Nicols

Title: President and Chief Executive Officer

Date: February 4, 2019

By: /s/ Gordon Sangster

Print Name: Gordon Sangster

Title: Senior Vice President and CFO

Date: February 4, 2019

LANDLORD:

METROPOLITAN LIFE INSURANCE COMPANY, **a New York corporation**

By: MetLife Investment Advisors, LLC,
a Delaware limited liability company,
its investment manager

By: /s/ Leland Low

Print Name: Leland Low

Title: Director

Date: February 8, 2019

EXHIBIT A

WORKLETTER AGREEMENT
(TENANT BUILD - ALLOWANCE)

This Workletter Agreement ("**Workletter**") is attached to and a part of a certain Amendment by and between METROPOLITAN LIFE INSURANCE COMPANY, a New York corporation, as Landlord, and CODEXIS, INC., a Delaware corporation, as Tenant, for the Premises. Terms used herein and not defined herein shall have the meaning of such terms as defined elsewhere in the Lease. For purposes of this Workletter, references to "State" and "City" shall mean the State and City in which the Building is located.

1. Landlord Work.

1.1. Notwithstanding any of the foregoing to the contrary, subject to delays caused by Force Majeure or Tenant Delay (defined below), Landlord, at Landlord's sole cost and expense, shall perform the work set forth on Exhibit A-1 hereto ("**Landlord Work**"), and within a reasonable time after delivery of possession shall Substantially Complete (defined below) the Landlord Work and leave the affected area in broom-clean condition with respect to Landlord Work (but Landlord shall not be obligated to do any clean-up or refuse removal related to construction of Tenant Alterations).

1.2. Tenant acknowledges and agrees that Landlord and Landlord's representatives and contractors shall have the right to enter the Premises at all times to perform such work until the Landlord Work is completed, and that such entry and work shall not constitute an eviction of Tenant in whole or in part and shall in no way excuse Tenant from performance of its obligations under the Lease. Tenant and Landlord acknowledge and agree that the Landlord Work and necessary coordination and cooperation to accomplish it will cause certain unavoidable level of disturbance, inconvenience, annoyance to Tenant's use and enjoyment of the Premises, and that in performing such Landlord Work Landlord shall use commercially reasonable efforts not to unreasonably and materially interfere with Tenant's construction, installations and business operations. Tenant shall cooperate with Landlord and Landlord's contractors(s) to allow the Landlord Work and shall move Tenant's trade fixtures, furnishings and equipment as reasonably requested by Landlord or Landlord's contractor(s). The costs of such cooperation and moving, and any related disconnections and installations of Tenant's trade fixtures, equipment, phones, furnishings and other personal property, shall be at Tenant's sole cost and expense. To the extent that Tenant, its contractors or subcontractors delay the Substantial Completion of the Landlord Work, such delay shall be a Tenant Delay and the Landlord Work shall be deemed Substantially Complete on the date such Landlord Work would have been completed but for the delay caused by Tenant, its contractors or subcontractors.

1.3. The Landlord Work shall be constructed in accordance with all applicable Laws, in a good and workmanlike manner and using new materials and equipment of good quality. For purposes of this Workletter, "**Substantially Complete**" and "**Substantial Completion**" of the Landlord Work shall mean the completion of the Landlord Work, except for minor insubstantial details of construction, decoration or mechanical adjustments which remain to be done and which shall not unreasonably and materially interfere with Tenant's regular business operations in the Premises. Substantial Completion shall be deemed to have occurred notwithstanding a requirement to complete "punchlist" or similar minor corrective work. Contemporaneously with or promptly after Substantial Completion of the Landlord Work, Tenant shall have the right to submit a written "punch list" to Landlord, setting forth any incomplete or defective item of construction. Landlord shall complete with reasonable diligence "punch list" items mutually agreed upon by Landlord and Tenant with respect to the Landlord Work. All construction and installation resulting from the Landlord Work shall immediately become and remain the property of Landlord.

2. Tenant's Plans.

2.1. Description. At its expense, Tenant shall employ:

(i) one or more architects reasonably satisfactory to Landlord and licensed by the State (" **Tenant's Architect**") to prepare architectural drawings and specifications for all layout and Premises improvements not included in, or requiring any change or addition to, the AS IS condition and Landlord Work, if any. Landlord hereby approves of Dan McCauley as a permitted “Tenant’s Architect”.

(ii) one or more engineers reasonably satisfactory to Landlord and licensed by the State (" **Tenant's Engineers**") to prepare structural, mechanical and electrical working drawings and specifications for all Premises improvements not included in, or requiring any change or addition to, the AS IS condition and Landlord Work, if any.

All such drawings and specifications are referred to herein as " **Tenant's Plans**". Tenant's Plans shall be in form and detail sufficient to secure all applicable governmental approvals. Tenant's Architect shall be responsible for coordination of all engineering work for Tenant's Plans and shall coordinate with any consultants retained by Tenant in connection with the design and installation of improvements to the Premises (the use of such consultants is subject to Landlord’s consent), and Landlord's architect or other representative to assure the consistency of Tenant's Plans with the Base Building Work and Landlord Work (if any).

Tenant shall pay Landlord, within twenty (20) days of receipt of each invoice from Landlord, the cost incurred by Landlord for Landlord's architects and engineers to review Tenant's Plans for consistency of same with the Base Building Work and Landlord Work, if any. Tenant's Plans shall also include the following:

(a) Final Space Plan: The "**Final Space Plan**" for the Premises shall include a full and accurate description of room titles, floor loads, alterations to the Base Building or Landlord Work (if any) or requiring any change or addition to the AS IS condition, and the dimensions and location of all partitions, doors, aisles, plumbing (and furniture and equipment to the extent same affect floor loading) and include a drop ceiling for the entire Premises and HVAC distributed throughout the entire Premises except the shipping and warehouse areas. The Final Space Plan shall (i) be compatible with the design, construction, systems and equipment of the Base Building and Landlord Work, if any; (ii) specify only materials, equipment and installations which are new and of a grade and quality no less than existing components of the Building when they were originally installed (collectively, (i) and (ii) may be referred to as “**Building Standard**” or “**Building Standards**”); (iii) comply with Laws, (iv) be capable of logical measurement and construction, and (v) contain all such information as may be required for the preparation of the Mechanical and Electrical Working Drawings and Specifications (including, without limitation, a capacity and usage report, from engineers designated by Landlord pursuant to Section 2.1(b). below, for all mechanical and electrical systems in the Premises).

(b) Mechanical and Electrical Working Drawings and Specifications: Tenant shall employ engineers reasonably satisfactory to Landlord to prepare Mechanical and Electrical Working Drawings and Specifications showing complete plans for electrical, life safety, automation, plumbing, water, and air cooling, ventilating, heating and temperature control and shall employ engineers designated by Landlord to prepare for Landlord a capacity and usage report ("**Capacity Report**") for all mechanical and electrical systems in the Premises.

(c) Issued for Construction Documents: The "**Issued for Construction Documents**" shall consist of all drawings (1/8" scale) and specifications necessary to construct all Premises improvements including, without limitation, architectural and structural working drawings and specifications and Mechanical and Electrical Working Drawings and Specifications and all applicable governmental authorities plan check corrections.

2.2. Approval by Landlord. Tenant's Plans and any revisions thereof shall be subject to Landlord's approval, which approval or disapproval:

(i) shall not be unreasonably withheld, provided however, that Landlord may disapprove Tenant's Plans in its sole and absolute discretion if they (a) adversely affect the structural integrity of the Building, including applicable floor loading capacity; (b) adversely affect any of the Building Systems (as defined below), the Common Areas or any other tenant space (whether or not currently occupied); (c) fail to fully comply with Laws, (d) adversely affect the exterior appearance of the Building; (e) provide for improvements which do not meet or exceed the Building Standards; or (f) involve any installation on the roof (except with respect to HVAC installation on the roof), or otherwise affect the roof, roof membrane or any warranties regarding either. Building Systems collectively shall mean the structural, electrical, mechanical (including, without limitation, heating, ventilating and air conditioning), plumbing, fire and life-safety (including, without limitation, fire protection system and any fire alarm), communication, utility, gas (if any), and security (if any) systems in the Building.

(ii) shall not be delayed beyond ten (10) business days with respect to initial submissions and major change orders (those which impact Building Systems or any other item listed in subpart (i) of Section 2.2 above) and beyond five (5) business days with respect to required revisions and any other change orders.

If Landlord disapproves of any of Tenant's Plans, Landlord shall advise Tenant of what Landlord disapproves in reasonable detail. After being so advised by Landlord, Tenant shall submit a redesign, incorporating the revisions required by Landlord, for Landlord's approval. The approval procedure shall be repeated as necessary until Tenant's Plans are ultimately approved. Approval by Landlord shall not be deemed to be a representation or warranty by Landlord with respect to the safety, adequacy, correctness, efficiency or compliance with Laws of Tenant's Plans. Tenant shall be fully and solely responsible for the safety, adequacy, correctness and efficiency of Tenant's Plans and for the compliance of Tenant's Plans with any and all Laws.

2.3. Landlord Cooperation. Landlord shall cooperate with Tenant and make good faith efforts to coordinate Landlord's construction review procedures to expedite the planning, commencement, progress and completion of Tenant Alterations. Landlord shall complete its review of each stage of Tenant's Plans and any revisions thereof and communicate the results of such review within the time periods set forth in Section 2.2 above.

2.4. City Requirements. Any changes in Tenant's Plans which are made in response to requirements of the applicable governmental authorities and/or changes which affect the Base Building Work shall be immediately submitted to Landlord for Landlord's review and approval.

2.5. "As-Built" Drawings and Specifications. A CADD-DXF diskette file and a set of black line drawings of all "as-built" drawings and specifications of Tenant's Work in the Premises (reflecting all field changes and including, without limitation, architectural, structural, mechanical and electrical drawings and specifications) prepared by Tenant's Architect and Engineers or by Contractors (defined below) shall be delivered by Tenant at Tenant's expense to the Landlord within thirty (30) days after completion of the Tenant Alterations. If Landlord has not received such drawings and diskette(s) within thirty (30) days, Landlord may give Tenant written notice of such failure. If Tenant does not produce the drawings and diskette(s) within ten (10) days after Landlord's written notice, Landlord may, at Tenant's sole cost which may be deducted from the Allowance, produce the drawings and diskette(s) using Landlord's personnel, managers, and outside consultants and contractors. Landlord shall receive an hourly rate reasonable for such production.

3. Tenant Alterations.

3.1. Tenant Alterations Defined. All tenant improvement work required by the Issued for Construction Documents (including, without limitation, any approved changes, additions or alterations pursuant to Section 6 below) is referred to in this Workletter as "**Tenant Alterations**."

3.2. Tenant to Construct. Tenant shall construct all Tenant Alterations pursuant to this Workletter, and except to the extent modified by or inconsistent with express provisions of this Workletter, pursuant with the provisions of the terms and conditions of Article Nine of the Lease, governing Tenant Alterations (except to the extent modified by this Workletter) and all such Tenant Alterations shall be considered "**Tenant Alterations**" for purposes of the Lease.

3.3. Construction Contract. All contracts and subcontracts for Tenant Alterations shall include any terms and conditions reasonably required by Landlord.

3.4. Contractor. Tenant shall select one or more contractors to perform the Tenant Alterations (" **Contractor**") subject to Landlord's prior written approval, which shall not unreasonably be withheld. Landlord hereby approves of [***] as a permitted "Contractor".

3.5. Division of Landlord Work and Tenant Alterations. Tenant Alterations is defined in Section 3.1 above and Landlord Work, if any, is defined in Section 1.

3.6. Restoration. Notwithstanding any of the foregoing to the contrary in the Existing Lease or in this Workletter, if so requested by Tenant in writing (and prominently in all capital and bold lettering which also states that such request is pursuant to Section 3.6 at the time Tenant requests approval of any Tenant Alterations, Landlord shall advise Tenant at the time of Landlord's approval of such Tenant Alterations as to whether Landlord will require that such Tenant Alterations be removed by Tenant from the Premises; provided, however, regardless of the foregoing, in any event, Landlord may require removal of any Tenant Alterations containing Hazardous Material and all Tenant's trade fixtures, and, subject to Section 6.03 of the Original Lease, cabling and wiring installed for Tenant's personal property or trade fixtures.

4. Tenant's Expense.

Tenant agrees to pay for all Tenant Alterations, including, without limitation, the costs of design thereof, whether or not all such costs are included in the "Permanent Improvement Costs" (defined below). Subject to the terms and conditions of this Workletter, Landlord shall provide an "**Allowance**" towards the cost of design and construction of the Tenant Alterations (including, without limitation, the replacement of HVAC or installation of new HVAC) as follows:

(a) Twenty and 00/100 Dollars ($20.00) per rentable square foot of Rentable Area of the 400 Penobscot Space (i.e., $757,120.00) for the replacement and installation of HVAC units in the 400 Penobscot Space;

(b) Ten and 00/100 Dollars ($10.00) per rentable square foot of Rentable Area of the 200 Penobscot Space, the 220 Penobscot Space and the Chesapeake Space (i.e., $392.440.00) for the replacement and installation of HVAC units in the 200 Penobscot Space, the 220 Penobscot Space and the Chesapeake Space which are older than fifteen (15) years old as of the Effective Date;

(c) Thirty-five and 00/100 Dollars ($35.00) per rentable square foot of Rentable Area of the 200 Penobscot Space and the 220 Penobscot Space (i.e., $987,840.00) for Permanent Improvements (defined below) and/or for the replacement and installation of HVAC units in the 200 Penobscot Space and the 220 Penobscot Space, provided, however, Tenant must spend not less than Ten and 00/100 ($10.00) per rentable square foot of Rentable Area of the 200 Penobscot Space and the 220 Penobscot Space for Permanent Improvements in the 200 Penobscot Space and the 220 Penobscot Space, and thereafter Tenant may use

the remainder of such Allowance for Permanent Improvements in any portion of the Penobscot Space or the Chesapeake Space;

(d) Thirty-five and 00/100 Dollars ($35.00) per rentable square foot of Rentable Area of the 400 Penobscot Space (i.e. $1,324,960.00) for Permanent Improvements and/or for the replacement and installation of HVAC units in the 400 Penobscot Space, provided, however, Tenant must spend not less than Ten and 00/100 ($10.00) per rentable square foot of Rentable Area of the 400 Penobscot Space for Permanent Improvements in the 400 Penobscot Space, and thereafter Tenant may use the remainder of such Allowance for Permanent Improvements in any portion of the Penobscot Space or the Chesapeake Space; and

(e) Twenty-five and 00/100 Dollars ($25.00) per rentable square foot of Rentable Area of the Chesapeake Space (i.e. $275,500.00) for Permanent Improvements and/or for the replacement and installation of HVAC units in the Chesapeake Space, provided, however, Tenant must spend not less than Seven and 50/100 ($7.50) per rentable square foot of Rentable Area of the Chesapeake Space for Permanent Improvements in the Chesapeake Space, and thereafter Tenant may use the remainder of such Allowance for Permanent Improvements in any portion of the Penobscot Space or the Chesapeake Space.

The term "**Permanent Improvement Costs**" shall mean the actual and reasonable costs of construction of that Tenant Alterations which constitutes permanent improvements to the Premises, actual and reasonable costs of design and management thereof and governmental permits therefor, and costs incurred by Landlord for Landlord's architects and engineers pursuant to Section 2.1, and Landlord's construction administration fee (defined in Section 7.10 below). Permanent Improvement Costs shall exclude costs of "Tenant's FF&E" (defined below) and shall include HVAC units as provided above. For purposes of this Workletter, "**Tenant's FF&E**" shall mean Tenant's furniture, furnishings, telephone systems, computer systems, equipment, any other personal property or fixtures, and installation thereof. If Tenant does not utilize one hundred percent (100%) of the Allowance for Permanent Improvement Costs no later than the date that is thirty (30) months following the Effective Date and submit full and complete application(s) for disbursement thereof pursuant to Section 5 below, Tenant shall have no right to the unused portion of the Allowance.

5. Application and Disbursement of the Allowance.

5.1. Tenant shall prepare a budget for all Tenant Alterations, including the Permanent Improvement Costs and all other costs of the Tenant Alterations ("**Budget**"), which Budget shall be subject to the reasonable approval of Landlord and may be reasonably updated by Tenant from time to time. Such Budget shall be supported by such other documentation as Landlord may require to evidence the total costs. To the extent the Budget exceeds the available Allowance ("**Excess Cost**"), Tenant shall be solely responsible for payment of such Excess Cost (subject to any remaining Allowance. Further, prior to any disbursement of the Allowance by Landlord, Tenant shall pay and disburse its own funds for all that portion of the Permanent Improvement Costs equal to the sum of (a) the Permanent Improvement Costs in excess of the Allowance; plus (b) the amount of "Landlord's Retention" (defined below). "**Landlord's Retention**" shall mean an amount equal to ten percent (10%) of the Allowance, which Landlord shall retain out of the Allowance and shall not be obligated to disburse unless and until after Tenant has completed the Tenant Alterations and complied with Section 5.4 below. Further, Landlord shall not be obligated to make any disbursement of the Allowance unless and until Tenant has provided Landlord with (i) bills and invoices covering all labor and material expended and used in connection with the particular portion of the Tenant Alterations for which Tenant has requested reimbursement, (ii) an affidavit from Tenant stating that all of such bills and invoices have either been paid in full by Tenant or are due and owing, and all such costs qualify as Permanent Improvement Costs, (iii) contractors affidavit covering all labor and materials expended and used, (iv) Tenant, contractors and architectural completion affidavits (as applicable), and (v) valid mechanics' lien releases and waivers pertaining to any completed portion of the Tenant Alterations which shall be conditional or unconditional, as applicable, all as provided pursuant to Section 5.2 and 5.4 below.

5.2. Upon Tenant's full compliance with the provisions of Section 5, and if Landlord determines that there are no applicable or claimed stop notices (or any other statutory or equitable liens of anyone

performing any of Tenant Alterations or providing materials for Tenant Alterations) or actions thereon, Landlord shall disburse the applicable portion of the Allowance as follows:

(a) In the event of conditional releases, to the respective contractor, subcontractor, vendor, or other person who has provided labor and/or services in connection with the Tenant Alterations, upon the following terms and conditions: (i) such costs are included in the Budget, are Permanent Improvement Costs, are covered by the Allowance, and Tenant has completed and delivered to Landlord a written request for payment, in form reasonably approved by Landlord, setting forth the exact name of the contractor, subcontractor or vendor to whom payment is to be made and the date and amount of the bill or invoice, (ii) the request for payment is accompanied by the documentation set forth in Section 5.1; and (iii) Landlord, or Landlord's appointed representative, has inspected and approved the work for which Tenant seeks payment; or

(b) In the event of unconditional releases, directly to Tenant upon the following terms and conditions: (i) Tenant seeks reimbursement for costs of Tenant Alterations which have been paid by Tenant, are included in the Budget, are Permanent Improvement Costs, and are covered by the Allowance; (ii) Tenant has completed and delivered to Landlord a request for payment, in form reasonably approved by Landlord, setting forth the name of the contractor, subcontractor or vendor paid and the date of payment, (iii) the request for payment is accompanied by the documentation set forth in Section 5.1; and (iv) Landlord, or Landlord's appointed representative, has inspected and approved the work for which Tenant seeks reimbursement.

5.3. Tenant shall provide Landlord with the aforementioned documents by the fifteenth (15 t)h of the month and payment shall be made within thirty (30) days after such documentation is provided.

5.4. Prior to Landlord disbursing the Landlord’s Retention to Tenant, Tenant shall submit to Landlord the following items within thirty (30) days after completion of the Tenant Alterations or such longer period as Landlord may permit: (i) “As Built” drawings and specifications pursuant to Section 2.5 above, (ii) all unconditional lien releases from all general contractor(s) and subcontractor(s) performing work, (iii) a “Certificate of Completion” prepared by Tenant’s Architect, and (iv) a final budget with supporting documentation detailing all costs associated with the Permanent Improvement Costs.

6. Changes, Additions or Alterations.

If Tenant desires to make any non-de minimis change, addition or alteration or desires to make any change, addition or alteration to any of the Building Systems after approval of the Issued for Construction Documents, Tenant shall prepare and submit to Landlord plans and specifications with respect to such change, addition or alteration. Any such change, addition or alteration shall be subject to Landlord's approval in accordance with the provisions of Section 2.2 of this Workletter. Tenant shall be responsible for any submission to and plan check and permit requirements of the applicable governmental authorities. Tenant shall be responsible for payment of the cost of any such change, addition or alteration if it would increase the Budget and Excess Cost previously submitted and approved pursuant to Section 5 above (subject to any remaining Allowance).

7. Miscellaneous.

7.1. Scope. Except as otherwise set forth in the Lease, this Workletter shall not apply to any space hereafter added to the Premises by Lease option or otherwise.

7.2. Tenant Alterations shall include (at Tenant's expense subject to application of the Allowance towards the costs of such items) for all of the Premises:

(a) Landlord approved lighting sensor controls as necessary to meet applicable Laws;

(b) Building Standard fluorescent fixtures in all Building office areas;

(c) Building Standard meters for each of electricity and chilled water used by Tenant shall be connected to the Building's system and shall be tested and certified prior to Tenant's occupancy of the Premises by a State certified testing company;

(d) Building Standard ceiling systems (including tile and grid) and;

(e) Building Standard air conditioning distribution and Building Standard air terminal units.

7.3. Sprinklers. Subject to any terms, conditions and limitations set forth herein, Landlord shall provide an operative sprinkler system consisting of mains, laterals, and heads "AS IS" on the date of delivery of the Premises to Tenant. Tenant shall pay for piping distribution, drops and relocation of, or additional, sprinkler system heads and Building firehose or firehose valve cabinets, if Tenant's Plans and/or any applicable Laws necessitate such.

7.4. Floor Loading. Floor loading capacity shall be within building design capacity which is 150 pounds per square foot. Tenant may exceed floor loading capacity with Landlord's consent, at Landlord's sole discretion and must, at Tenant's sole cost and expense, reinforce the floor as required for such excess loading.

7.5. Work Stoppages. If any work on the Real Property other than Tenant Alterations is delayed, stopped or otherwise affected by construction of Tenant Alterations, Tenant shall immediately take those actions necessary or desirable to eliminate such delay, stoppage or effect on work on the Real Property other than Tenant Alterations.

7.6. Life Safety. Tenant (or Contractor) shall employ the services of a fire and life-safety subcontractor reasonably satisfactory to Landlord for all fire and life-safety work at the Building.

7.7. Locks. Tenant may purchase locks, cylinders and keys for the Premises from its own vendor, provided that (a) such vendor and the locks, cylinders and keys to be used are subject to Landlord's prior written approval; (b) of a make and model which are functional, operable and compatible with Landlord's master key system; (c) a master key or keys are provided to Landlord, of which Landlord may place one such master key in the "knox box" for use by the fire department and emergency personnel in the event of an emergency and may retain another key for Landlord's use for entry permitted under the Lease; and (d) the contact information for Tenant's vendor for locks, cylinders and keys used in the Premises shall be provided to Landlord with Tenant's request for approval.

7.8. Authorized Representatives. Tenant has designated Tony Catindig to act as Tenant's representative with respect to the matters set forth in this Workletter. Such representative(s) shall have full authority and responsibility to act on behalf of Tenant as required in this Workletter. Tenant may add or delete authorized representatives upon five (5) business days' notice to Landlord.

7.9. Intentionally Omitted.

7.10. Fee. Landlord shall receive a fee equal to one percent (1%) of the Allowance for Landlord's review and supervision of construction of the Tenant Alterations, which fee shall be paid by Landlord applying one percent (1.0%) of the Allowance in payment thereof. Such fee is in addition to Tenant's reimbursement of costs incurred by Landlord pursuant to other provisions hereof, including, without limitation, for Landlord's architects and engineers to review Tenant's Plans.

8. Force and Effect.

The terms and conditions of this Workletter shall be construed to be a part of the Lease and shall be deemed incorporated in the Lease by this reference. Should any inconsistency arise between this Workletter and the Lease as to the specific matters which are the subject of this Workletter, the terms and conditions of this Workletter shall control.

EXHIBIT A-1
TO WORKLETTER AGREEMENT

LANDLORD WORK

Landlord Work shall mean the following work, to be performed by Landlord's contractor(s):

1. Replace the roofs of the buildings of which the 400 Penobscot Space, the 200 Penobscot and the Chesapeake Space. The cost of such replacement of the roofs shall be amortized over their useful lives and included as an Operating Expense. Landlord and Tenant shall work together to coordinate HVAC work and the roof work.

2. Improve the exterior lighting in the parking lot, including upgrading the parking lot lights, building wall pack lights and the bollard lights with LED light fixtures.

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EXHIBIT B

101 SAGINAW SPACE RESTORATION

EXHIBIT C

FAIR MARKET RENTAL RATE

1. Definition of Fair Market Rental Rate. "**Fair Market Rental Rate**" shall mean the Monthly Base Rent equal to the monthly base rental per rentable square foot which a tenant would pay and which a willing landlord would accept for space comparable to the Premises in the Building and in other buildings in Seaport Centre and along the Highway 101 corridor in Redwood City, Redwood Shores, San Carlos and Belmont (the "**Applicable Market**") for the period for which such rental is to be paid and for a lease on terms substantially similar to those of the Lease (including, without limitation, those applicable to Taxes, Operating Expenses and exclusions, but also considering so-called net and triple net leases, and leases utilizing operating expense stops or base years, and making appropriate adjustment between such leases and this Lease, as described below), based on prevailing market conditions in the Applicable Market at the time such determination is made ("**Comparable Transactions**"). Without limiting the generality of the foregoing, Comparable Transactions shall be for a term similar to the term of tenancy and for space comparable in use, floor levels, view and orientation, square footage and location within the Building and in the Applicable Market as the transaction for which Fair Market Rental Rate is being determined; however, leases of unusual or odd shaped spaces shall not be considered. In any determination of Fair Market Rental Rate, the stated or contract monthly net or base rental in Comparable Transactions shall be appropriately adjusted to take into account the different terms and conditions prevailing in such transactions and those present in the Lease, including, without limitation: (a) the extent to which average annual expenses and taxes per rentable square foot payable by tenants in Comparable Transactions vary from those payable by Tenant under the Lease, and so, for example, if the Lease provides for payment of Rent Adjustments and/or certain Operating Expenses on the basis of increases over a base year, then the rate of Monthly Base Rent under the Lease shall be based upon a step-up to change the calendar year which serves as the base year for calculation of the base for such Operating Expenses for the Option Term to be the full calendar year in which the Option Term commences, and such step-up shall be considered in the determination of the Fair Market Rental Rate; (b) tenant improvements, value of existing tenant improvements, the concessions, if any, being given by landlords in Comparable Transactions, such as parking charge abatement, free rent or rental abatement applicable after substantial completion of any tenant improvements (and no adjustment shall be made for any free or abated rent during any construction periods), loans at below-market interest rates, moving allowances, space planning allowances, lease takeover payments and work allowances, as compared to any tenant improvement, refurbishment or repainting allowance given to Tenant under the Lease for the space for which Fair Market Rental Rate is being determined; (c) the brokerage commissions, fees and bonuses payable by landlords in Comparable Transactions (whether to tenant's agent, such landlord or any person or entity affiliated with such landlord), as compared to any such amounts payable by Landlord to the broker(s) identified with respect to the transaction for which Fair Market Rental Rate is being determined; (d) the time value of money; (e) any material difference between the definition of rentable area and the ratio of project rentable to useable square feet in Comparable Transactions, as compared to such figures applicable to the space for which Fair Market Rental Rate is being determined; and (f) the extent to which charges for parking by tenants in Comparable Transactions vary from those payable by Tenant under the Lease.

2. Sealed Estimates. In the event the Lease requires Fair Market Rental Rate to be determined in accordance with this Exhibit, Landlord and Tenant shall meet within ten (10) business days thereafter and each simultaneously submit to the other in a sealed envelope its good faith estimate of Fair Market Rental Rate (the "**Estimates**"). If the higher Estimate is not more than one hundred five percent (105%) of the lower Estimate, then Fair Market Rental Rate shall be the average of the two Estimates. If such simultaneous submission of Estimates does not occur within such ten (10) business day period, then either party may by notice to the other designate any reasonable time within five (5) business days thereafter and any reasonable place at or near the Building for such meeting to take place. In the event only one party submits an Estimate at that meeting, such Estimate shall be Fair Market Rental. In the event neither party submits an Estimate at that meeting, the transaction for which Fair Market Rental Rate is being determined shall be deemed cancelled and of no further force or effect.

3. Selection of Arbitrators. If the higher Estimate is more than one hundred five percent (105%) of the lower Estimate, then either Landlord or Tenant may, by written notice to the other within five (5) business days after delivery of Estimates at the meeting, require that the disagreement be resolved by arbitration. In the event neither party gives such notice, the transaction for which Fair Market Rental Rate is being determined shall be deemed cancelled and of no further force or effect. Within five (5) business days after such notice, the parties shall select as arbitrators three (3) mutually acceptable independent MAI appraisers with experience in real estate activities, including at least five (5) years experience in appraising comparable life science space in the Applicable Market ("**Qualified Appraisers**"). If the parties cannot timely agree on such arbitrators, then within the following five (5) business days, each shall select and inform the other party of one (1) Qualified Appraiser and within a third period of five (5) business days, the two appraisers (or if only one (1) has been duly selected, such single appraiser) shall select as arbitrators a panel of three additional Qualified Appraisers, which three arbitrators shall proceed to determine Fair Market Rental Rate pursuant to Section 4 of this Exhibit. Both Landlord and Tenant shall be entitled to present evidence supporting their respective positions to the panel of three arbitrators.

4. Arbitration Procedure. Once a panel of arbitrators has been selected as provided above, then as soon thereafter as practicable each arbitrator shall select one of the two Estimates as the one which, in its opinion, is closer to Fair Market Rental Rate. Upon an Estimate's selection by two (2) of the arbitrators, it shall be the applicable Fair Market Rental Rate and such selection shall be binding upon Landlord and Tenant. If the arbitrators collectively determine that expert advice is reasonably necessary to assist them in determining Fair Market Rental Rate, then they may retain one or more qualified persons, including but not limited to legal counsel, brokers, architects or engineers, to provide such expert advice. The party whose Estimate is not chosen by the

arbitrators shall pay the costs of the arbitrators and any experts retained by the arbitrators. Any fees of any counsel or expert engaged directly by Landlord or Tenant, however, shall be borne by the party retaining such counsel or expert.

5. Rent Pending Determination of Fair Market Rental Rate. In the event that the determination of Fair Market Rental Rate has not been concluded prior to commencement of the applicable rental period for the applicable space for which the Fair Market Rental Rate is being determined, Tenant shall pay Landlord Monthly Base Rent and Rent Adjustment Deposits as would apply under Landlord's Estimate pursuant to Section 2 of this Exhibit until the Fair Market Rental Rate is determined. In the event that the Fair Market Rental Rate subsequently determined is different from the amount paid for the applicable period, then within thirty (30) days after such determination, Tenant shall pay Landlord any greater amounts due and Landlord shall credit Tenant (against the next Monthly Base Rent installments due) for any reduction in the amounts due.

Exhibit 31.1

CERTIFICATION

I, John J. Nicols, certify that:

1. I have reviewed this Quarterly Report on Form 10-Q of Codexis, Inc.;

2. Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;

3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this report;

4. The registrant's other certifying officer(s) and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the registrant and have:

   (a) Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;

   (b) Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles;

   (c) Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and

   (d) Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth fiscal quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the registrant's internal control over financial reporting; and

5. The registrant's other certifying officer(s) and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of the registrant's board of directors (or persons performing the equivalent functions):

   (a) All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and

   (b) Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

Date: May 8, 2019

/s/ John J. Nicols

John J. Nicols

President and Chief Executive Officer
(principal executive officer)

Exhibit 31.2

CERTIFICATION

I, Gordon Sangster, certify that:

1. I have reviewed this Quarterly Report on Form 10-Q of Codexis, Inc.;

2. Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;

3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this report;

4. The registrant's other certifying officer(s) and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the registrant and have:

   (a) Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;

   (b) Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles;

   (c) Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and

   (d) Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth fiscal quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the registrant's internal control over financial reporting; and

5. The registrant's other certifying officer(s) and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of the registrant's board of directors (or persons performing the equivalent functions):

   (a) All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and

   (b) Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

Date: May 8, 2019

/s/ Gordon Sangster

Gordon Sangster
Senior Vice President and Chief Financial Officer
(principal financial and accounting officer)

Exhibit 32.1

CERTIFICATION PURSUANT TO
18 U.S.C. SECTION 1350,
AS ADOPTED PURSUANT TO
SECTION 906 OF THE SARBANES-OXLEY ACT OF 2002

In connection with the Quarterly Report of Codexis, Inc. (the "Company") on Form 10-Q for the fiscal quarter ended March 31, 2019, as filed with the Securities and Exchange Commission (the "Report"), John J. Nicols, President and Chief Executive Officer of the Company and Gordon Sangster, Senior Vice President and Chief Financial Officer of the Company, respectively, do each hereby certify, pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002, that:

- The Report fully complies with the requirements of Section 13(a) or 15(d) of the Securities Exchange Act of 1934; and
- The information in the Report fairly presents, in all material respects, the financial condition and results of operations of the Company.

Date: May 8, 2019

/s/ John J. Nicols

John J. Nicols

President and Chief Executive Officer
(principal executive officer)

/s/ Gordon Sangster

Gordon Sangster
Senior Vice President and Chief Financial Officer
(principal financial and accounting officer)