UNITED STATES
SECURITIES AND EXCHANGE COMMISSION
WASHINGTON, DC 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 September 30, 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: 001-38942

ARCTURUS THERAPEUTICS HOLDINGS INC.

(Exact Name of Registrant as Specified in its Charter)

Delaware **(State or other jurisdiction of incorporation or organization)**	**32-0595345** **(I.R.S. Employer Identification No.)**
10628 Science Center Drive, Suite 250 **San Diego, California** **(Address of principal executive offices)**	**92121** **(Zip Code)**

Registrant's telephone number, including area code: (858) 900-2660

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 $0.001 per share	ARCT	The NASDAQ Stock Market LLC

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, smaller reporting company, or an emerging growth company. See the definitions of "large accelerated filer," "accelerated filer," "smaller reporting company," and "emerging growth company" in Rule 12b-2 of the Exchange Act.

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

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

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

As of November 6, 2019, the registrant had 15,125,293 shares of voting common stock outstanding.

ARCTURUS THERAPEUTICS HOLDINGS INC. AND ITS SUBSIDIARIES

TABLE OF CONTENTS

Item 1. Financial Statements.

ARCTURUS THERAPEUTICS HOLDINGS INC. AND ITS SUBSIDIARIES
CONDENSED CONSOLIDATED BALANCE SHEETS
(In U.S. dollars in thousands, except par value information)

	September 30, 2019 (unaudited)	December 31, 2018
Assets		
Current assets:		
Cash and cash equivalents	$ 74,172	$ 36,709
Accounts receivable	2,625	4,481
Prepaid expenses and other current assets	2,611	638
Total current assets	79,408	41,828
Property and equipment, net	2,073	1,975
Operating lease right-of-use asset, net	5,324	—
Equity-method investment	303	288
Non-current restricted cash	107	107
Total assets	$ 87,215	$ 44,198
Liabilities and stockholders' equity		
Current liabilities:		
Accounts payable	$ 4,013	$ 2,398
Accrued liabilities	6,676	3,907
Deferred revenue	10,999	6,272
Total current liabilities	21,688	12,577
Deferred revenue, net of current portion	14,551	7,534
Long-term debt	10,016	9,911
Operating lease liability, net of current portion	5,065	—
Deferred rent	—	534
Total liabilities	$ 51,320	$ 30,556
Stockholders' equity		
Common stock: $0.001 par value; 30,000 shares authorized; 15,126 issued and outstanding at September 30, 2019; NIS 0.07 par value; 30,000 shares authorized, 10,762 issued, 10,719 outstanding and 43 held in treasury at December 31, 2018	15	214
Additional paid-in capital	96,559	58,302
Accumulated deficit	(60,679)	(44,874)
Total stockholders' equity	35,895	13,642
Total liabilities and stockholders' equity	$ 87,215	$ 44,198

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

ARCTURUS THERAPEUTICS HOLDINGS INC. AND ITS SUBSIDIARIES
CONDENSED CONSOLIDATED STATEMENTS OF OPERATIONS AND COMPREHENSIVE LOSS
(unaudited)
U.S. dollars in thousands (except per share data)

	Three Months Ended September 30,		Nine Months Ended September 30,	
	2019	2018	2019	2018
Collaboration revenue	$ 3,318	$ 3,423	$ 17,821	$ 8,176
Operating expenses:				
Research and development, net	7,053	3,969	21,646	12,135
General and administrative	3,881	3,810	10,871	17,141
Total operating expenses	10,934	7,779	32,517	29,276
Loss from operations	(7,616)	(4,356)	(14,696)	(21,100)
Gain (loss) from equity-method investment	303	(47)	15	(47)
Finance (expense) income, net	(120)	150	(321)	373
Net loss	$ (7,433)	$ (4,253)	$ (15,002)	$ (20,774)
Net loss per share, basic and diluted	$ (0.56)	$ (0.42)	$ (1.18)	$ (2.07)
Weighted-average shares outstanding, basic and diluted	13,201	10,093	12,734	10,059
Comprehensive loss:				
Net loss	$ (7,433)	$ (4,253)	$ (15,002)	$ (20,774)
Unrealized gain on short-term investments	—	2	—	7
Comprehensive loss	$ (7,433)	$ (4,251)	$ (15,002)	$ (20,767)

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

ARCTURUS THERAPEUTICS HOLDINGS INC. AND ITS SUBSIDIARIES
CONDENSED CONSOLIDATED STATEMENTS OF STOCKHOLDERS' EQUITY
(unaudited)
U.S. dollars in thousands

Three Months Ended September 30, 2019

	Common Stock Shares	Common Stock Amount	Additional Paid-In Capital	Accumulated Other Comprehensive (Loss) Gain	Accumulated Deficit	Total Stockholders' Equity
BALANCE - June 30, 2019	**13,120**	**$ 13**	**$ 74,851**	**$ —**	**$ (53,246)**	**$ 21,618**
Net loss	—	—	—	—	(7,433)	(7,433)
Share-based compensation	—	—	383	—	—	383
Issuance of common stock, net of issuance costs	1,995	2	21,276	—	—	21,278
Issuance of common stock upon exercise of stock options	11	—	49	—	—	49
BALANCE – September 30, 2019	**15,126**	**$ 15**	**$ 96,559**	**$ —**	**$ (60,679)**	**$ 35,895**

Three Months Ended September 30, 2018

	Common Stock Shares	Common Stock Amount	Additional Paid-In Capital	Accumulated Other Comprehensive (Loss) Gain	Accumulated Deficit	Total Stockholders' Equity
BALANCE - June 30, 2018	**10,748**	**$ 214**	**$ 57,189**	**$ 2**	**$ (39,610)**	**$ 17,795**
Net loss	—	—	—	—	(4,253)	(4,253)
Unrealized gain on short-term investments	—	—	—	2	—	2
Share-based compensation	—	—	587	—	—	587
Issuance of common stock upon exercise of stock options	13	—	20	—	—	20
BALANCE – September 30, 2018	**10,761**	**$ 214**	**$ 57,796**	**$ 4**	**$ (43,863)**	**$ 14,151**

Nine Months Ended September 30, 2019

	Common Stock Shares	Common Stock Amount	Additional Paid-In Capital	Accumulated Other Comprehensive (Loss) Gain	Accumulated Deficit	Total Stockholders' Equity
BALANCE - December 31, 2018	**10,762**	**$ 214**	**$ 58,302**	**$ —**	**$ (44,874)**	**$ 13,642**
Net loss	—	—	—	—	(15,002)	(15,002)
Treasury stock	(43)	—	—	—	—	—
Share-based compensation	—	—	1,185	—	—	1,185
Redomiciliation share exchange	—	(203)	203	—	—	—
Issuance of restricted common stock and option, net of issuance costs	2,400	2	15,543	—	—	15,545
Issuance of common stock, net of issuance costs	1,995	2	21,276	—	—	21,278
Issuance of common stock upon exercise of stock options	12	—	50	—	—	50
Effect of adoption of ASU 2014-09	—	—	—	—	(803)	(803)
BALANCE – September 30, 2019	**15,126**	**$ 15**	**$ 96,559**	**$ —**	**$ (60,679)**	**$ 35,895**

Nine Months Ended September 30, 2018

	Common Stock Shares	Common Stock Amount	Additional Paid-In Capital	Accumulated Other Comprehensive (Loss) Gain	Accumulated Deficit	Total Stockholders' Equity
BALANCE – December 31, 2017	**10,699**	**$ 212**	**$ 56,674**	**$ (3)**	**$ (23,089)**	**$ 33,794**
Net loss	—	—	—	—	(20,774)	(20,774)
Unrealized gain on short-term investments	—	—	—	7	—	7
Share-based compensation	—	—	753	—	—	753
Issuance of common stock upon exercise of stock options	62	2	369	—	—	371
BALANCE – September 30, 2018	**10,761**	**$ 214**	**$ 57,796**	**$ 4**	**$ (43,863)**	**$ 14,151**

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

ARCTURUS THERAPEUTICS HOLDINGS INC. AND ITS SUBSIDIARIES
CONDENSED CONSOLIDATED STATEMENTS OF CASH FLOWS
(unaudited)
U.S. dollars in thousands

	Nine Months Ended September 30,	
	2019	2018
OPERATING ACTIVITIES:		
Net loss	$ (15,002)	$ (20,774)
Adjustments to reconcile net loss to net cash provided by (used in) operating activities:		
Depreciation and amortization	531	415
Amortization of right-of-use operating lease asset	544	—
Share-based compensation expense	1,185	753
Non-cash interest expense	105	—
(Gain) loss from equity-method investment	(15)	47
Changes in operating assets and liabilities		
Accounts receivable	1,856	(643)
Prepaid expense and other assets	(1,973)	611
Accounts payable	1,489	938
Accrued liabilities	1,432	9
Deferred revenue	10,941	3,647
Net cash provided by (used in) operating activities	1,093	(14,997)
INVESTING ACTIVITIES:		
Proceeds from maturities of short-term investments	—	30,211
Purchases of short-term investments	—	(9,093)
Acquisition of property and equipment	(503)	(1,253)
Net cash (used in) provided by investing activities	(503)	19,865
FINANCING ACTIVITIES:		
Proceeds from the issuance of restricted common stock and option, net of issuance costs	15,545	—
Proceeds from the issuance of common stock, net of issuance costs	21,278	—
Proceeds from exercise of stock options	50	332
Net cash provided by financing activities	36,873	332
NET INCREASE IN CASH, CASH EQUIVALENTS AND RESTRICTED CASH	37,463	5,200
Cash, cash equivalents and restricted cash at beginning of the period	36,816	25,238
Cash, cash equivalents and restricted cash at end of the period	$ 74,279	$ 30,438

	Nine Months Ended September 30,	
	2019	2018
Supplemental disclosure of cash flow information		
Cash paid for interest	$ 508	$ —
Non-cash investing activities		
Right-of-use asset obtained in exchange for lease liabilities	$ 5,868	$ —
Sale of intangible assets for equity investment	$ —	$ 590
Release of repurchase liability for restricted shares	$ —	$ 37
Purchase of property and equipment in accounts payable	$ 126	$ 177

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

Note 1. Description of Business, Basis of Presentation and Summary of Significant Accounting Policies

Description of Business

Arcturus Therapeutics Holdings Inc. (the "Company") is a RNA medicines company focused on significant opportunities in rare, liver, and respiratory diseases. Management believes that the Company's key proprietary technology has the potential to address the major hurdles in RNA development, namely the effective and safe delivery of RNA therapeutics to disease-relevant target tissues.

The financial statements for periods prior to June 17, 2019, the effective date of the Redomiciliation (as described below), relate to Arcturus Therapeutics Ltd. and relate to Arcturus Therapeutics Holdings Inc. for the period from and after June 17, 2019. Unless stated otherwise or the context otherwise requires, references to the "Company," "Arcturus," "we," "our" and "us" mean Arcturus Therapeutics Holdings Inc. and its consolidated subsidiaries from and after the effective time of the Redomiciliation and, prior to that time, to its predecessor, Arcturus Therapeutics Ltd.

Basis of Presentation

The accompanying condensed consolidated financial statements include the accounts of Arcturus Therapeutics Holdings Inc. and its subsidiaries and are unaudited. All intercompany accounts and transactions have been eliminated in consolidation. These condensed consolidated financial statements have been prepared in accordance with U.S. generally accepted accounting principles ("GAAP") for interim financial information. Accordingly, they do not include all of the information and footnotes required by GAAP for complete financial statements. In management's opinion, the accompanying condensed consolidated financial statements reflect all adjustments, consisting of normal recurring adjustments, considered necessary for a fair presentation of the results for the interim periods presented.

Interim financial results are not necessarily indicative of results anticipated for the full year. These condensed consolidated financial statements should be read in conjunction with the audited financial statements and footnotes included in the Company's Annual Report on Form 10-K for the year ended December 31, 2018.

These condensed consolidated financial statements are prepared in accordance with GAAP, which requires management to make estimates and assumptions regarding the valuation of certain debt and equity instruments, the equity-method investment, share-based compensation, accruals for liabilities, deferred revenue, expense accruals, and other matters that affect the reported amounts of assets and liabilities and disclosure of contingent assets and liabilities at the date of the financial statements and the reported amounts of revenues and expenses during the reporting periods. Although these estimates are based on management's knowledge of current events and actions the Company may undertake in the future, actual results may ultimately differ from these estimates and assumptions.

Liquidity

The Company's activities since inception have consisted principally of performing research and development activities, general and administration activities, and raising capital. The Company's activities are subject to significant risks and uncertainties, including failing to secure additional funding before the Company achieves sustainable revenues and profit from operations.

The Company is a pre-clinical bioscience company that is dependent on obtaining external equity and debt financings to fund its operations. Historically, the Company's primary sources of financing have been through the sale of its securities, through issuance of debt and through collaboration agreements. The Company raised $10.0 million in gross proceeds from a long-term debt agreement entered into on October 12, 2018 with Western Alliance Bank (Note 5). On June 18, 2019, the Company entered into a Third Amendment to the Research Collaboration and License Agreement with Ultragenyx Pharmaceutical Inc. ("Ultragenyx"), from which the Company received $30.0 million. Furthermore, in separate offerings, the Company raised total net proceeds of $21.4 million during the third quarter of 2019 through the sale of equity securities. Research and development activities have required significant capital investment since the Company's inception.

The Company expects its operations to continue to require cash investment to pursue the Company's research and development activities, including preclinical studies, formulation development, clinical trials and related drug manufacturing. The Company has experienced net losses since its inception and as of September 30, 2019 has an accumulated deficit of $60.7 million. The Company expects to continue to incur additional losses for the foreseeable future, and the Company will need to raise additional debt or equity financing or enter into additional collaborations to fund its development. The ability of the Company to transition to profitability is dependent on identifying and developing successful mRNA drug candidates. In the near future, if the Company is not able to achieve planned milestones, incurs costs in excess of its forecasts, or does not meet the covenant requirements associated with its debt (Note

5), it will need to reduce discretionary spending, or discontinue the development of some or all of its products, which will delay part of its development programs, all of which will have a material adverse effect on the Company's ability to achieve its intended business objectives. There can be no assurances that additional financing will be secured or, if secured, will be on favorable terms to the Company. The Company's management is of the opinion that its current financial resources will be sufficient to continue the development of the Company's products for at least twelve months from the date that the condensed consolidated financial statements for the quarter ended September 30, 2019 are issued.

Recent Developments

Arcturus Therapeutics Ltd. ("Arcturus Israel") completed the process to redomicile from an Israeli limited company to a Delaware corporation (the "Redomiciliation"). On February 11, 2019, Arcturus Israel filed an application with the Tel-Aviv District Court (the "Israeli Court") to approve the convening of a general shareholders meeting of Arcturus Israel for the approval of the Redomiciliation pursuant to Sections 350 and 351 of the Israeli Companies Law (the "Companies Law"). Following the Israeli Court approval dated March 13, 2019, the Company filed with the Securities and Exchange Commission a registration statement on Form S-4 (the "Form S-4"), which included a joint proxy statement/prospectus for the convening of the general shareholder meeting, held on May 17, 2019, as described in the Form S-4. The general shareholders meeting resulted in the approval of the Redomiciliation, and Arcturus Israel then approached the Israeli Court and requested its approval of the Redomiciliation.

In connection with the Redomiciliation, Arcturus Israel entered into a share exchange agreement (the "Exchange Agreement") with a special-purpose company, Arcturus Therapeutics Holdings Inc., the reporting company and parent to Arcturus Therapeutics, Inc. ("Arcturus Sub").

In furtherance of the Redomiciliation, and pursuant to the terms of the Exchange Agreement, the holders of ordinary shares of Arcturus Israel as of a future record date and the holders of options to purchase ordinary shares of Arcturus Israel as of the same record date transferred their ordinary shares of Arcturus Israel and options to purchase ordinary shares of Arcturus Israel, respectively, to the Company and, in exchange thereof, received one share of common stock of the Company for each ordinary share of Arcturus Israel and an option to purchase one share of common stock of the Company in exchange for each ordinary share of Arcturus Israel underlying the existing option to be so exchanged, respectively.

As a result of the Exchange Agreement, the par value of Arcturus Israel's ordinary shares prior to the Redomiciliation is presented in New Israeli Shekel and the par value of the Company's common stock subsequent to the Redomiciliation is presented in United States Dollars.

As of June 17, 2019, the common stock of the Company is listed on the NASDAQ Stock Market LLC ("NASDAQ"). Upon consummation of the transactions contemplated by the Share Exchange Agreement, Arcturus Israel's ordinary shares were delisted from trading on NASDAQ, and Arcturus Israel became a private company (as defined in the Companies Law) wholly-owned by the Company.

Pursuant to the Exchange Agreement, on June 12, 2019 all of the shares of Arcturus Sub were distributed to the Company and Arcturus Sub became a wholly-owned and direct subsidiary of the Company. This distribution was completed in connection with a liquidation of Arcturus Israel which was formally initiated after the redomiciliation described above.

On October 30, 2019, the Company amended its loan agreement with Western Alliance Bank. See *"Note 5. Long-term debt with Western Alliance Bank"* for further information.

See *"Note 6 Stockholders' Equity – Registered Direct Offerings"* for further information on the Company's recent registered direct offerings.

Segment Information

Operating segments are identified as components of an enterprise about which separate discrete financial information is available for evaluation by the chief operating decision-maker in making decisions regarding resource allocation and assessing performance. The Company and its chief operating decision-maker view the Company's operations and manage its business in one operating segment, which is the research and development of medical applications for the Company's nucleic acid-focused technology.

Revenue Recognition

Effective January 1, 2019, the Company adopted *Accounting Standards Update ("ASU") 2014-09, Revenue from Contracts with Customers (Topic 606)*, or Topic 606, using the modified retrospective transition method. Topic 606 provides a unified model to determine how revenue is recognized and the Company applied the standard to collaborative research and technology agreements that were in progress as of the effective date, January 1, 2019. The Company determines revenue recognition for arrangements within the scope of Topic 606 by performing the following five steps: (i) identify the contract; (ii) identify the performance obligations in the

contract; (iii) determine the transaction price; (iv) allocate the transaction price to the performance obligations in the contract; and (v) recognize revenue when, or as, the company satisfies a performance obligation.

The terms of the Company's collaborative research and development agreements include license fees, upfront payments, milestone payments when and if certain research or technology transfer milestones are achieved, development milestones and reimbursement for research and development activities, option exercise fees, other contingent payments for the achievement of defined collaboration objectives and certain preclinical, clinical, regulatory and sales-based events, as well as royalties on sales of commercialized products. Arrangements that include upfront payments are recorded as deferred revenue upon receipt or when due and may require deferral of revenue recognition to a future period until the Company performs obligations under these arrangements. The Company records research funding as accounts receivable when the right to consideration is unconditional. The event-based milestone payments represent variable consideration, and the Company uses the most likely amount method to estimate this variable consideration because the Company will either receive the milestone payment or will not, which makes the potential milestone payment a binary event. The most likely amount method requires the Company to determine the likelihood of earning the milestone payment. Given the high degree of uncertainty around achievement of these milestones, the Company determines the milestone amounts to be fully constrained and does not recognize revenue until the uncertainty associated with these payments is resolved. The Company will recognize revenue from sales-based royalty payments when or as the sales occur. The Company will re-evaluate the transaction price in each reporting period as uncertain events are resolved and other changes in circumstances occur.

A performance obligation is a promise in a contract to transfer a distinct good or service to the collaborative partner and is the unit of account in Topic 606. A contract's transaction price is allocated to each distinct performance obligation based on relative standalone selling price and recognized as revenue when, or as, the performance obligation is satisfied. Under Topic 606, the Company elected to use the practical expedients permitted related to adoption, which does not require the Company to disclose certain information regarding certain remaining performance obligations as of the end of the reporting period. Topic 606 is applicable for revenue recognized in accordance with the practical expedient for measuring progress toward satisfaction of a performance obligation, and variable consideration classified as a sales-based or usage-based royalty promised in exchange for a license.

See "*Note 2, Collaboration Revenue*" for specific details surrounding the Company's collaboration arrangements.

Leases

In February 2016, the FASB issued ASU 2016-02, Leases (Topic 842), which requires lessees to recognize most leases on the balance sheet as lease liabilities with corresponding right-of-use assets and to disclose key information about leasing arrangements. The Company adopted Topic 842 on its effective date in the first quarter of 2019 using a modified retrospective approach. The Company elected the available package of practical expedients upon adoption, which allowed it to carry forward historical assessments of whether existing agreements contained a lease and the classification of existing operating leases. The Company continues to report its financial position as of December 31, 2018 under the former lease accounting standard (Topic 840) in the condensed consolidated balance sheet.

The adoption impact was due to the recognition of an operating lease liability with a corresponding right-of-use asset based on the present value of remaining minimum lease payments. A reduction of the right-of-use asset was recorded to reflect the balance of the deferred rent obligation and there was no impact to retained earnings.

Research and Development, Net

Research and development costs are expensed as incurred. These expenses result from the Company's independent research and development efforts as well as efforts associated with collaboration arrangements. Research and development costs include salaries and personnel-related costs, consulting fees, fees paid for contract research and manufacturing services, the costs of laboratory supplies, equipment and facilities, preclinical studies and other external costs are shown net of any grants.

Cystic Fibrosis Foundation

On August 1, 2019, the Company amended its Development Program Letter Agreement, dated May 16, 2017 and as amended July 13, 2018, with the Cystic Fibrosis Foundation ("CFF"). Pursuant to the amendment, (i) CFF will increase the amount it will award to advance LUNAR-CF to $15.0 million from approximately $3.2 million, (ii) the Company will provide $5.0 million in matching funds for remaining budgeted costs, (iii) the related disbursement schedule from CFF to Arcturus will be modified such that (a) $4.0 million will be disbursed upon execution of the CFF Amendment, (b) $2.0 million will be disbursed within 30 days of the first day of each of January, April, July and October 2020 upon Arcturus invoicing CFF to meet project goals, and (c) the last payment of $3.0 million less the prior award previously paid out, equaling approximately $2.3 million, will be disbursed upon Arcturus Sub invoicing CFF to meet good manufacturing practices and opening an Investigational New Drug ("IND") application. The funds received from CFF will be recognized as contra research and development expense in proportion to the percentage covered by CFF of the overall budget. For the three months ended September 30, 2019, the Company recognized $0.7 million of contra expense with $3.3 million remaining in accrued expenses.

Statement of Cash Flows

The following table provides a reconciliation of cash and cash equivalents and restricted cash reported within the condensed consolidated balance sheet to the total of the same such amounts shown in the condensed consolidated statement of cash flows:

(in thousands)	September 30, 2019	September 30, 2018
Cash and cash equivalents	$ 74,172	$ 30,331
Non-current restricted cash	107	107
Total cash, cash equivalents and restricted cash shown in the statement of cash flows	$ 74,279	$ 30,438

Net Loss per Share

Basic net loss per share is calculated by dividing the net loss by the weighted-average number of shares of common stock outstanding for the period, without consideration for common stock equivalents. Diluted net loss per share is calculated by dividing the net loss by the weighted-average number of shares of common stock and dilutive common stock equivalents outstanding for the period determined using the treasury-stock method. Dilutive shares of common stock are comprised of stock options.

No dividends were declared or paid during the reported periods.

Recently Adopted Accounting Pronouncements

Revenue from Contracts with Customers

In May 2014, the Financial Accounting Standards Board (FASB) issued Topic 606, which supersedes nearly all existing revenue recognition guidance under GAAP. The FASB subsequently issued amendments to Topic 606 that have the same effective date and transition date.

The Company adopted this new guidance, effective January 1, 2019, using the modified retrospective transition method, in which the standard is applied as of the date of initial adoption. The Company recorded the cumulative effect of initially applying the standard as an adjustment to the opening balance of accumulated deficit. The adoption of the new revenue recognition guidance resulted in an increase of $0.8 million to deferred revenue and an increase of $0.8 million to accumulated deficit as of January 1, 2019. The change in revenue was due to a change in how the Company accounts for changes in the measure of progress and changes to the transaction price and for the recognition of revenue. Under Topic 605, the Company accounted for changes to the measure of progress and changes to the transaction price prospectively. Topic 606 requires companies to account for a change to the measure of progress or a change to the transaction price as a cumulative catch-up in the period of change. There were no other impacts upon the adoption of Topic 606. The Company will apply the standard to all new contracts initiated on or after the effective date.

Leases

In February 2016, the FASB issued ASU 2016-02, *Leases (Topic 842)* in order to increase transparency and comparability among organizations by recognizing lease assets and lease liabilities on the balance sheet for those leases classified as operating leases under previous GAAP. ASU 2016-02 requires a lessee to recognize a liability for lease payments (the lease liability) and a right-of-use asset (representing its right to use the underlying asset for the lease term) on the balance sheet. ASU 2016-02 is effective for fiscal years beginning after December 15, 2018 (including interim periods within those periods) using a modified retrospective approach.

In July 2018, the FASB issued ASU 2018-11, *Leases (Topic 842): Targeted Improvements*, which provides entities an optional transition method to apply the new guidance as of the adoption date, rather than as of the earliest period presented. In transition, entities may also elect a package of practical expedients that must be applied in its entirety to all leases commencing before the effective date, unless the lease was modified, to not reassess (a) the existence of a lease, (b) lease classification or (c) determination of initial direct costs, which effectively allows entities to carryforward accounting conclusions under previous U.S. GAAP.

The Company adopted ASU 2016-02, using the optional transition method and electing the package of practical expedients described above on January 1, 2019. Due to the adoption, the Company recognized a new lease liability on the Company's consolidated balance sheet for its operating lease of office and lab space of $6.4 million on January 1, 2019, with a corresponding right-of-use asset of $5.9 million based on the present value of the remaining minimum lease payments. See Note 8 for further discussion.

Note 2. Collaboration Revenue

The Company has entered into license agreements and collaborative research and development arrangements with pharmaceutical and biotechnology companies. Under these arrangements, the Company is entitled to receive license fees, upfront payments, milestone payments when and if certain research or technology transfer milestones are achieved, development milestones, reimbursement for research and development activities, option exercise fees, other contingent payments for the achievement of defined collaboration objectives and certain preclinical, clinical, regulatory and sales-based events, as well as royalties on sales of commercialized products. The Company's costs of performing these services are included within research and development expense. The Company's milestone payments are typically defined by achievement of certain preclinical, clinical, and commercial success criteria. Preclinical milestones may include in vivo proof of concept in disease animal model(s), lead candidate identification, and completion of IND-enabling studies. Clinical milestones may include successful enrollment of the first or second patient in or completion of Phase I, II, and III clinical trials, and commercial revenue is often tiered based on net or aggregate sale amounts. The Company cannot guarantee the achievement of these milestones due to risks associated with preclinical and clinical activities required for development of nucleic acid medicine-based therapeutics.

The following table presents changes during the nine months ended September 30, 2019 in the balances of contract assets, including receivables from collaborative partners, and contract liabilities, including deferred revenue, as compared to what was disclosed in the Company's Annual Report.

(in thousands)	Contract Assets
BALANCE - December 31, 2018	$ 4,480
Additions for revenue billings	16,524
Deductions for cash collections	(18,379)
BALANCE – September 30, 2019	$ 2,625

(in thousands)	Contract Liabilities
BALANCE - December 31, 2018	$ 13,806
Additions for advanced billings	29,136
Additions resulting from adoption of Topic 606	803
Deductions for promised goods/services provided in current period	(18,195)
BALANCE – September 30, 2019	$ 25,550

The following table summarizes the Company's collaboration revenues for the periods indicated (in thousands).

	For the Three Months Ended September 30,		For the Nine Months Ended September 30,	
(Dollars in thousands)	2019	2018	2019	2018
Collaboration Partner - Janssen	$ 966	$ 291	$ 2,101	$ 638
Collaboration Partner - Ultragenyx	922	1,789	4,854	4,495
Collaboration Partner - Takeda	224	302	518	905
Collaboration Partner - CureVac	1,057	314	6,360	772
Other	149	727	3,988	1,366
Total collaboration revenue	$ 3,318	$ 3,423	$ 17,821	$ 8,176

The following paragraphs provide information regarding the nature and purpose of the Company's most significant collaboration arrangements.

Collaboration Partner – Janssen

In October 2017 the Company entered into a research collaboration and license agreement with Janssen (the "2017 Agreement"). The 2017 Agreement allocated discovery, development, funding obligations, and ownership of related intellectual property among the Company and Janssen. The Company received an upfront payment of $7.7 million and may receive preclinical, development and sales milestone payments of $56.5 million, as well as royalty payments on any future licensed product sales. Janssen began reimbursing the Company for research costs during the first quarter of 2019 upon the completion of the first of three research periods. Janssen may also pay option exercise fees within the $1.0 million to $5.0 million range per target. Janssen will pay royalties on annual net sales of licensed products in the low to mid-single digits range, subject to reduction on a country-by-country and licensed-product-by-licensed-product basis and subject to certain events, such as expiration of program patents. In addition, the 2017 Agreement includes an exclusivity period.

Accounting Analysis under ASC 606

In evaluating the 2017 Agreement in accordance with ASC Topic 606, the Company concluded that the contract counterparty, Janssen, is a customer. The Company identified the following promised goods/services as of the inception of the Agreement: (i) research services, (ii) license to use Arcturus technology and (iii) participation in the Joint Research Committee. The Company concluded that the promised goods/services are incapable of being distinct and consequently do not have any value on a standalone basis. Accordingly, they are determined to represent a single performance obligation. The Company concluded that Janssen's options to select additional collaboration targets and to license rights to selected targets are not priced at a discount and therefore do not represent performance obligations for which the transaction price would be allocated.

As of September 30, 2019, the remaining transaction price of $23.6 million, consisting of upfront consideration received and budgeted reimbursable out-of-pocket costs, is expected to be recognized using an input method over the remaining research period of 18 months. None of the development and commercialization milestones were included in the transaction price, as all milestone amounts were not estimated to be met, are outside the control of the Company and contingent upon success in future clinical trials and the collaborator's efforts. Any consideration related to sales-based royalties will be recognized when the related sales occur, provided that the reported sales are reliably measurable, and the Company has no remaining promised goods/services, as such sales were determined to relate predominantly to the license granted to Janssen and therefore have also been excluded from the transaction price. For the three and nine months ended September 30, 2019, an adjustment of $0.3 million was made to the transaction price.

Total deferred revenue as of September 30, 2019 and December 31, 2018 for Janssen was $6.1 million and $6.5 million, respectively. No transition adjustment was necessary upon adoption of Topic 606.

Collaboration Partner – Ultragenyx

In October 2015 the Company entered into a research collaboration and license agreement with Ultragenyx (the "Ultragenyx Agreement"), whereby Arcturus granted to Ultragenyx a co-exclusive license under Arcturus technology and shall be in effect only during the reserve target exclusivity term as discussed in the following paragraphs. This collaboration agreement was amended in 2017, 2018 and during the second quarter of 2019. During the initial phase of the collaboration, the Company will design and optimize therapeutics for certain rare disease targets. Ultragenyx has the option under the Ultragenyx Agreement to add additional rare disease targets during the collaborative development period. Additionally, during the collaborative development period, the Company will participate with Ultragenyx in a joint steering committee. The Ultragenyx Agreement also includes an initial exclusivity period with an option to extend this period.

As part of the Ultragenyx Agreement and related amendments, Ultragenyx has paid $27.9 million in upfront fees, exclusivity extension fees and additional consideration. Ultragenyx also reimburses the Company for all internal and external development costs incurred, pursuant to the Ultragenyx Agreement, is required to make additional payments upon exercise of the Ultragenyx expansion option or exclusivity extension (if any) and if Ultragenyx achieves certain, clinical, regulatory and sales milestones, then the Company is eligible to receive royalty payments. For each development target for which Ultragenyx exercises its option, Ultragenyx will pay the Company a one-time option exercise fee that increases based upon the number of development targets selected by Ultragenyx from $0.5 million to $1.5 million.

The current potential development, regulatory and commercial milestone payments for the existing development targets as of September 30, 2019 are $138.0 million. Ultragenyx will pay royalties as a single-digit percentage of net sales on a product-by-product and country-by-country basis during the applicable royalty term. As of September 30, 2019, the Company has not yet reached the clinical phase of the contract.

On June 18, 2019, Arcturus and Ultragenyx amended the collaboration agreement for a third time (“Amendment 3”). As part of Amendment 3, the total number of targets was increased from 10 to 12, and reserve targets will be exclusively reserved for Ultragenyx with no fees for four years after execution of the amendment. An equity component was also added as part of Amendment 3 wherein Ultragenyx purchased 2.4 million shares of common stock at a premium price. Along with the equity purchase, Ultragenyx received the option to purchase 0.6 million additional shares of common stock at $16 per share within two years of executing the amendment (Note 6).

The consideration received from Ultragenyx as a result of Amendment 3 was equal to $30.0 million and was comprised of a $24.0 million common stock purchase and a $6.0 million upfront payment. Specifically for Amendment 3, management determined the transaction price to be $14.4 million, comprised of $6.0 million from the upfront payment and $8.4 million from the premium paid by Ultragenyx for the purchase of Arcturus common stock. See further discussion below regarding determining the transaction price. Management determined the fair value of the premium received by using the opening stock price subsequent to execution of Amendment 3 and applying a lack of marketability discount as the shares received by Ultragenyx are restricted for two years.

Accounting Analysis under ASC 606

In evaluating the Ultragenyx agreement in accordance with ASC Topic 606, the Company concluded that the contract counterparty, Ultragenyx, is a customer. The Company has identified the following promised goods/services as part of the initial agreement and subsequent amendments: (i) research services, (ii) license to use Arcturus technology, (iii) exclusivity and (iv) participation in the Joint Steering Committee. The Company concluded that the promised goods/services are incapable of being distinct and consequently do not have any value on a standalone basis. Accordingly, they are determined to represent a single performance obligation. The Company concluded that Ultragenyx’s options to extend exclusivity and options to select additional collaboration targets and to license rights to selected targets are not priced at a discount and therefore do not represent performance obligations for which the transaction price would be allocated.

At September 30, 2019, the transaction price included the upfront consideration received, exclusivity extension payments and additional consideration received pursuant to Amendment 3. The Company recognizes the reimbursement of labor and expenses as costs are incurred and none of the development and commercialization milestones were included in the transaction price, as all milestone amounts were fully constrained. As part of its evaluation of the constraint, the Company considered numerous factors, including that the consideration is outside the control of the Company and contingent upon success in future clinical trials, approval from the Food and Drug Administration and the collaborator’s efforts. Any consideration related to sales-based royalties will be recognized when the related sales occur as they are constrained, provided that the reported sales are reliably measurable and the Company has no remaining promised goods/services, as such sales were determined to relate predominantly to the license granted to Ultragenyx and therefore have also been excluded from the transaction price.

Amendment 3 was deemed a contract modification and accounted for as part of the original Ultragenyx Agreement and the Company recorded a cumulative catch-up adjustment of $1.1 million on the modification date. The transaction price will be recognized to revenue on a straight-line basis using an input method over the 4-year reserve target exclusivity period. The reserve target exclusivity period represents the timing over which promised goods/services will be provided. Total deferred revenue as of September 30, 2019 and December 31, 2018 from Ultragenyx was $13.6 million and $2.7 million, respectively.

Upon adoption of Topic 606, the Company reversed $0.8 million of previously recorded revenue related to Ultragenyx through an increase to deferred revenue and a decrease to beginning retained earnings. The adjustment was due to a change in the way the Company accounts for updates to the period over which revenue is recognized as well as accounting for adjustments to the transaction price. Under Topic 605, the Company accounted for these changes prospectively and under Topic 606 the Company accounts for the changes as a change in estimate recorded as a cumulative catch-up in the period in which the change occurred.

Collaboration Partner – CureVac

In January 2018, the Company entered into a Development and Option Agreement with CureVac, (the "Development and Option Agreement"). Under the terms of the Development and Option Agreement, the parties agreed to conduct joint preclinical development programs once CureVac makes a payment to pull down a target on the basis of which CureVac is granted options for taking a license on pre-agreed license terms to develop and commercialize certain products incorporating the Company's patents and know-how related to delivery technology (the LUNAR® platform) (the "Arcturus Delivery Technology"), and CureVac patents and know-how related to mRNA technology. Subject to certain restrictions, the parties will have an undivided one-half interest in the patents and know-how developed jointly by the parties during the course of the Development and Option Agreement. Pursuant to the terms of the Development and Option Agreement, CureVac will have a number of target options to co-develop from a reserved target list to enter into licenses under the Arcturus Delivery Technology with respect to the development, manufacture and commercialization of licensed products (which can include products identified for development by the Company unless the Company is permitted by the terms of the Development and Option Agreement to place such products on a restricted list). A separate notice and fee will be required for each license agreement. If the target to which the license agreement relates is chosen by the parties for co-development under the Co-Development Agreement (which is defined below and discussed in the following paragraph) the license agreement will terminate as such programs will be covered under the Co-Development Agreement discussed below, and therefore CureVac will be given a credit for any exercise fees, milestone payments already paid and all other payments made in relation to the license agreement towards future such payments incurred with respect to future licenses under the Arcturus Delivery Technology.

Prior to expiration of the initial term of 8 years (which was subsequently amended, as discussed below), the Agreement also includes an option to extend the term on an annual basis for up to 3 years and subject to payment by CureVac to Arcturus of a non-refundable annual extension fee. The agreement included potential milestone payments for selected targets from CureVac to the Company. The current potential milestone payment for the remaining target as of September 30, 2019 is $14.0 million for rare disease targets and $23.0 million for non-rare disease targets. CureVac will pay royalties as a percentage of net sales on a product-by-product and country-by-country basis during the applicable royalty term in the low single-digit range. As of September 30, 2019, the Company has not yet reached the clinical phase of the contract. Pursuant to a May 2018 amendment to the Development and Option Agreement (as amended and restated on September 28, 2018), the Company increased the number of targets available to CureVac under the Development and Option Agreement and agreed upon the license forms to be executed upon selection of the targets by CureVac.

Concurrently with the Development and Option Agreement, the Company entered into a Co-Development and Co-Commercialization Agreement (the "Co-Development Agreement") which the Company considered a combined contract with the Development and Option Agreement for purposes of revenue recognition. However, on February 11, 2019, the Company announced the termination of the obligations of CureVac for the preclinical development of ARCT-810, effective 180 days from February 5, 2019 and the re-assumption by the Company of the worldwide rights thereto. As a result, Arcturus will reassume 100% global rights for its flagship asset, clinical development candidate ARCT-810, a messenger RNA (mRNA) drug to treat ornithine transcarbamylase deficiency.

On July 26, 2019, the Company entered into an amendment ("CureVac Amendment") to its Development and Option Agreement (as amended, the "Development and Option Agreement"), with CureVac, pursuant to which the Company and CureVac agreed to (i) shorten the time period during which CureVac may select potential targets to be licensed from the Company from eight years to four years, and (ii) reduce the overall number of maximum targets to be reserved and licensed.

In connection with the CureVac Amendment, the Company and CureVac also entered into a Termination Agreement (the "Termination Agreement") terminating the Co-Development Agreement between the Company and CureVac dated as of January 1, 2018. The Termination Agreement is effective as of July 26, 2019. Pursuant to the Termination Agreement, CureVac agreed to make a one-time payment to Arcturus in the amount of $4.0 million. The payment was made in July 2019.

Accounting Analysis under ASC 606

In evaluating the CureVac Development and Option Agreement and Co-Development Agreement in accordance with ASC Topic 606, the Company concluded that the contract counterparty, CureVac, is a customer. The Company has identified the following promised goods/services as part of the initial agreement with CureVac and subsequent amendments: (i) research services, (ii) license to use Arcturus technology, (iii) exclusivity and (iv) participation in the Joint Steering Committee. The Company concluded that the promised goods/services are incapable of being distinct and consequently do not have any value on a standalone basis. Accordingly, they are determined to represent a single performance obligation. The Company concluded that CureVac's options to extend the research term and options to select additional collaboration targets and to license rights to selected targets are not priced at a discount and therefore do not represent performance obligations for which the transaction price would be allocated.

At September 30, 2019, the transaction price included the $5.0 million upfront consideration received. The Company recognizes the reimbursement of labor and expenses as costs are incurred and none of the development and commercialization milestones were included in the transaction price, as all milestone amounts were fully constrained. As part of its evaluation of the constraint, the Company considered numerous factors, including that receipt of the milestones is outside the control of the Company and contingent

upon success in future clinical trials and the collaborator's efforts. Any consideration related to sales-based royalties will be recognized when the related sales occur as they are constrained, provided that the reported sales are reliably measurable and the Company has no remaining promised goods/services, as such sales were determined to relate predominantly to the license granted to CureVac and therefore have also been excluded from the transaction price. For the three and nine months ended September 30, 2019, no adjustments were made to the transaction price.

The transaction price of $5.0 million was recorded as deferred revenue in the Company's balance sheet upon receipt and is currently being recognized as revenue on a straight-line basis using an input method over the amended forty-six month contractual term as of September 30, 2019. As a result of Amendment 3, the Company recorded a cumulative catch up adjustment of $0.4 million on the modification date, July 26, 2019. Total deferred revenue as of September 30, 2019 and December 31, 2018 for CureVac was $3.4 million and $4.4 million, respectively. No adjustment was necessary upon adoption of Topic 606.

Other Collaboration Revenue

The $4.0 million of other collaboration revenue for the nine months ended September 30, 2019 was primarily related to the Research and Exclusive License Agreement with Synthetic Genomics, Inc. ("SGI") into which the Company entered during October 2017. Under the agreement, the Company granted SGI an exclusive license for the Arcturus LMD Technology to research, develop and sell products for diseases excluding all respiratory disease viruses other than influenza. Revenue related to this agreement is made up of labor reimbursements and sublicense revenue. The Company recognized a sublicense revenue amount of $3.3 million for the nine months ended September 30, 2019 whereby SGI sublicensed to multiple parties.

Note 3. Fair Value Measurements

The Company establishes the fair value of its assets and liabilities using the price that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date. The Company establishes a fair value hierarchy based on the inputs used to measure fair value.

The three levels of the fair value hierarchy are as follows:

Level 1: Quoted prices in active markets for identical assets or liabilities.

Level 2: Inputs, other than the quoted prices in active markets, that are observable either directly or indirectly.

Level 3: Unobservable inputs in which little or no market data exists and are therefore determined using estimates and assumptions developed by the Company, which reflect those that a market participant would use.

The carrying value of cash, restricted cash, accounts receivable, accounts payable, and accrued liabilities approximate their respective fair values due to their relative short maturities. The carrying amounts of long-term debt for the amount drawn on the Company's debt facility approximates fair value as the interest rate is variable and reflects current market rates.

As of September 30, 2019 and December 31, 2018, all assets measured at fair value on a recurring basis consisted of cash equivalents, money market funds, which were classified within Level 1 of the fair value hierarchy. The fair value of these financial instruments was measured based on quoted prices.

Note 4. Balance Sheet Details

Prepaid expenses and other current assets consisted of the following as of September 30, 2019 and December 31, 2018:

(in thousands)	September 30, 2019	December 31, 2018
Prepaid expenses	$ 2,578	$ 546
Other current assets	33	92
Total	$ 2,611	$ 638

Property and equipment, net for the same periods consisted of the following:

(in thousands)	September 30, 2019	December 31, 2018
Research equipment	$ 3,235	$ 2,711
Computers and software	271	200
Office equipment and furniture	561	527
Leasehold improvements	34	34
Total	4,101	3,472
Less accumulated depreciation and amortization	(2,028)	(1,497)
Property and equipment, net	$ 2,073	$ 1,975

Depreciation and amortization expense was $0.2 million and $0.2 million for the three months ended September 30, 2019 and 2018, respectively, and $0.5 million and $0.4 million for nine months ended September 30, 2019 and 2018, respectively.

Accrued liabilities consisted of the following as of September 30, 2019 and December 31, 2018:

(in thousands)	September 30, 2019	December 31, 2018
Accrued compensation	$ 1,979	$ 974
Cystic Fibrosis Foundation Liability (Note 1)	3,336	—
Refundable fees received	—	2,259
Current portion of operating lease liability	801	—
Other accrued liabilities	560	674
Total	$ 6,676	$ 3,907

Note 5. Debt

Long-term debt with Western Alliance Bank

On October 12, 2018, the Company entered into a Loan and Security Agreement with Western Alliance Bank (the “Bank”) whereby the Company received gross proceeds of $10.0 million under a long-term debt agreement (the “Loan”). The Loan has a maturity date of October 1, 2022 and carries interest at the U.S. prime rate plus 1.25%. The loan has an interest-only period of 19 months, which could be extended by an additional 6 months if certain conditions are met, followed by an amortization period of 30 months, or 24 months if the interest-only period is extended.

The Company paid a loan origination fee of $128,000 which was recorded as a debt discount and is being accreted over the term of the Loan. In addition, the Company is required to pay a fee of $350,000 upon certain change of control events.

Upon maturity or prepayment, the Company will be required to pay a 3% fee, or a 2% fee if the U.S. Food and Drug Administration accepts certain IND applications prior to maturity. Because acceptance of an IND is outside of the Company’s control, management estimated that the Company will be liable for a fee of 3% of the principal balance, or $300,000 upon repayment or maturity, and such fee is accreted to the debt balance using the effective interest method over the term of the Loan.

The Loan is collateralized by all of the assets of the Company, excluding intellectual property, which is subject to a negative pledge. The Loan contains customary conditions of borrowing, events of default and covenants, including covenants that restrict the Company’s ability to dispose of assets, merge with or acquire other entities, incur indebtedness and make distributions to holders of the Company’s capital stock. In addition, the Company is required to maintain at least 50% of its deposit and investment accounts, or $20 million, whichever is lower, with Western Alliance Bank.

The Loan also includes covenants which include the Company’s (1) nomination of a clinical candidate by December 31, 2018, which the Company is in compliance with, and (2) submission of a clinical candidate for IND application, made to the U.S. Food and Drug Administration by December 31, 2019 and have it approved by January 31, 2020, provided that, if the Company has received net cash proceeds from sale, on or after October 12, 2018, of the Company’s equity securities in an amount of not less than $15,000,000, then the IND submission date shall be extended to May 31, 2020 and the approval date shall be extended to June 30, 2020. As a result of the equity purchase by Ultragenyx of 2.4 million shares of common stock (previously discussed at Note 2), the IND submission date and approval date have been extended to May 31, 2020 and June 30, 2020, respectively.

Should an event of default occur, including the occurrence of a material adverse effect, the Company could be liable for immediate repayment of all obligations under the Loan. As of September 30, 2019, the Company is in compliance with all covenants and conditions of the Loan.

On October 30, 2019, Arcturus Therapeutics, Inc. (the "Borrower"), a wholly-owned subsidiary of the Company and the Bank entered into a Third Amendment (the "Third Amendment") to the Loan and Security Agreement dated as of October 12, 2018 (as amended, the "Loan Agreement").

Pursuant to the amendment, the Bank agreed to make a term loan to the Company on October 30, 2019, in the amount of $15 million (the "Term Loan"). After repaying $10 million for the Loan the Company owed to the Bank, the resulting net increase in the indebtedness of the Company was $5 million. The Term Loan bears interest at a floating rate ranging from 1.25% to 2.75% above the prime rate. The amendment further provides that the Term Loan has a maturity date of October 30, 2023. The Company shall make monthly payments of interest only until the interest-only end date of April 1, 2021, which is subject to extension to October 1, 2021 upon the occurrence of an equity or expansion event and the absence of an event of default, and thereafter shall make monthly payments of principal and interest during a 30-month amortization period.

The Term Loan may be prepaid in full at any time, provided that a prepayment fee is required to be paid by the Company upon prepayment. The prepayment fee ranges from 0.50% to 2.00% of the prepaid principal amount depending upon the date on which the prepayment is made. In connection with the Third Amendment, the Company guaranteed the Borrower's obligations under the Loan Agreement and pledged substantially all of its assets as security under the Loan Agreement.

The amendment also modified the Company's covenants to extend the dates by which a selected IND must be submitted and by which the U.S. Food and Drug Administration or equivalent authority must accept the IND, and also required the Company to maintain the lesser of (i) all of its total consolidated and unrestricted cash in total deposits with the Bank or (ii) $15 million in total deposits with the Bank.

Note 6. Stockholders' Equity

Registered Direct Offerings

In July and September of 2019, the Company entered into engagement letters with H.C. Wainwright & Co., LLC (the "Placement Agent") relating to registered direct offerings of common stock to certain institutional investors. Pursuant to each letter agreement, the Company agreed to pay the Placement Agent a cash fee of 6.0% of the gross proceeds from each offering and reimburse the cost of expenses.

In connection therewith, on August 1, 2019, August 2, 2019 and September 26, 2019, the Company and certain Investors entered into securities purchase agreements relating to the issuance and sale of shares of common stock. The purchase price per share for each share offered in the offerings was $11.50. The aggregate gross proceeds of the offerings were $23.0 million for an aggregate of 1,995,653 shares of common stock.

The net proceeds to the Company from the Offering, after deducting Placement Agent fees and the Company's estimated offering expenses, were approximately $21.3 million. The Offerings closed on August 5, 2019 and September 30, 2019, respectively.

The offer and sale of the common stock was registered under the Securities Act of 1933, as amended (the "Securities Act"), on the Company's Registration Statement on Form S-3 (Registration No. 333-232281), previously filed with the Securities and Exchange Commission and declared effective on July 29, 2019.

Equity Purchase Agreement

On June 18, 2019, the Company entered into an Equity Purchase Agreement (the "Expanded Ultragenyx Agreement") with Ultragenyx. Pursuant to the terms of the Expanded Ultragenyx Agreement, the Company sold an aggregate of 2,400,000 shares of common stock, par value $0.001 per share ("Common Stock") at a price of $10.00 per share to Ultragenyx on June 19, 2019. Pursuant to the Expanded Ultragenyx Agreement, the Company also granted Ultragenyx a two-year option (the "Option") to purchase up to 600,000 additional shares of Common Stock at a price of $16.00 per share.

The Option to purchase additional shares of Common Stock may not be exercised if Ultragenyx's ownership of the Company's common stock would exceed 19.99% of the Company's total shares outstanding following such exercise. The option was recorded as a component of stockholders' equity within additional paid-in capital.

Pursuant to the terms of the Expanded Ultragenyx Agreement, until the later of (i) the first anniversary of the closing date or (ii) the date on which Ultragenyx beneficially owns less than 8.0% of the total voting power of the Company, at each annual stockholders meeting or any stockholders meeting at which members of the board of directors (the "Board") are to be elected, the Company must nominate one director designated by Ultragenyx (the "Ultragenyx Designee"). Additionally, the Ultragenyx Designee has the contractual right to be appointed to all Board committees (subject to applicable NASDAQ rules). Ultragenyx also has the right to have a designee attend Board meetings as a non-voting observer.

In connection with the Expanded Ultragenyx Agreement, the Company and Ultragenyx entered into a Registration Rights Agreement (the "Registration Rights Agreement"). The Registration Rights Agreement requires the Company to file a registration statement providing for the resale of the shares within 180 days of June 18, 2019, and provides Ultragenyx with certain "piggy-back" registration rights with respect to registration statements that the Company may file.

Restricted Common Shares

In March 2013, the founders of the Company purchased 2,783,686 shares of common stock for $0.0068 per share. Of the shares purchased, 1,538,353 were subject to a repurchase option whereby the Company has an option for two months after date of termination of service to repurchase any or all of the unvested shares at the original purchase price per share. The repurchase option shall be deemed to be automatically exercised by the Company as of the end of the two-month period unless the Company notifies the purchaser that it does not intend to exercise its option. The shares will be vested (1) 25% after obtaining suitable siRNA license; (2) 25% after *in vivo* proof-of-concept achieved; (3) 25% after a regulatory agency new drug application (such as an Investigational New Drug application) is filed and accepted by the applicable regulatory agency; and (4) 25% after human biological proof-of-concept is achieved. The Company met the first two milestones during 2013 and 2014 leaving an unvested balance of 769,176 shares. In 2017, the stock purchase agreements were amended to clarify vesting conditions and also to accelerate the vesting of 146,510 shares resulting in a modification expense of $1,495,000. As of September 30, 2019 and 2018, there were 622,667 shares of common stock unvested and subject to the repurchase option.

Net Loss per Share

Dilutive securities that were not included in the calculation of diluted net loss per share for the three and nine months ended September 30, 2019 as they were anti-dilutive totaled 166,921 and 96,615, respectively, and 98,000 and 91,000 for the three and nine months ended September 30, 2018, respectively.

For the three and nine months ended September 30, 2019 and 2018, the calculation of the weighted-average number of shares outstanding excludes unvested restricted shares of common stock of 622,667.

Note 7. Share-Based Compensation

In August 2018, the Company adopted the 2018 Omnibus Equity Incentive Plan ("2018 Plan"). Under the 2018 Plan, the Company is authorized to issue up to a maximum of 1,100,000 shares of common stock pursuant to the exercise of incentive stock options or other awards provided for therein. As of September 2019, the Company issued a certain number of options to purchase common stock to a group of employees as well as options to purchase a total of 243,750 shares of common stock to certain executives. The Company also issued options to purchase a total of 130,000 shares of common stock to the non-executive members of the Company's board of directors. In June 2019, the Company adopted the 2019 Omnibus Equity Incentive Plan ("2019 Plan"), which was ratified by the Stockholders at the Company's annual meeting on October 25, 2019. Under the 2019 Plan, the Company is authorized to issue up to a maximum of 2,600,000 shares of common stock pursuant to the exercise of incentive stock options or other awards provided for therein. In connection with the Redomiciliation, all outstanding options to purchase shares in Arcturus Israel under the above described plans were exchanged for an option to purchase the same number of shares of the Company's common stock under the 2019 Plan. Accordingly, as of September 30, 2019, a total of 1,233,707 shares remain available for future issuance under the 2019 Plan, and no further shares will be issued under the 2018 Plan.

Stock Options

Share-based compensation expenses included in the Company's condensed statements of operations and comprehensive loss for the three and nine months ended September 30, 2019 and 2018 were:

	For the Three Months Ended September 30,		For the Nine Months Ended September 30,	
(in thousands)	**2019**	**2018**	**2019**	**2018**
Research and development	$ 158	$ 286	$ 466	$ 315
General and administrative	225	301	719	438
Total	$ 383	$ 587	$ 1,185	$ 753

Share-based compensation expense for the three and nine months ended September 30, 2019 excludes expense related to options granted to the Chief Executive Officer and Chief Financial Officer as the option grants are subject to shareholder approval which was ratified at the Company's annual meeting on October 25, 2019.

Note 8. Leases

In October 2017, the Company entered into a non-cancellable operating lease agreement for office space adjacent to its previously occupied headquarters. The commencement of the lease began in March 2018 and the lease extends for approximately 84 months from the commencement date with a remaining lease term of six years. Monthly rental payments are due under the lease and there are escalating rent payments during the term of the lease. The Company is also responsible for its proportional share of operating expenses of the building and common areas. In conjunction with the new lease, the Company received free rent for four months and received a tenant improvement allowance of $74,000. The lease may be extended for one five-year period at the then current market rate with annual escalations; however, the Company deemed the extension option not reasonably certain to be exercised and therefore excluded the option from the lease terms. The Company entered into an irrevocable standby letter of credit with the landlord for a security deposit of $96,000 upon executing the lease which is included (along with additional funds required to secure the letter of credit) in the balance of non-current restricted cash.

Operating lease right-of-use asset and liability on the condensed consolidated balance sheets represent the present value of remaining lease payments over the remaining lease terms. The Company does not allocate lease payments to non-lease components; therefore, payments for common-area-maintenance and administrative services are not included in the operating lease right-of-use asset and liability. The Company uses its incremental borrowing rate to calculate the present value of the lease payments, as the implicit rate in the lease is not readily determinable.

As of September 30, 2019, the payments of the operating lease liability were as follows:

(in thousands)	Remaining Lease Payments
2019 (remaining)	$ 311
2020	1,272
2021	1,310
2022	1,349
2023	1,390
Thereafter	1,745
Total remaining lease payments	7,377
Less: imputed interest	(1,511)
Total operating lease liabilities	$ 5,866
Weighted-average remaining lease term	6 years
Weighted-average discount rate	8.4%

Operating lease costs consist of the fixed lease payments included in operating lease liability and are recorded on a straight-line basis over the lease terms. Operating lease costs were $0.3 million and $0.9 million for the three and nine months ended September 30, 2019.

Note 9. Related Party Transactions

Ultragenyx

On June 17, 2019, Arcturus and Ultragenyx executed Amendment 3. In addition, as a result of the Expanded Ultragenyx Agreement, Ultragenyx owns 15.9% of the outstanding common stock of the Company as of September 30, 2019. For the three and nine months ended September 30, 2019, the Company has recognized revenue of $0.9 million and $4.9 million, respectively, and for the three and nine months ended September 30, 2018, the Company recognized revenue of $1.8 million and $4.5 million. As of September 30, 2019 and 2018, the Company holds accounts receivable balances of negligible amounts. (Note 2)

Providence

In March 2016, the Company entered into a Research Collaboration and License Agreement with a related party, Providence, whose CEO and President is also a shareholder of the Company, to identify and optimize microRNA modulators or mimetics for the treatment of neoplastic diseases. In April 2017, the Providence Agreement was amended to include mRNA for the treatment of neoplastic disease. In July 2018, the Providence Agreement was amended and restated to cover brain neoplasms, breast neoplasms and ovarian neoplasms. Each party is responsible for their own research costs under the agreement, and Providence is responsible for all development costs through the completion of Phase 2 clinical trials. The Company is entitled to share in future product revenue of each product provided the Company shares in the product's post Phase 2 costs. Separately, Providence has agreed to pay for FTEs at a specified rate. For the three and nine months ended September 30, 2019, the Company has recognized revenue of a $0.1 million and $0.4 million, respectively, and for the three and nine months ended September 30, 2018, the Company has recognized revenue of $0.4

million and $0.5 million, respectively. As of September 30, 2019, the Company holds an accounts receivable balance from Providence of $0.4 million.

Equity-Method Investment

In June 2018, the Company completed the sale of its intangible asset related to the ADAIR technology. Pursuant to the asset purchase agreement for ADAIR, the Company received a 30% ownership interest in the common stock of a privately held company in consideration for the sale of the ADAIR technology. As this ownership interest is greater than 20% and one executive of the Company holds a seat on the investee's board of directors, the Company has the ability to exercise significant influence over the operating and financial policies of this investee; therefore, the Company accounts for this investment as an equity-method investment. The Company has no requirement to invest further in this private company. The Company has recorded $0.6 million of its share of losses of the equity method investee leaving no equity investment balance as of June 30, 2019. During the third quarter of 2019, the equity method investee issued shares of its common stock at a share price greater than the initial investment which resulted in the Company recording a gain in its equity method investment. The gain was partly offset by additional losses incurred by the equity method investee resulting in a net gain of $0.3 million recorded as of September 30, 2019.

Note 10. Subsequent Events

Amendment to Long-term debt with Western Alliance Bank

See discussion of amendment at Note 5.

Item 2. Management's Discussion and Analysis of Financial Condition and Results of Operations.

The following is a discussion of the financial condition and results of operations of Arcturus Therapeutics Holdings Inc. for the three and nine-month periods ended September 30, 2019. Unless otherwise specified herein, references to the "Company," "Arcturus," "we," "our" and "us" mean Arcturus Therapeutics Holdings Inc. and its consolidated subsidiaries from and after the effective time of the Redomiciliation and, prior to that time, to our predecessor, Arcturus Therapeutics Ltd. You should read the following discussion and analysis together with the interim condensed consolidated financial statements and related notes included elsewhere herein. For additional information relating to our management's discussion and analysis of financial conditions and results of operations, please see our Annual Report on Form 10-K for the year ended December 31, 2018 (the "2018 Annual Report"), which was filed with the U.S. Securities and Exchange Commission (the "Commission") on March 18, 2019 and amended on April 10, 2019. Unless otherwise defined herein, capitalized words and expressions used herein shall have the same meanings ascribed to them in the 2018 Annual Report.

This report includes forward-looking statements which, although based on assumptions that we consider reasonable, are subject to risks and uncertainties which could cause actual events or conditions to differ materially from those currently anticipated and expressed or implied by such forward-looking statements.

You should read this report and the documents that we reference in this report and have filed as exhibits to this report completely and with the understanding that our actual future results may be materially different from what we expect. You should also review the factors and risks we describe in the reports we will file or submit from time to time with the Commission after the date of this report. We qualify all of our forward-looking statements by these cautionary statements.

Overview

Arcturus is the successor to Arcturus Israel. Following the Redomiciliation on June 17, 2019, Arcturus became the ultimate parent company of Arcturus Israel.

Arcturus is an emerging RNA medicines company focused on the development and commercialization of therapeutics directed towards rare, infectious, fibrotic, and respiratory diseases with significant unmet medical need. The genetic medicines industry is constantly struggling to identify non-viral delivery solutions for large RNA molecules to different cell types. Arcturus' LUNAR® Delivery technology is lipid mediated – and non-viral. LUNAR is versatile, compatible with various types of RNA -- and has been shown to deliver large RNA to different cell types including Liver hepatocytes, Liver stellate cells, Muscle cells (myocytes), and Lung cells (including bronchial epithelial cells).

Our activities since inception have consisted principally of performing research and development activities, general and administrative activities and raising capital to fund those efforts. Our activities are subject to significant risks and uncertainties, including failing to secure additional funding before we achieve sustainable revenues and profit from operations. As of September 30, 2019, we had an accumulated deficit of $60.7 million.

Results of Operations

The following discussion and analysis of our financial condition and results of operations should be read in conjunction with our condensed consolidated financial statements and related notes appearing elsewhere in this Report and our audited financial statements and related notes for the year ended December 31, 2018. Our historical results of operations and the year-to-year comparisons of our results of operations that follow are not necessarily indicative of future results.

Collaboration Revenue

We enter into arrangements with pharmaceutical and biotechnology partners that may contain upfront payments, license fees for research and development arrangements, research and development funding, milestone payments, option exercise fees and royalties on future sales. The following table summarizes our total revenues for the periods indicated (in thousands):

	Three Months Ended September 30,		2018 to 2019	
(Dollars in thousands)	2019	2018	$ change	% change
Collaboration revenue	$ 3,318	$ 3,423	$ (105)	-3.1%

Collaboration revenue decreased by $0.1 million during the three months ended September 30, 2019 as compared to the three months ended September 30, 2018. The decrease in collaboration revenue primarily relates to decreased revenue of $0.9 million reduction in labor and expense reimbursements from Ultragenyx, partly offset by a $0.8 million increase in revenue recognition of the upfront payment caused by a reduction in length of the CureVac Development and Option Agreement.

	Nine Months Ended September 30,		2018 to 2019	
(Dollars in thousands)	2019	2018	$ change	% change
Collaboration revenue	$ 17,821	$ 8,176	$ 9,645	*

* *Greater than 100%*

Collaboration revenue increased by $9.6 million during the nine months ended September 30, 2019 as compared to the nine months ended September 30, 2018. The increase in collaboration revenue primarily relates to increased revenue of $9.8 million recognized upon execution of Amendment 3 with Ultragenyx, increased revenue associated with CureVac for revenue that was previously constrained under ASC 606 and recognizing sublicense revenue from SGI. Increases were partly offset by decreased revenue recognition from the Takeda collaboration agreement, which is ramping up more slowly than in 2018.

Our operating expenses consist of research and development and general and administrative expenses.

	Three Months Ended September 30,		2018 to 2019		Nine Months Ended September 30,		2018 to 2019	
(Dollars in thousands)	2019	2018	$ change	% change	2019	2018	$ change	% change
Operating expenses:								
Research and development, net	$ 7,053	$ 3,969	$ 3,084	77.7%	$ 21,646	$ 12,135	$ 9,511	78.4%
General and administrative	3,881	3,810	71	1.9%	10,871	17,141	(6,270)	-36.6%
Total	$ 10,934	$ 7,779	$ 3,155	40.6%	$ 32,517	$ 29,276	$ 3,241	11.1%

The following table presents our total research and development expenses by category:

	Three Months Ended September 30,		2018 to 2019		Nine Months Ended September 30,		2018 to 2019	
(Dollars in thousands)	2019	2018	$ change	% change	2019	2018	$ change	% change
External pipeline development expenses:								
LUNAR-OTC (ARCT-810)	$ 3,337	$ 1,242	$ 2,095	*	$ 9,167	$ 2,614	$ 6,553	*
LUNAR-CF, net	147	66	81	*	598	97	501	*
Discovery technologies	787	266	521	*	2,716	2,381	335	14.1%
External platform development expenses:								
Partnered discovery technologies	348	276	72	26.1%	1,039	1,474	(435)	-29.5%
Total development expenses	$ 4,619	$ 1,850	$ 2,769	*	$ 13,520	$ 6,566	$ 6,954	*
Personnel related expenses	$ 1,884	$ 1,745	$ 139	8.0%	$ 6,408	$ 4,545	$ 1,863	41.0%
Facilities and equipment expenses	550	374	176	47.1%	1,718	1,024	694	67.8%
Total research and development expenses, net	$ 7,053	$ 3,969	$ 3,084	77.7%	$ 21,646	$ 12,135	$ 9,511	78.4%

* *Greater than 100%*

Research and Development Expenses, net

Our development expenses consist primarily of external manufacturing costs, in-vivo research studies performed by contract research organizations, clinical and regulatory consultants, and laboratory supplies related to conducting research and development activities.

Our LUNAR-OTC (ARCT-810) program is expected to achieve IND submission by early 2020. We expect that the program costs will continue to increase as was the case during the three and nine-month periods, whereby the programs costs increased by $2.1 million and $6.6 million for the three and nine months ended September 30, 2019 as compared to 2018, respectively.

Our Lunar-CF program during the 2017 and 2018 previously reported periods was primarily funded by our Company. As a result of the new CF agreement that was executed during July 2019, we expect that our development efforts and our portion of the costs to increase over the next several years as we move towards IND submission expected in 2021. During the quarter ended September 30, 2019, the Company incurred $0.2 million costs that were offset with funds received from CFF.

Discovery technologies represents our efforts to expand our product pipeline and are expected to continually increase over the near future. During the three and nine months ended September 30, 2019 as compared to 2018, our costs increased by $0.5 million and $0.3 million, respectively, as we focused our efforts on the discovery and development of our next programs.

Within our platform development expenses, our partnered discovery expenses with our current partners are expected to fluctuate based on the needs of our collaboration partners. During the three months ended September 30, 2019 as compared to 2018, the expenses were higher by $0.1 million and during the nine months ended September 30, 2019 as compared to 2018, the expenses were lower by $0.5 million, both as a result of the stage of the collaboration partners.

Personnel related expenses increased by $0.1 million and $1.9 million during the three and nine months ended September 30, 2019 and 2018, respectively, associated with increased headcount necessary to advance our external pipeline and platform efforts. During the quarter ended September 30, 2019, offsetting in the expense amount as contra-expense is $0.4 million of funds received from CFF. We expect to continue to expand our headcount as required to meet our plan.

Facilities and equipment expenses increased by $0.2 million and $0.7 million during the three and nine months ended September 30, 2019 and 2018, respectively, primarily as a result of higher rent and related costs associated with our new headquarters that we entered during early 2018.

General and Administrative Expenses

General and administrative expenses consist primarily of salaries and related benefits for our executive, administrative and accounting functions and professional service fees for legal and accounting services as well as other general and administrative expenses.

General and administrative expenses for the three months ended September 30, 2019 as compared to the three months ended September 30, 2018 were relatively flat. However, the decrease in general and administrative expenses of $6.3 million for the nine months ended September 30, 2019 as compared to the nine months ended September 30, 2018 was primarily due to $7.3 million related to a proxy contest incurred during the first half of 2018. Subsequent to September 30, 2019, the Company received $2.4 million from an insurance settlement for proxy related fees incurred during the first half of 2018.

Finance (expense) income, net

	Three Months Ended September 30,		2018 to 2019		Nine Months Ended September 30,			
(Dollars in thousands)	2019	2018	$ change	% change	2019	2018	$ change	% change
Finance (expense) income, net:								
Interest income	$ 85	$ 150	$ (65)	-43.3%	$ 293	$ 375	$ (82)	-21.9%
Interest expense	(205)	—	(205)	*	(614)	(2)	(612)	*
Total	$ (120)	$ 150	$ (270)	*	$ (321)	$ 373	$ (694)	*

* *Greater than 100%*

Interest income is generated on cash and cash equivalents. Interest expense was incurred in conjunction with our long-term debt agreement which was executed during the fourth quarter of 2018.

Liquidity and Capital Resources

Our products that are being developed have not generated significant revenue. As a result, we have suffered recurring losses and significant cash resources will be required to execute our business plans. These losses are expected to continue for an extended period of time.

Historically, our major sources of cash have comprised proceeds from collaboration partners, various public and private offerings of our common stock, option and warrant exercises, and interest income. From inception through September 2019, we raised approximately $204.2 million in gross proceeds from various public and private offerings of our common stock, debt issuances, collaboration agreements, and the merger with Alcobra. In June of 2019, we raised $30 million through execution of an amended collaboration agreement and an equity purchase agreement with Ultragenyx.

As of September 30, 2019, we had approximately $74.3 million in cash, restricted cash and cash equivalents. Our plans to mitigate an expected shortfall of capital and thus support future operations, include raising additional funds. The actual amount of cash that we will need to operate is subject to many factors. During the third quarter of 2019, the Company raised additional capital in excess of $25.0 million, including proceeds from the Offerings in excess of $21.0 million and a one-time payment to Arcturus from CureVac in the amount of $4.0 million. See *"Note 2 Collaboration Revenue"* for further information.

Based on our planned operations, we expect that our current cash and cash equivalents balances, inclusive of the August 2019 and September 2019 financings, will be sufficient to fund our operations for at least 12 months after the date the condensed consolidated financial statements are filed without raising additional capital through equity or debt financing. The accompanying financial statements have been prepared on a going concern basis, which contemplates the realization of assets and the satisfaction of liabilities in the normal course of business. The financial statements do not include any adjustments relating to the recoverability and classification of asset amounts or the classification of liabilities that might be necessary should we be unable to continue as a going concern within one year after the date the financial statements are issued.

We also recognize that we will need to raise additional capital in order to continue to execute our business plan in the future. There is no assurance that additional financing will be available when needed, that we will be able to obtain financing on terms acceptable to us, or that we will become profitable and generate positive operating cash flow. If we are unable to raise sufficient additional funds, we will have to scale back operations.

Overview

Since our inception, we have funded our operations principally with proceeds from the sale of capital stock, convertible notes and revenues earned through collaborative agreements. At September 30, 2019, we had $74.2 million in unrestricted cash and cash equivalents.

To support our long-term plans, we intend to seek additional capital through equity or debt financings, collaborative or other funding arrangements with partners or through other sources of financing. Should we seek additional financing from outside sources, we may not be able to raise such financing on terms acceptable to us or at all. If we are unable to raise additional capital when required or on acceptable terms, we may be required to scale back or discontinue the advancement of product candidates, reduce headcount, liquidate our assets, file for bankruptcy, reorganize, merge with another entity, or cease operations.

If we are unable to maintain sufficient financial resources, our business, financial condition and results of operations will be materially and adversely affected. There can be no assurance that we will be able to obtain the needed financing on acceptable terms or at all. Additionally, equity or debt financings may have a dilutive effect on the holdings of our existing shareholders.

The following table shows a summary of our cash flows for the nine months ended September 30, 2019 and 2018 (in thousands):

	Nine Months Ended September 30,	
(Dollars in thousands)	**2019**	**2018**
Cash provided by (used in):		
Operating activities	$ 1,093	$ (14,997)
Investing activities	(503)	19,865
Financing activities	36,873	332
Net increase in cash, cash equivalents and restricted cash	$ 37,463	$ 5,200

Operating Activities

Our primary use of cash is to fund operating expenses, which consist mainly of research and development expenditures and general and administrative expenditures. We have incurred significant losses which have been partially offset by cash collected through our collaboration agreements and acquired through our 2017 merger. Cash collections under the collaboration agreements can vary from year to year depending on the terms of agreement and work performed. These changes on cash flows primarily relate to the timing of cash receipts for upfront payments, reimbursable expenses and achievement of milestones under these collaborative agreements.

Net cash provided by operating activities was $1.1 million on a net loss of $15.0 million for the nine months ended September 30, 2019, compared to net cash used of $15.0 million on a net loss of $20.8 million for the nine months ended September 30, 2018. Adjustments for non-cash charges, including share-based compensation, depreciation and amortization, interest expense and loss from equity-method investment were $2.7 million and $1.2 million for the nine months ended September 30, 2019 and 2018, respectively. Changes in working capital resulted in adjustments to operating net cash inflows of $13.7 million and $4.6 million for the nine months ended September 30, 2019 and 2018, respectively, and were primarily driven by increases in deferred revenue, accounts payable and accrued liabilities as well as a decrease in accounts receivable partly offset by an increase in prepaid expenses for the nine months ended September 30, 2019.

Investing Activities

Net cash used in investing activities of $0.5 million for the nine months ended September 30, 2019 reflected cash used to purchase property and equipment. Net cash provided by investing activities of $19.9 million for the nine months ended September 30, 2018 reflected proceeds of the maturities of our short-term investments of $30.2 million, offset by purchases of short-term investments of $9.1 million, and cash used to purchase property and equipment of $1.2 million.

Financing Activities

Net cash provided by financing activities for the nine months ended September 30, 2019 reflected proceeds from the issuance of common stock and the exercise of stock options of $36.9 million. Net cash provided by financing activities for the nine months ended September 30, 2018 consisted of net proceeds from the exercise of stock options of $0.3 million.

Funding Requirements

We anticipate that we will continue to generate annual net losses for the foreseeable future, and we expect the losses to increase as we continue the development of, and seek regulatory approvals for, our product candidates, and begin commercialization of our products. As a result, we will require additional capital to fund our operations in order to support our long-term plans. The Company intends to seek additional capital through equity and/or debt financings, collaborative or other funding arrangements with partners or through other sources of financing. Should we seek additional financing from outside sources, we may not be able to raise such financing on terms acceptable to us or at all. If we are unable to raise additional capital when required or on acceptable terms, we may be required to scale back or discontinue the advancement of product candidates, reduce headcount, liquidate our assets, file for bankruptcy, reorganize, merge with another entity, or cease operations.

Our future funding requirements are difficult to forecast and will depend on many factors, including the following:

- the achievement of milestones under our strategic alliance agreements;
- the terms and timing of any other strategic alliance, licensing and other arrangements that we may establish;
- the initiation, progress, timing and completion of preclinical studies and clinical trials for our product candidates;
- the number and characteristics of product candidates that we pursue;
- the outcome, timing and cost of regulatory approvals;
- delays that may be caused by changing regulatory requirements;
- the cost and timing of hiring new employees to support our continued growth;
- the costs involved in filing and prosecuting patent applications and enforcing and defending patent claims;
- the costs and timing of procuring clinical and commercial supplies of our product candidates;
- the costs and timing of establishing sales, marketing and distribution capabilities;
- the costs associated with legal proceedings; and

the extent to which we acquire or invest in businesses, products or technologies.

Critical Accounting Policies and Estimates

We prepare our condensed consolidated financial statements in conformity with accounting principles generally accepted in the United States, or U.S. GAAP. As such, we make certain estimates, judgements and assumptions that we believe are reasonable, based upon information available to us. These judgements involve making estimates about the effect of matters that are inherently uncertain and may significantly impact our results of operations and financial condition. We describe our significant accounting policies more fully in Note 2 to our consolidated financial statements for the year ended December 31, 2018.

The following are our significant accounting policies which we believe are the most critical to aid in fully understanding and evaluating our reported financial results.

Revenue Recognition

Effective January 1, 2019, the Company adopted *ASU 2014-09, Revenue from Contracts with Customers (Topic 606)*, or Topic 606, using the modified retrospective transition method. Topic 606 provides a unified model to determine how revenue is recognized. We determine revenue recognition for arrangements within the scope of Topic 606 by performing the following five steps: (i) identify

the contract; (ii) identify the performance obligations in the contract; (iii) determine the transaction price; (iv) allocate the transaction price to the performance obligations in the contract; and (v) recognize revenue when, or as, we satisfy a performance obligation.

The terms of our collaborative research and development agreements include license fees, upfront payments, milestone payments when and if certain research or technology transfer milestones are achieved, development milestones and reimbursement for research and development activities, option exercise fees, other contingent payments for the achievement of defined collaboration objectives and certain preclinical, clinical, regulatory and sales-based events, as well as royalties on sales of commercialized products. Arrangements that include upfront payments are recorded as deferred revenue upon receipt or when due and may require deferral of revenue recognition to a future period until we perform obligations under these arrangements. We record research funding as accounts receivable when the right to consideration is unconditional. The event-based milestone payments represent variable consideration, and we use the most likely amount method to estimate this variable consideration because we will either receive the milestone payment or we will not, which makes the potential milestone payment a binary event. The most likely amount method requires us to determine the likelihood of earning the milestone payment. Given the high degree of uncertainty around achievement of these milestones, we determine the milestone amounts to be fully constrained and do not recognize revenue until the uncertainty associated with these payments is resolved. We will recognize revenue from sales-based royalty payments when or as the sales occur. We will re-evaluate the transaction price in each reporting period as uncertain events are resolved and other changes in circumstances occur.

A performance obligation is a promise in a contract to transfer a distinct good or service to the collaborative partner and is the unit of account in Topic 606. A contract's transaction price is allocated to each distinct performance obligation based on relative standalone selling price and recognized as revenue when, or as, the performance obligation is satisfied. Under Topic 606, we elected to use the practical expedients permitted related to adoption, which does not require us to disclose certain information regarding certain remaining performance obligations as of the end of the reporting period. Topic 606 is applicable for revenue recognized in accordance with the practical expedient for measuring progress toward satisfaction of a performance obligation, and variable consideration classified as a sales-based or usage-based royalty promised in exchange for a license.

Leases

In February 2016, the FASB issued ASU 2016-02, Leases (Topic 842), which requires lessees to recognize most leases on the balance sheet as lease liabilities with corresponding right-of-use assets and to disclose key information about leasing arrangements. We adopted Topic 842 on its effective date in the first quarter of 2019 using a modified retrospective approach. We elected the available package of practical expedients upon adoption, which allowed us to carry forward our historical assessment of whether existing agreements contained a lease and the classification of our existing operating leases. We continue to report our financial position as of December 31, 2018 under the former lease accounting standard (Topic 840) in our condensed consolidated balance sheet.

The adoption impact was due to the recognition of operating lease liabilities with corresponding right-of-use assets based on the present value of remaining minimum lease payments. The difference between these amounts was recorded as a reduction of the right-of-use asset by the existing balance of deferred rent obligation with no impact to retained earnings.

Contractual Obligations

See "Note 8 Leases" for further details on our noncancelable contractual commitments.

Item 3. Quantitative and Qualitative Disclosures About Market Risk.

Our primary exposure to market risk is interest income sensitivity, which is affected by changes in the general level of United States interest rates. Due to the nature of our cash and cash equivalents, we believe that we are not subject to any material market risk exposure. We do not have any foreign currency or other derivative financial instruments.

Item 4. Controls and Procedures.

Evaluation of Disclosure Controls and Procedures

As required by Rule 13a-15(b) and Rule 15d-15(b) of the Exchange Act, our management, including our principal executive officer, our principal financial officer and our principal accounting officer, conducted an evaluation as of the end of the period covered by this Quarterly Report on Form 10-Q of the effectiveness of the design and operation of our disclosure controls and procedures. Based on that evaluation, management has concluded that as of September 30, 2019, the Company's disclosure controls and procedures were effective at the reasonable assurance level and we believe the condensed consolidated financial statements included in this Form 10-Q for the quarterly period ended September 30, 2019 fairly present, in all material respects, our financial position, results of operations, comprehensive loss, statements of stockholders' equity and cash flows for the periods presented in conformity with U.S. generally accepted accounting principles.

Changes in Internal Control over Financial Reporting

As required by Rule 13a-15(d) and Rule 15d-15(d) of the Exchange Act, our management, including our principal executive officer, our principal financial officer and our principal accounting officer, conducted an evaluation of the internal control over financial reporting to determine whether any other changes occurred during the period covered by this Quarterly Report on Form 10-Q that have materially affected, or are reasonably likely to materially affect, our internal control over financial reporting. Based on that evaluation, our principal executive officer, principal financial officer and principal accounting officer concluded that there were no changes in our internal controls over financial reporting during the period covered by this Quarterly Report on Form 10-Q that materially affected, or were reasonably likely to materially affect, our internal control over financial reporting.

PART II—OTHER INFORMATION

Item 1. Legal Proceedings.

None.

Item 1A. Risk Factors.

Our business is subject to various risks, including those described in Item 1A of our Annual Report on Form 10-K for the fiscal year ended December 31, 2018, which we strongly encourage you to review. As of the filing of this report, there have been no material changes from the risk factors disclosed in Item 1A of our Form 10-K.

Item 2. Unregistered Sales of Equity Securities and Use of Proceeds.

None.

Item 3. Defaults Upon Senior Securities.

None.

Item 4. Mine Safety Disclosures.

Not applicable.

Item 5. Other Information.

None.

Item 6. Exhibits.

Exhibit No.	Description
2.1	Share Exchange Agreement, dated as of February 11, 2019, by and between the Company and Arcturus Therapeutics Holdings Inc. Incorporated by reference to Exhibit 10.13 to the Company's Annual Report on Form 10-K for the year ended December 31, 2018 filed with the SEC on March 18, 2019.
3.1	Certificate of Incorporation of Arcturus Therapeutics Holdings Inc. (incorporated by reference to Annex B to the proxy statement / prospectus which forms part of the Registration Statement on Form S-4 (File No. 333-230353) filed on March 18, 2019).
3.2	Bylaws of Arcturus Therapeutics Holdings Inc. (incorporated by reference to Annex C to the proxy statement / prospectus which forms part of the Registration Statement on Form S-4 (File No. 333-230353) filed on March 18, 2019).
4.1	Arcturus Therapeutics Ltd. 2018 Omnibus Equity Incentive Plan. Incorporated by reference to Exhibit 99.3 to the Company's Report of Foreign Private Issuer on Form 6-K filed with the SEC on July 27, 2018 (File No. 001-35932).
4.2	Arcturus Therapeutics Ltd. Amended and Restated Compensation Policy for Company Office Holders. Incorporated by reference to Exhibit 99.2 to the Company's Report of Foreign Private Issuer on Form 6-K filed with the SEC on July 27, 2018 (File No. 001-35932).
4.3	Agreement and Plan of Merger and Reorganization among Alcobra Ltd., Aleph MergerSub, Inc. and Arcturus Therapeutics, Inc., dated as of September 27, 2017. Incorporated by reference to Exhibit 99.2 to the Company's Report of Foreign Private Issuer on Form 6-K filed with the SEC on September 28, 2017 (File No. 001-35932).
4.4	Form of Indemnification Agreement. Incorporated by reference to Exhibit 10.4 to the Company's Form F-1/A filed with the SEC on February 19, 2013 (File No. 333-186003).
4.5†	Alcobra Ltd. Amended and Restated 2010 Incentive Option Plan. Incorporated by reference to Exhibit 4.3 to the Company's Form 20-F filed with the SEC on April 28, 2017 (File No. 001-35932).
4.6†	2013 Equity Incentive Plan of Arcturus Therapeutics, Inc. Incorporated by reference to Exhibit 99.1 to the Company's Form S-8 filed with the SEC on November 30, 2017 (File No. 333-221830).
4.7†	Arcturus Therapeutics Holdings Inc. 2019 Omnibus Equity Incentive Plan. Incorporated by reference to Exhibit 3.2 to the Company's Form 8-K12B filed with the SEC on June 14, 2019.
10.1	Loan and Security Agreement, dated October 12, 2018, by and between Western Alliance Bank and Arcturus Therapeutics, Inc. Incorporated by reference to Exhibit 10.1 to the Company's Report of Foreign Private Issuer on Form 6-K filed with the SEC on October 15, 2018 (File No. 001-35932).
10.2	Sales Agreement, dated October 15, 2018, by and between Arcturus Therapeutics Ltd. and Leerink Partners LLC. Incorporated by reference to Exhibit 10.2 to the Company's Report of Foreign Private Issuer on Form 6-K filed with the SEC on October 15, 2018 (File No. 001-35932).
10.3	Amended and Restated Amendment to Development and Option Agreement, dated as of September 28, 2018, by and between CureVac AG and Arcturus Therapeutics Inc. Incorporated by reference to Exhibit 99.2 to the Company's Report of Foreign Private Issuer on Form 6-K filed with the SEC on October 1, 2018 (File No. 001-35932).
10.4	Research Collaboration and License Agreement, by and between Arcturus Therapeutics, Inc. and Janssen Pharmaceuticals, Inc., dated October 18, 2017. Incorporated by reference to Exhibit 4.7 to Form 20-F filed with the SEC on May 14, 2018 (File No. 001-35932).
10.5	Research and Exclusive License Agreement, by and between Arcturus Therapeutics, Inc. and Synthetic Genomics, Inc., effective October 24, 2017. Incorporated by reference to Exhibit 4.8 to Form 20-F filed with the SEC on May 14, 2018 (File No. 001-35932).
10.6	Research Agreement, by and between Arcturus Therapeutics, Inc. and Millennium Pharmaceuticals, Inc., a wholly-owned subsidiary of Takeda Pharmaceutical Company Limited, effective December 6, 2016, as amended December 21, 2017. Incorporated by reference to Exhibit 4.9 to Form 20-F filed with the SEC on May 14, 2018 (File No. 001-35932).
10.7	Research Collaboration and License Agreement, by and between Arcturus Therapeutics, Inc. and Ultragenyx Pharmaceutical Inc., entered into as of October 26, 2015, as amended October 17, 2017 and April 20, 2018. Incorporated by reference to Exhibit 4.10 to Form 20-F filed with the SEC on May 14, 2018 (File No. 001-35932).

10.8	Letter Agreement, by and between Arcturus Therapeutics, Inc. and Cystic Fibrosis Foundation Therapeutics, Inc., dated May 16, 2017. Incorporated by reference to Exhibit 4.11 to Form 20-F filed with the SEC on May 14, 2018 (File No. 001-35932).
10.9	Development and Option Agreement, by and between Arcturus Therapeutics, Inc. and CureVac AG, dated January 1, 2018, as amended May 3, 2018. Incorporated by reference to Exhibit 4.12 to Form 20-F filed with the SEC on May 14, 2018 (File No. 001-35932).
10.10	Co-Development and Co-Commercialization Agreement, by and between Arcturus Therapeutics, Inc. and CureVac AG, dated January 1, 2018. Incorporated by reference to Exhibit 4.13 to Form 20-F filed with the SEC on May 14, 2018 (File No. 001-35932).
10.11	License Agreement, by and between Arcturus Therapeutics, Inc., as successor-in-interest to Marina Biotech, Inc., and Protiva Biotherapeutics Inc., dated as of November 28, 2012. Incorporated by reference to Exhibit 4.14 to Form 20-F/A filed with the SEC on July 10, 2018 (File No. 001-35932).
10.12	Patent Assignment and License Agreement, by and between Arcturus Therapeutics, Inc. and Marina Biotech, Inc., dated as of August 9, 2013. Incorporated by reference to Exhibit 4.15 to Form 20-F filed with the SEC on May 14, 2018 (File No. 001-35932).
10.13	Share Exchange Agreement, dated as of February 11, 2019, by and between Arcturus Therapeutics Ltd. and Arcturus Therapeutics Holdings Inc. Incorporated by reference to Exhibit 10.13 to the Company's Annual Report on Form 10-K for the year ended December 31, 2018 filed with the SEC on March 18, 2019.
10.14	Amended and Restated Joint Venture, Research Collaboration and License Agreement, dated as of July 14, 2018 by and between Arcturus Therapeutics, Inc. and Providence Therapeutics, Inc. Incorporated by reference to Exhibit 10.14 to the Company's Amendment No. 1 to Annual Report on Form 10-K for the year ended December 31, 2018 filed with the SEC on April 10, 2019.
10.15	Research Collaboration Agreement, dated as of March 8, 2019 by and between Arcturus Therapeutics, Inc. and Millennium Pharmaceuticals, Inc., a wholly-owned subsidiary of Takeda Pharmaceutical Company Limited. Incorporated by reference to Exhibit 10.15 to the Company's Annual Report on Form 10-K for the year ended December 31, 2018 filed with the SEC on March 18, 2019.
10.16+	Amendment dated as of August 1, 2019, by and between Arcturus Therapeutics, Inc. and Cystic Fibrosis Foundation to that certain Development Program Letter Agreement of May 16, 2017. Incorporated by reference to Exhibit 10.16 to the Company's Quarterly Report on Form 10-Q for the quarterly period ended June 30, 2019, filed with the SEC on August 14, 2019.
10.17	Letter Agreement, dated July 26, 2019, between the Company and the Placement Agent. Incorporated by reference to Exhibit 1.1 to the Company's Current Report on Form 8-K dated August 2, 2019.
10.18	Securities Purchase Agreement, dated August 1, 2019, between the Company and the Investors party thereto. Incorporated by reference to Exhibit 10.1 to the Company's Current Report on Form 8-K dated August 2, 2019.
10.19	Securities Purchase Agreement, dated August 2, 2019, between the Company and the Investors party thereto. Incorporated by reference to Exhibit 10.1 to the Company's Current Report on Form 8-K dated August 5, 2019.
10.20+	Amendment to Development and Option Agreement, dated July 26, 2019, by and between Arcturus Therapeutics, Inc. and CureVac AG. Incorporated by reference to Exhibit 10.20 to the Company's Quarterly Report on Form 10-Q for the quarterly period ended June 30, 2019, filed with the SEC on August 14, 2019.
10.21	Termination Agreement, dated July 26, 2019, by and between Arcturus Therapeutics, Inc. and CureVac AG. Incorporated by reference to Exhibit 10.21 to the Company's Quarterly Report on Form 10-Q for the quarterly period ended June 30, 2019, filed with the SEC on August 14, 2019.
10.22	Registration Rights Agreement, dated June 18, 2019, between the Company and Ultragenyx Pharmaceutical Inc. Incorporated by reference to Exhibit 4.1 to the Company's Current Report on Form 8-K dated June 20, 2019.
10.23	Equity Purchase Agreement, dated June 18, 2019, between the Company and Ultragenyx Pharmaceutical Inc. Incorporated by reference to Exhibit 10.1 to the Company's Current Report on Form 8-K dated June 20, 2019.
10.24	Third Amendment, dated June 18, 2019 to Research Collaboration and License Agreement, dated October 26, 2015, as amended on October 17, 2017 and April 20, 2018, between the Company and Ultragenyx Pharmaceutical Inc. Incorporated by reference to Exhibit 10.2 to the Company's Current Report on Form 8-K dated June 20, 2019.

10.25*+	Third Amendment, dated October 30, 2019, by and between Western Alliance Bank, and Arcturus Therapeutics, Inc. to the Loan and Security Agreement dated as of October 12, 2018.
10.26	Securities Purchase Agreement, dated September 25, 2019, by and between the Company and each purchaser party thereto. Incorporated by reference to Exhibit 10.1 to the Company's Current Report on Form 8-K filed with the SEC on September 27, 2019.
31.1*	Certification of Principal Executive Officer Pursuant to Rules 13a-14(a) and 15d-14(a) under the Securities Exchange Act of 1934, as Adopted Pursuant to Section 302 of the Sarbanes-Oxley Act of 2002.
31.2*	Certification of Principal Financial Officer Pursuant to Rules 13a-14(a) and 15d-14(a) under the Securities Exchange Act of 1934, as Adopted Pursuant to Section 302 of the Sarbanes-Oxley Act of 2002.
32.1*	Certification of Principal Executive Officer Pursuant to 18 U.S.C. Section 1350, as Adopted Pursuant to Section 906 of the Sarbanes-Oxley Act of 2002.
32.2*	Certification of Principal Financial Officer Pursuant to 18 U.S.C. Section 1350, as Adopted Pursuant to Section 906 of the Sarbanes-Oxley Act of 2002.
101.INS	XBRL Instance Document
101.SCH	XBRL Taxonomy Extension Schema Document
101.CAL	XBRL Taxonomy Extension Calculation Linkbase Document
101.DEF	XBRL Taxonomy Extension Definition Linkbase Document
101.LAB	XBRL Taxonomy Extension Labels Linkbase Document
101.PRE	XBRL Taxonomy Extension Presentation Linkbase Document

* Filed herewith.

\+ Portions of this exhibit, marked by brackets, have been omitted pursuant to Item 601(b)(10)(iv) of Regulation S-K under the Securities Act of 1933, as amended, because they are both (i) not material and (ii) would likely cause competitive harm to the registrant if publicly disclosed.

† Management compensatory plan, contract or arrangement.

SIGNATURE

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.

ARCTURUS THERAPEUTICS HOLDINGS INC.

Date: November 8, 2019

By: /s/ Andrew Sassine
Andrew Sassine
Chief Financial Officer

Exhibit 10.25

REDACTED

Certain identified information, indicated by [***], has been excluded from the exhibit because it is both (i) not material and (ii) would likely cause competitive harm if publicly disclosed.

THIRD AMENDMENT TO LOAN AND SECURITY AGREEMENT

This Third Amendment to Loan and Security Agreement (this "Amendment") is entered into as of October 30, 2019, by and between WESTERN ALLIANCE BANK, an Arizona corporation ("Bank"), and ARCTURUS THERAPEUTICS, INC., a Delaware corporation ("Borrower").

RECITALS

Borrower and Bank are parties to that certain Loan and Security Agreement dated as of October 12, 2018, as amended from time to time (the "Agreement"). The parties desire to amend the Agreement in accordance with the terms of this Amendment.

NOW, THEREFORE, the parties agree as follows:

1. The following definitions in Section 1.1 of the Agreement hereby are added, amended or restated to read as follows:

"Amortization Date" means May 1, 2021; provided, however, if the Interest Only End Date is October 1, 2021, "Amortization Date" means November 1, 2021.

[***]

"Equity/Expansion Event" means on or after **[***]** and on or before **[***]**, Borrower's receipt of net proceeds of at least **[***]** from the sale and issuance of equity securities, the creation of new partnerships or the expansion of existing partnerships, in each case, from investors or partners and on terms and conditions reasonably satisfactory to Bank.

"Interest Only End Date" means April 1, 2021; provided, however, (i) upon the occurrence of Equity/Expansion Event and (ii) if no Event of Default has occurred and is continuing as a result of a breach by Borrower of Section 6.8, "Interest Only End Date" means October 1, 2021.

"Parent" means Arcturus Therapeutics Holdings Inc., a Delaware corporation, and the owner of one hundred percent (100.00%) of the Shares of Borrower.

"Payment Date" is the first (1st) calendar day of each calendar month, commencing on November 1, 2019.

"Prepayment Fee" is, with respect to the Term Loan subject to prepayment (other than pursuant to a refinancing by Bank or a syndicate of lenders of which Bank is a part or the agent thereof) prior to the Term Loan Maturity Date, whether by mandatory or voluntary prepayment, acceleration or otherwise, an additional fee in an amount equal to (i) for a prepayment made on or after the Third Amendment Effective Date through and including the first anniversary of the Third Amendment Effective Date, two percent (2.00%) of the principal amount of the Term Loan prepaid; (ii) for a prepayment made after the first anniversary of the Third Amendment Effective Date through and including the second anniversary of the Third Amendment Effective Date, one percent (1.00%) of the principal amount of the Term Loan prepaid; and (iii) for a prepayment made

after the second anniversary of the Third Amendment Effective Date and prior to the Term Loan Maturity Date, one-half of one percent (0.50%) of the principal amount of the Term Loan prepaid. Notwithstanding the foregoing and for the avoidance of any doubt, Borrower shall not be responsible for any Prepayment Fee prior to the Third Amendment Effective Date."

"Qualifying Deposits" means unrestricted cash held in demand deposit accounts and/or money market accounts at Bank, earning the Bank's posted interest rates.

"Term Loan Maturity Date" is October 30, 2023.

"Third Amendment Effective Date" means October 30, 2019.

2. The following defined term in Section 1.1 of the Agreement hereby is omitted in its entirety:

"Alcobra" means Alcobra, Inc., a Delaware corporation and a wholly-owned Subsidiary of Parent.

3. Subsections (i), (ii) and (iii) of Section 2.1(a) of the Agreement hereby are amended and restated in their entirety to read as follows:

"(i) Availability. Subject to the terms and conditions of this Agreement, the Bank agrees to make a term loan to Borrower on the Third Amendment Effective Date, or as soon thereafter as practical, in the amount of Fifteen Million Dollars ($15,000,000.00) (the "Term Loan"). After repayment, the Term Loan may not be reborrowed. Upon the extension of the Term Loan pursuant to this Section 2.1(a)(i), Bank has no further obligations to make Credit Extensions.

(ii) Repayment. Borrower shall make monthly payments of interest only on each Payment Date through and including the Payment Date immediately preceding the Amortization Date. Commencing on the Amortization Date, and continuing on the Payment Date of each month thereafter, Borrower shall make consecutive equal monthly payments of principal, together with applicable interest, in arrears, to Bank, as calculated by Bank (which calculations shall be deemed correct absent manifest error) based upon: (1) the amount of the Term Loan, (2) the effective rate of interest, as determined in Section 2.3(a), and (3) a repayment schedule equal to thirty (30) months, if the Amortization Date is May 1, 2021, or twenty-four (24) months, if the Amortization Date is November 1, 2021. All unpaid principal and accrued and unpaid interest with respect to the Term Loan is due and payable in full on the Term Loan Maturity Date. The Term Loan may only be prepaid in accordance with Section 2.1(a)(iii).

(iii) Prepayment.

i) Voluntary Prepayment. Borrower shall have the option to prepay all, but not less than all, of the Term Loan advanced by Bank under this Agreement, provided Borrower (A) delivers written notice to Bank of its election to prepay the Term Loan at least five (5) Business Days prior to such prepayment and (B) pays, on the date of such prepayment, (a) all outstanding principal with respect to the Term Loan, plus accrued but unpaid interest, (b) the Final Payment, (c) the Prepayment Fee, plus (d) all other sums, including Bank Expenses, if any, that shall have become due and payable hereunder as a result of such prepayment.

4. Section 2.3(a) of the Agreement hereby is amended and restated in its entirety to read as follows:

"(a) **Interest Rate.** Except as set forth in Section 2.3(b), the Term Loan shall bear interest, on the outstanding Daily Balance thereof, at a floating rate equal to (i) if Qualifying Deposits at Bank are greater than or equal to **[***]**, one and one-quarter percent (1.25%) above the Prime Rate, (ii) if Qualifying Deposits at Bank are equal to or greater than **[***]** but less than **[***]**, two percent (2.00%) above the Prime Rate and (iii) if Qualifying Deposits at Bank are less than **[***]**, two and three-quarters percent (2.75%) above the Prime Rate."

5. Section 6.7 of the Agreement hereby is amended and restated in its entirety to read as follows:

"6.7 **Accounts**. Borrower shall (i) maintain and shall cause each of its Domestic Subsidiaries to maintain (x) all of its operating accounts, and (y) at least the lesser of (A) one hundred percent (100.00%) of their total consolidated, unrestricted cash, or (B) Fifteen Million Dollars ($15,000,000.00) in total deposits with Bank and (ii) endeavor to utilize and shall cause each of its Subsidiaries to endeavor to utilize Bank's International Banking Division for any international banking services required by Borrower, including, but not limited to, foreign currency wires, hedges, swaps, foreign exchange contracts, and Letters of Credit. All accounts permitted hereunder to be maintained outside of Bank shall be subject to control agreements in favor of, and in form and content acceptable to, Bank; provided, that, Borrower shall be permitted to maintain its cash collateral account with **[***]**, not subject to a control agreement, provided that such **[***]** shall maintain a balance at all times not to exceed **[***]**. Notwithstanding the foregoing, as of the Second Amendment Effective Date through December 31, 2019 (the "Transition Period"), Parent shall be permitted to maintain cash in an amount up to **[***]** in an account outside of Bank (the "**[***]**"); provided, that, the **[***]** shall not be subject to a control agreement in favor of Bank during the Transition Period."

6. Section 6.8 of the Agreement hereby is amended and restated in its entirety to read as follows:

r (b) a **[***]**, by **[***]**, and have it accepted by the FDA (either by the passage of time or formal response) or equivalent competent authority by **[***]**."

7. Section 6.13 of the Agreement hereby is amended and restated in its entirety to read as follows:

"6.13. **Reserved**."

8. Section 7.14 of the Agreement hereby is omitted in its entirety.

9. Exhibit D to the Agreement is hereby replaced with Exhibit D attached hereto.

10. No course of dealing on the part of Bank or its officers, nor any failure or delay in the exercise of any right by Bank, shall operate as a waiver thereof, and any single or partial exercise of any such right shall not preclude any later exercise of any such right. Bank's failure at any time to require strict performance by Borrower of any provision shall not affect any right of Bank thereafter to demand strict compliance and performance. Any suspension or waiver of a right must be in writing signed by an officer of Bank.

11. Unless otherwise defined, all initially capitalized terms in this Amendment shall be as defined in the Agreement. The Agreement, as amended hereby, shall be and remain in full force and effect in accordance with its respective terms and hereby is ratified and confirmed in all respects. Except as expressly set forth herein, the execution, delivery, and performance of this Amendment shall not operate as a waiver of, or as an amendment of, any right, power, or remedy of Bank under the Agreement, as in effect prior to the date hereof.

12. Borrower represents and warrants that the Representations and Warranties contained in the Agreement are true and correct in all material respects as of the date of this Amendment (except to the extent any such representation or warranty is expressly stated to have been made as of a specific date, in which case such representation or warranty shall be true and correct in all material respects as of such date), and that no Event of Default has occurred and is continuing.

13. As a condition to the effectiveness of this Amendment, Bank shall have received, in form and substance satisfactory to Bank, the following:

(a) this Amendment, duly executed by Borrower;

(b) an Amended and Restated Side Letter with respect to the Fee in Lieu;

(c) a Guaranty, duly executed by Parent;

(d) a Security Agreement, duly executed by Parent;

(e) a Certificate of the Secretary of (i) Borrower with respect to incumbency and resolutions authorizing the execution and delivery of this Amendment and (ii) Parent with respect to incumbency and resolutions authorizing the execution and delivery of the Guaranty.

(f) a payment (in addition to and not a substitution for the Final Payment) in the amount of **[***]**;

(g) all reasonable Bank Expenses incurred through the date of this Amendment, which, following notice from Bank to Borrower, may be debited from any of Borrower's accounts; and

(h) such other documents, and completion of such other matters, as Bank may reasonably deem necessary or appropriate.

14. This Amendment may be executed in two or more counterparts, each of which shall be deemed an original, but all of which together shall constitute one instrument.

[Balance of Page Intentionally Left Blank.]

IN WITNESS WHEREOF, the undersigned have executed this Amendment as of the first date above written.

ARCTURUS THERAPEUTICS, INC.

By: /s/ Joseph Payne

Title: President and CEO

WESTERN ALLIANCE BANK, an Arizona corporation

By: /s/ Bill Wickline

Title: Senior Director, Commercial Banking

Exhibit 31.1

CERTIFICATION OF PRINCIPAL EXECUTIVE OFFICER

I, Joseph E. Payne, certify that:

1. I have reviewed this Quarterly Report on Form 10-Q of Arcturus Therapeutics Holdings 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: November 8, 2019

By: /s/ Joseph E. Payne

Joseph E. Payne
President and Chief Executive Officer

Exhibit 31.2

CERTIFICATION OF PRINCIPAL FINANCIAL OFFICER

I, Andrew Sassine, certify that:

1. I have reviewed this Quarterly Report on Form 10-Q of Arcturus Therapeutics Holdings 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: November 8, 2019

By: /s/ Andrew Sassine

Andrew Sassine
Chief Financial Officer

Exhibit 32.1

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

The undersigned, the President and Chief Executive Officer of Arcturus Therapeutics Holdings Inc. (the "Company"), hereby certifies on the date hereof, pursuant to 18 U.S.C. 1350(a), as adopted pursuant to Section 906 of The Sarbanes-Oxley Act of 2002, that the Quarterly Report on Form 10-Q for the period ended September 30, 2019 (the "Form 10-Q"), filed concurrently herewith by the Company, fully complies with the requirements of Section 13(a) or 15(d) of the Securities Exchange Act of 1934, as amended, and that the information contained in the Form 10-Q fairly presents, in all material respects, the financial condition and results of operations of the Company.

Date: November 8, 2019

By: /s/ Joseph E. Payne

Joseph E. Payne
President and Chief Executive Officer

Exhibit 32.2

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

The undersigned, the Chief Financial Officer of Arcturus Therapeutics Holdings Inc. (the "Company"), hereby certifies on the date hereof, pursuant to 18 U.S.C. 1350(a), as adopted pursuant to Section 906 of The Sarbanes-Oxley Act of 2002, that the Quarterly Report on Form 10-Q for the period ended September 30, 2019 (the "Form 10-Q"), filed concurrently herewith by the Company, fully complies with the requirements of Section 13(a) or 15(d) of the Securities Exchange Act of 1934, as amended, and that the information contained in the Form 10-Q fairly presents, in all material respects, the financial condition and results of operations of the Company.

Date: November 8, 2019

By: /s/ Andrew Sassine

Andrew Sassine
Chief Financial Officer