UNITED STATES
SECURITIES AND EXCHANGE COMMISSION
WASHINGTON, DC 20549

FORM 10-Q

☒ **Quarterly report pursuant to Section 13 or 15(d) of the Securities Exchange Act of 1934**

For the quarterly period ended September 30, 2020

☐ **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 001-33957

HARVARD BIOSCIENCE, INC.
(Exact Name of Registrant as Specified in Its Charter)

Delaware	**04-3306140**
(State or other jurisdiction of Incorporation or organization)	(I.R.S. Employer Identification No.)

84 October Hill Road, Holliston, Massachusetts 01746
(Address of Principal Executive Offices, including zip code)

(508) 893-8999
(Registrant's telephone number, including area code)

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, $0.01 par value	HBIO	The Nasdaq Global Market

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

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

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

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

If an emerging growth company, indicate by check mark if the registrant has elected not to use the 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 October 30, 2020, there were 38,975,510 shares of the registrant's common stock issued and outstanding.

HARVARD BIOSCIENCE, INC.

FORM 10-Q

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PART I. FINANCIAL INFORMATION

Item 1. Financial Statements.

HARVARD BIOSCIENCE, INC.
CONSOLIDATED BALANCE SHEETS
(Unaudited, in thousands, except share and per share data)

	September 30, 2020	December 31, 2019
Assets		
Current assets:		
Cash and cash equivalents	$ 2,806	$ 8,335
Accounts receivable, net	13,879	20,704
Inventories	22,689	22,061
Other current assets	4,146	2,472
Total current assets	43,520	53,572

Property, plant and equipment, net		4,309		4,776
Operating lease right-of-use assets		7,927		8,463
Goodwill		57,647		57,381
Intangible assets, net		34,315		38,405
Other long-term assets		1,896		2,273
Total assets	$	149,614		164,870
Liabilities and Stockholders' Equity				
Current liabilities:				
Current portion of long-term debt	$	2,807	$	6,900
Current portion of operating lease liabilities		2,190		2,424
Accounts payable		5,990		5,339
Deferred revenue		3,559		3,949
Accrued income taxes		749		609
Other current liabilities		5,953		6,091
Total current liabilities		21,248		25,312
Long-term debt		40,669		46,917
Deferred tax liability		1,906		1,974
Operating lease liabilities		7,692		8,224
Other long-term liabilities		932		749
Total liabilities		72,447		83,176
Commitments and contingencies - Note 15				
Stockholders' equity:				
Preferred stock, par value $0.01 per share, 5,000,000 shares authorized		-		-
Common stock, par value $0.01 per share, 80,000,000 shares authorized; 46,719,632 and 45,933,715 shares issued and 38,974,125 and 38,188,208 shares outstanding, respectively		438		438
Additional paid-in-capital		231,142		229,189
Accumulated deficit		(131,771)		(124,576)
Accumulated other comprehensive loss		(11,974)		(12,689)
Treasury stock at cost, 7,745,507 common shares		(10,668)		(10,668)
Total stockholders' equity		77,167		81,694
Total liabilities and stockholders' equity	$	149,614	$	164,870

See accompanying notes to condensed consolidated financial statements.

HARVARD BIOSCIENCE, INC.
CONSOLIDATED STATEMENTS OF OPERATIONS AND COMPREHENSIVE LOSS
(Unaudited, in thousands, except share and per share data)

	Three Months Ended September 30,				Nine Months Ended September 30,			
		2020		2019		2020		2019
Revenues	$	24,037	$	27,418	$	71,116	$	85,204
Cost of revenues		10,542		12,439		30,783		38,116
Gross profit		13,495		14,979		40,333		47,088
Operating expenses:								
Sales and marketing expenses		4,588		5,294		14,446		17,370
General and administrative expenses		5,399		6,604		17,828		17,215
Research and development expenses		1,949		2,564		6,336		8,070
Amortization of intangible assets		1,377		1,422		4,258		4,289
Impairment charges		-		460		-		1,401
Total operating expenses		13,313		16,344		42,868		48,345
Operating income (loss)		182		(1,365)		(2,535)		(1,257)
Other expense:								
Interest expense, net		(1,205)		(1,348)		(3,737)		(4,129)
Other (expense) income, net		(392)		39		(472)		(214)
Total other expense		(1,597)		(1,309)		(4,209)		(4,343)
Loss before income taxes		(1,415)		(2,674)		(6,744)		(5,600)
Income tax expense (benefit)		(317)		(54)		451		(363)
Net loss	$	(1,098)	$	(2,620)	$	(7,195)	$	(5,237)

Loss per share:				
Basic and diluted loss per share	$ (0.03)	$ (0.07)	$ (0.19)	$ (0.14)
Weighted-average common shares:				
Basic and diluted	38,920	38,036	38,540	37,764
Comprehensive income (loss):				
Net loss	$ (1,098)	$ (2,620)	$ (7,195)	$ (5,237)
Other comprehensive income/(loss):				
Foreign currency translation adjustments	1,638	(1,495)	681	(1,686)
Derivatives qualifying as hedges, net of tax:				
Gain (loss) on derivative instruments designated and qualifying as cash flow hedges	(1)	(78)	(228)	(572)
Amounts reclassified from accumulated other comprehensive loss to net loss	93	37	262	73
Derivatives qualifying as hedges, net of tax	92	(41)	34	(499)
Other comprehensive (loss) income	1,730	(1,536)	715	(2,185)
Comprehensive loss	$ 632	$ (4,156)	$ (6,480)	$ (7,422)

See accompanying notes to condensed consolidated financial statements.

HARVARD BIOSCIENCE, INC.
CONSOLIDATED STATEMENTS OF STOCKHOLDERS' EQUITY
(Unaudited, in thousands)

Three Months Ended September 30, 2020

	Number of Shares Issued	Common Stock	Additional Paid-in Capital	Accumulated Deficit	Accumulated Other Comprehensive Loss	Treasury Stock	Total Stockholders' Equity
Balance at June 30, 2020	46,414	$ 438	$ 230,675	$ (130,673)	$ (13,704)	$ (10,668)	$ 76,068
Stock option exercises	3	-	7	-	-	-	7
Stock purchase plan	-	-	1	-	-	-	1
Vesting of restricted stock units	467	-	-	-	-	-	-
Shares withheld for taxes	(164)	-	(620)	-	-	-	(620)
Stock compensation expense	-	-	1,079	-	-	-	1,079
Net loss	-	-	-	(1,098)	-	-	(1,098)
Other comprehensive income	-	-	-	-	1,730	-	1,730
Balance at September 30, 2020	46,720	$ 438	$ 231,142	$ (131,771)	$ (11,974)	$ (10,668)	$ 77,167

Three Months Ended September 30, 2019

	Number of Shares Issued	Common Stock	Additional Paid-in Capital	Accumulated Deficit	Accumulated Other Comprehensive Loss	Treasury Stock	Total Stockholders' Equity
Balance at June 30, 2019	45,640	$ 436	$ 227,249	$ (122,506)	$ (14,181)	$ (10,668)	$ 80,330
Stock purchase plan	-	-	70	-	-	-	70
Vesting of restricted stock units	238	-	-	-	-	-	-
Shares withheld for taxes	(68)	-	(129)	1	-	-	(128)
Stock compensation expense	-	-	987	-	-	-	987
Net loss	-	-	-	(2,620)	-	-	(2,620)
Other comprehensive loss	-	-	-	-	(1,536)	-	(1,536)
Balance at September 30, 2019	45,810	$ 436	$ 228,177	$ (125,125)	$ (15,717)	$ (10,668)	$ 77,103

Nine Months Ended September 30, 2020

	Number of Shares Issued	Common Stock	Additional Paid-in Capital	Accumulated Deficit	Accumulated Other Comprehensive Loss	Treasury Stock	Total Stockholders' Equity
Balance at December 31, 2019	45,934	$ 438	$ 229,189	$ (124,576)	$ (12,689)	$ (10,668)	$ 81,694
Stock option exercises	10	-	26	-	-	-	26
Stock purchase plan	64	-	168	-	-	-	168
Vesting of restricted stock units	981	-	-	-	-	-	-
Shares withheld for taxes	(269)	-	(882)	-	-	-	(882)
Stock compensation expense	-	-	2,641	-	-	-	2,641
Net loss	-	-	-	(7,195)		-	(7,195)
Other comprehensive income	-	-	-		715	-	715
Balance at September 30, 2020	46,720	$ 438	$ 231,142	$ (131,771)	$ (11,974)	$ (10,668)	$ 77,167

	Number of Shares Issued	Common Stock	Additional Paid-in Capital	Accumulated Deficit	Accumulated Other Comprehensive Loss	Treasury Stock	Total Stockholders' Equity
Nine Months Ended September 30, 2019							
Balance at December 31, 2018	45,124	$ 436	$ 226,377	$ (119,889)	$ (13,532)	$ (10,668)	$ 82,724
Stock option exercises	3	-	-	-	-	-	-
Stock purchase plan	94	-	159	-	-	-	159
Vesting of restricted stock units	792	-	-	-	-	-	-
Shares withheld for taxes	(203)	-	(552)	1	-	-	(551)
Stock compensation expense	-	-	2,193	-	-	-	2,193
Net loss	-	-	-	(5,237)	-	-	(5,237)
Other comprehensive loss	-	-	-	-	(2,185)	-	(2,185)
Balance at September 30, 2019	45,810	$ 436	$ 228,177	$ (125,125)	$ (15,717)	$ (10,668)	$ 77,103

See accompanying notes to condensed consolidated financial statements.

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HARVARD BIOSCIENCE, INC.
CONSOLIDATED STATEMENTS OF CASH FLOWS
(Unaudited, in thousands)

	2020	2019
Cash flows from operating activities:		
Net loss	$ (7,195)	$ (5,237)
Adjustments to reconcile net loss to net cash provided by operating activities:		
Depreciation	1,453	1,497
Impairment charges	-	1,401
Amortization of intangible assets	4,258	4,289
Amortization of deferred financing costs	295	287
Stock-based compensation expense	2,641	2,193
Provision for allowance for doubtful accounts	24	394
Other	5	41
Changes in operating assets and liabilities:		
Accounts receivable	6,805	3,805
Inventories	(511)	635
Other assets	(878)	(147)
Accounts payable	665	(2,059)
Accrued income taxes	102	(591)
Other current liabilities	(181)	180
Deferred revenue	(380)	(255)
Other long-term liabilities	(262)	(608)
Net cash provided by operating activities	6,841	5,825
Cash flows from investing activities:		
Additions to property, plant and equipment	(1,088)	(778)
Disposition of business	-	1,020
Other	-	(15)
Net cash (used in) provided by investing activities	(1,088)	227
Cash flows from financing activities:		
Proceeds from borrowings	9,615	4,300
Repayments of debt	(20,251)	(11,103)
Taxes paid for net share settlement of equity awards	(688)	(392)
Net cash used in financing activities	(11,324)	(7,195)
Effect of exchange rate changes on cash	42	(185)
Decrease in cash and cash equivalents	(5,529)	(1,328)
Cash and cash equivalents at beginning of period	8,335	8,173
Cash and cash equivalents at end of period	$ 2,806	$ 6,845
Supplemental disclosures of cash flow information:		
Cash paid for interest	$ 3,795	$ 4,226
Cash paid for income taxes, net of refunds	$ 410	$ 411

See accompanying notes to condensed consolidated financial statements.

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1. Basis of Presentation, Risks and Uncertainties, and Summary of Significant Accounting Policies

Basis of Presentation

The unaudited consolidated financial statements of Harvard Bioscience, Inc. and its wholly-owned subsidiaries (collectively, Harvard Bioscience or the Company) as of September 30, 2020 and for the three and nine months ended September 30, 2020 and 2019, have been prepared by the Company pursuant to the rules and regulations of the Securities and Exchange Commission (SEC). Certain information and footnote disclosures normally included in financial statements prepared in accordance with U.S. generally accepted accounting principles (U.S. GAAP) have been condensed or omitted pursuant to such rules and regulations. The December 31, 2019 consolidated balance sheet was derived from audited financial statements but does not include all disclosures required by U.S. GAAP. However, the Company believes that the disclosures are adequate to make the information presented not misleading. These unaudited consolidated financial statements should be read in conjunction with the consolidated financial statements and the notes thereto included in the Company's Annual Report on Form 10-K for the fiscal year ended December 31, 2019, which was filed with the SEC on March 16, 2020.

In the opinion of management, all adjustments, which include normal recurring adjustments necessary to present a fair statement of financial position as of September 30, 2020, results of operations and comprehensive income (loss) for the three and nine months ended September 30, 2020 and 2019 and cash flows for the nine months ended September 30, 2020 and 2019, as applicable, have been made. The results of operations for the three and nine months ended September 30, 2020 are not necessarily indicative of the operating results for the full fiscal year or any future periods.

Risks and Uncertainties

On March 11, 2020, the World Health Organization declared the outbreak of a novel coronavirus (COVID-19) as a pandemic. The COVID-19 pandemic has had a negative impact on the Company's operations to date and the future impacts of the pandemic and any resulting economic impact are largely unknown and rapidly evolving. Since the COVID-19 outbreak in the United States, Europe and elsewhere, many customers, particularly academic research institutions, have been unable to maintain laboratory work which has negatively impacted, and will continue to, negatively impact our sales. Additionally, to ensure business continuity while maintaining a safe environment for employees aligned with guidance from government and health organizations, the Company transitioned the majority of its workforce to work-from-home while implementing social distancing requirements and other measures in factories to allow manufacturing and other personnel essential to production to continue work within our facilities. Business travel was significantly reduced during this period. While the Company has maintained operations under these conditions, these measures represent disruptions which can impact productivity including sales and marketing activities. Accordingly, these conditions in addition to the overall impact on the global economy have negatively impacted our results of operations and cash flows.

As a result of these market and economic conditions, in accordance with the guidelines set forth in ASC 350 and ASC 360, the Company performed an analysis for potential interim impairment indicators of its intangible and other long-lived assets. As of September 30, 2020, the Company concluded there were no impairments of goodwill, other indefinite-lived intangibles, or long-lived assets that resulted from triggering events due to the COVID-19 pandemic.

Summary of Significant Accounting Policies

The accounting policies underlying the accompanying unaudited consolidated financial statements are those set forth in Note 2 to the consolidated financial statements included in the Company's Annual Report on Form 10-K for the year ended December 31, 2019, which was filed with the SEC on March 16, 2020. There have been no material changes in the Company's significant accounting policies during the three and nine months ended September 30, 2020.

2. Recently Issued Accounting Pronouncements

Accounting Pronouncements to be Adopted

In September 2016, the Financial Accounting Standards Board (FASB) issued Accounting Standards Update (ASU) No. 2016-13, *Financial Instruments—Credit Losses (Topic 326): Measurement of Credit Losses on Financial Instruments (ASU 2016-13),* which amends the impairment model by requiring entities to use a forward-looking approach based on expected losses rather than incurred losses to estimate credit losses on certain types of financial instruments, including trade receivables. This may result in the earlier recognition of allowances for losses. The FASB issued several ASUs after ASU 2016-13 to clarify implementation guidance and to provide transition relief for certain entities. ASU 2016-13 is effective for the Company for fiscal years beginning after December 15, 2022, with early adoption permitted. The Company is evaluating the impact that adopting ASU 2016-13 and related amendments will have on its consolidated financial position, results of operations and cash flows.

In August 2018, the FASB issued ASU No. 2018-14, *Disclosure Framework—Changes to the Disclosure Requirements for Defined Benefit Plans* (ASU 2018-14), which amends ASC 715 to add, remove and clarify disclosure requirements related to defined benefit pension and other postretirement plans. The ASU is effective for public entities for fiscal years ending after December 15, 2020, with early adoption permitted. The Company is evaluating the effect of adopting this new accounting guidance but does not expect adoption will have a material impact on the disclosure in the Company's Consolidated Financial Statements.

In December 2019, the FASB issued ASU 2019-12, *Income Taxes (Topic 740): Simplifying the Accounting for Income Taxes* (ASU 2019-12), which enhances and simplifies various aspects of the income tax accounting guidance related to intra-period tax allocation, interim period accounting for enacted changes in tax law, and the year-to-date loss limitation in interim period tax accounting. ASU 2019-12 also amends other aspects of the guidance to reduce complexity in certain areas. ASU 2019-12 is effective for the Company on January 1, 2021. Early adoption is permitted. The Company is evaluating the effect of adopting this new accounting guidance but does not expect adoption will have a material impact on the Company's Consolidated Financial Statements.

3. Accumulated Other Comprehensive Loss

Changes in each component of accumulated other comprehensive loss, net of tax, for the nine months ended September 30, 2020 are as follows:

(in thousands)	Foreign currency translation adjustments	Derivatives qualifying as hedges	Defined benefit pension plans	Total
Balance at December 31, 2019	$ (13,173)	$ (603)	$ 1,087	$ (12,689)
Other comprehensive income (loss) before reclassifications	681	(228)	-	453
Amounts reclassified from AOCI into income	-	262	-	262
Net other comprehensive income	681	34	-	715
Balance at September 30, 2020	$ (12,492)	$ (569)	$ 1,087	$ (11,974)

4. Goodwill and Intangible Assets

Goodwill

The change in the carrying amount of goodwill for the nine months ended September 30, 2020 is as follows:

(in thousands)	
Carrying amount at December 31, 2019	$ 57,381
Effect of change in currency translation	266
Carrying amount at September 30, 2020	$ 57,647

Intangible Assets

Amortizable intangible assets:	Weighted Average Life* (in years)	September 30, 2020 Gross		Accumulated Amortization	Net	December 31, 2019 Gross	Accumulated Amortization	Net
		(in thousands)						
Distribution agreements/customer relationships	9.1	$ 18,130		$ (7,400)	$ 10,730	$ 17,891	$ (6,340)	$ 11,551
Existing technology	5.4	41,347		(22,524)	18,823	41,222	(19,698)	21,524
Trade names	5.7	8,668		(4,150)	4,518	7,692	(3,497)	4,195
Patents	-	213		(213)	-	218	(218)	-
Total amortizable intangible assets		$ 68,358		$ (34,287)	$ 34,071	$ 67,023	$ (29,753)	$ 37,270
Indefinite-lived intangible assets:					244			1,135
Total intangible assets					$ 34,315			$ 38,405

* Weighted average life as of September 30, 2020.

Effective January 1, 2020, the Company determined that $0.9 million of tradenames previously classified as indefinite-lived should be classified as amortizing due to anticipated changes in worldwide marketing programs and estimated an economic life of 4 years for this intangible asset.

Intangible asset amortization expense was $1.4 million for each of the three months ended September 30, 2020 and 2019, respectively and was $4.3 million for each of the nine months ended September 30, 2020 and 2019, respectively.

Estimated amortization expense of existing amortizable intangible assets for each of the five succeeding years and thereafter as of September 30, 2020 is as follows:

Year Ending December 31,	**Amortization Expense**
	(in thousands)
2020 (remainder of year)	$ 1,676
2021	5,703
2022	5,672
2023	5,569
2024	5,267
Thereafter	10,184
Total	$ 34,071

5. Balance Sheet Information

The following tables provide details of selected balance sheet items as of the periods indicated:

Inventories:

	September 30, 2020	December 31, 2019
	(in thousands)	
Finished goods	$ 5,311	$ 5,561
Work in process	3,897	3,153
Raw materials	13,481	13,347
Total	$ 22,689	$ 22,061

Other Current Liabilities:

	September 30, 2020	December 31, 2019
	(in thousands)	
Compensation and payroll	$ 2,218	$ 2,554
Professional fees	594	395
Warranty costs	184	252
Customer related costs	1,038	963
Interest	376	425
Other	1,543	1,502
Total	$ 5,953	$ 6,091

6. Restructuring and Other Exit Costs

On an ongoing basis, the Company reviews the global economy, the healthcare industry, and the markets in which it competes to identify operational efficiencies, enhance commercial capabilities and align its cost base and infrastructure with customer needs and its strategic plans. In order to realize these opportunities, the Company undertakes restructuring-type activities from time to time to transform its business.

The following tables summarize restructuring and other exit charges for the periods set forth below:

	Three Months Ended September 30,		Nine Months Ended September 30,	
(in thousands)	2020	2019	2020	2019
Cost of revenues	$ -	$ 235	$ -	$ 235
Severance costs	234	209	1,585	209
Impairment charges	-	460	-	460
Other	85	10	310	10
Restructuring and other exit costs	$ 319	$ 914	$ 1,895	$ 914

The following table summarizes the changes in the restructuring liabilities for the nine months ended September 30, 2020:

(in thousands)	Severance	Other	Total
Balance at December 31, 2019	$ 364	$ 4	$ 368
Restructuring and other exit costs	1,585	310	1,895
Non-cash charges	-	(168)	(168)
Cash payments	(1,370)	(117)	(1,487)
Balance at September 30, 2020	$ 579	$ 29	$ 608

During the nine months ended September 30, 2019, the Company incurred impairment charges of $1.4 million consisting of pre-restructuring plan charges of $0.9 million to write-off certain in-process research and development intangible assets, and restructuring plan charges of $0.5 million to write-off certain intangible assets as a result of a decision to discontinue a product line and cease operations in its facility in North Carolina.

As of September 30, 2020, the Company had a restructuring liability of $0.6 million which is payable within the next twelve months and has been included in other current liabilities in the consolidated balance sheet.

7. Related Party Transactions

In connection with the 2014 acquisitions of Multi Channel Systems MCS GmbH ("MCS") and Triangle BioSystems, Inc. ("TBSI"), the Company entered into facility lease agreements with the former principal owners of these companies and both became employees of the Company. The TBSI agreement expired on September 30, 2019, and the MCS agreement expires on December 31, 2024. Pursuant to these lease agreements, the Company made rent payments of approximately $0.1 million and $0.2 million for the three and nine months ended September 30, 2020, respectively, and $0.1 million and $0.3 million for the three and nine months ended September 30, 2019, respectively.

8. Leases

The Company has noncancelable operating leases for offices, manufacturing facilities, warehouse space, automobiles and equipment expiring at various dates through 2024 and thereafter.

The components of lease expense for the three and nine months ended September 30, 2020 and 2019 are as follows:

	Three Months Ended		Nine Months Ended	
	September 30, 2020	September 30, 2019	September 30, 2020	September 30, 2019
Operating lease cost	$ 565	$ 523	$ 1,647	$ 1,561
Short term lease cost	46	29	131	156
Sublease income	(26)	(104)	(158)	(309)
Total lease cost	$ 585	$ 448	$ 1,620	$ 1,408

Supplemental cash flow information related to the Company's operating leases was as follows:

	Nine Months Ended	
	September 30, 2020	September 30, 2019
	(in thousands)	
Cash paid for operating lease liabilities:	$ 2,041	$ 1,815
Right of use assets obtained in exchange for lease obligations:	$ 401	$ -

Supplemental balance sheet information related to the Company's operating leases was as follows:

	September 30, 2020	December 31, 2019
	(in thousands)	
Operating lease right-of use assets	$ 7,927	$ 8,463
Current portion, operating lease liabilities	$ 2,190	$ 2,424
Operating lease liabilities, long term	7,692	8,224
Total operating lease liabilities	$ 9,882	$ 10,648
Weighted average remaining lease term (in years)	7.6	8.1
Weighted average discount rate	9.2%	9.2%

Future minimum lease payments for operating leases, with initial or remaining terms in excess of one year at September 30, 2020, are as follows:

	Operating Leases
2021	$ 2,198
2022	1,999
2023	1,944
2024	1,897
2025	1,044
Thereafter	5,086
Total lease payments	14,168
Less interest	(4,286)
Total operating lease liabilities	$ 9,882

9. Capital Stock and Stock-Based Compensation

Fourth Amended and Restated 2000 Stock Option and Incentive Plan

On June 11, 2020, the stockholders of the Company approved the Fourth Amended and Restated 2000 Stock Option and Incentive Plan (the "Fourth A&R Plan"), which plan authorizes the grant of stock options and stock-based awards to officers, employees, non-employee directors and other key persons of the Company and its subsidiaries. The Fourth A&R Plan modified the Company's Third Amended and Restated 2000 Stock Option and Incentive Plan to, among other things, increase the aggregate number of shares authorized for issuance by 3,700,000 shares and reduce the fungible share ratio for deferred stock awards from 1.79 to 1.49. As of September 30, 2020, there were 3,288,084 shares available for issuance under the Fourth A&R Plan. Under the terms of the Fourth A&R Plan, each restricted stock unit or other deferred stock award that is granted decreases the shares available for grant by 1.49 shares and each restricted stock unit that is cancelled or forfeited increases the shares available for grant by 1.49 shares.

Stock-Based Payment Awards

Stock option and restricted stock unit activity for the nine months ended September 30, 2020 were as follows:

	Stock Options		Restricted Stock Units		Market Condition RSUs	
	Stock Options Outstanding	Weighted Average Exercise Price	Restricted Stock Units Outstanding	Grant Date Fair Value	Market Condition RSUs Outstanding	Grant Date Fair Value
Balance at December 31, 2019	2,266,122	$ 3.93	1,590,450	$ 2.27	529,491	$ 1.67
Granted	894,154	2.61	1,001,113	2.73	332,622	2.98
Exercised	(9,994)	2.56	-	-	-	-
Vested (RSUs)	-	-	(748,096)	2.34	(233,056)	1.47
Cancelled/Forfeited	(253,419)	3.43	(89,864)	3.27	(39,286)	3.03
Market Condition RSU - Performance Factor Adjustment	-	-	-	-	233,055	1.47
Balance at September 30, 2020	2,896,863	$ 3.56	1,753,603	$ 2.46	822,826	$ 2.13

As of September 30, 2020, the total compensation costs related to unvested awards not yet recognized is $5.4 million and the weighted average period over which it is expected to be recognized is approximately 2.4 years.

Stock-based compensation expense for the three and nine months ended September 30, 2020 and 2019 was allocated as follows:

	Three Months Ended September 30,		Nine Months Ended September 30,	
	2020	2019	2020	2019
	(in thousands)			
Cost of revenues	$ 19	$ 13	$ 43	$ 34
Sales and marketing expenses	92	39	205	68
General and administrative expenses	908	895	2,249	1,975
Research and development expenses	60	40	144	116
Total stock-based compensation expenses	$ 1,079	$ 987	$ 2,641	$ 2,193

The Company did not capitalize any stock-based compensation.

The weighted average estimated fair value per share of stock options granted during the nine months ended September 30, 2020 and 2019 was $1.21 The following assumptions were used to estimate the fair value of the options granted during the nine months ended September 30, 2020:

Volatility	58.3%
Risk-free interest rate	0.3%
Expected holding period (in years)	4.4
Dividend Yield	-%

The weighted average estimated fair value of the Market Condition RSUs that were granted during the nine months ended September 30, 2020 was $2.98. The following assumptions were used to estimate the fair value of the Market Condition RSUs granted during the nine months ended September 30, 2020, using a Monte-Carlo valuation simulation:

Volatility	80.6%
Risk-free interest rate	0.2%
Correlation coefficient	0.3
Dividend Yield	-%

Earnings (Loss) Per Share

Basic earnings (loss) per share is calculated by dividing net income (loss) by the number of weighted average shares of common stock outstanding during the period. The calculation of diluted earnings per share assumes conversion of stock options, restricted stock units and Market Condition RSUs into common stock using the treasury method. The weighted average number of shares used to compute basic and diluted earnings per share consists of the following:

	Three Months Ended		Nine Months Ended	
	September 30 ,2020	September 30, 2019	September 30 ,2020	September 30, 2019
Basic	38,920,041	38,036,261	38,539,703	37,764,489
Dilutive effect of equity awards	-	-	-	-
Diluted	38,920,041	38,036,261	38,539,703	37,764,489

The shares used in calculating the diluted earnings per share of common stock in the above table exclude options, restricted stock units and Market Condition RSUs of approximately 5,473,292 and 4,055,076 as of September 30, 2020 and 2019, respectively, as the impact of these shares would be anti-dilutive.

10. Long Term Debt

As of September 30, 2020, and December 31, 2019, the Company's borrowings were comprised of:

	September 30, 2020	December 31, 2019
	(in thousands)	
Long-term debt:		
Term loan	$ 43,911	$ 54,997
Revolver	450	-
Less: unamortized deferred financing costs	(885)	(1,180)
Total debt	43,476	53,817
Less: current installments	(3,200)	(3,200)
Less: excess cash flow sweep	-	(4,093)
Current unamortized deferred financing costs	393	393
Long-term debt	$ 40,669	$ 46,917

On January 31, 2018, the Company entered into a financing agreement by and among the Company and certain subsidiaries of the Company as borrowers (collectively, the "Borrower"), certain subsidiaries of the Company as guarantors, various lenders from time to time (the "Lenders"), and Cerberus Business Finance, LLC, as collateral agent and administrative agent for the Lenders (the "Financing Agreement").

The Financing Agreement provides for senior secured credit facilities comprised of a $64.0 million term loan and up to a $25.0 million revolving line of credit subject to available borrowing base. The revolving facility is available for use by the Company and its subsidiaries for general corporate and working capital needs, and other purposes to the extent permitted by the Financing Agreement. Borrowings available under the revolving line of credit are limited to a borrowing base derived from the Company's eligible accounts receivable and inventory, as defined in the Financing Agreement. As of September 30, 2020, borrowings available under the revolving facility were $7.3 million.

The Financing Agreement contains certain restrictive covenants, including a requirement to maintain a maximum leverage ratio among other financial and non-financial covenants, as defined in the Financing Agreement. The Company was compliant with all covenants under the Financing Agreement as of September 30, 2020. The maximum permitted leverage is the ratio of total debt to consolidated EBITDA, as defined in the Financing Agreement with a maximum ratio of 3.25 as of June 30, 2020 and for all quarters thereafter until the maturity of the Financing Agreement in 2023. Due to the negative impact of the COVID-19 pandemic on the Company's revenue and consolidated EBITDA, the gap between the leverage ratio and maximum permitted leverage has reduced. During the nine months ended September 30, 2020, the Company made an additional principal payment of $4.7 million on its term loan.

Based on the Company's current operating plans, including actions taken to mitigate the negative impact of the COVID-19 pandemic on the Company's business and financial condition, it expects that available cash, cash generated from current operations and debt capacity will be sufficient to finance current operations, any costs associated with restructuring activities and capital expenditures. This assessment includes consideration of the Company's best estimates of the impact of the COVID-19 pandemic on its financial results. If the negative impact of the COVID-19 pandemic is more significant than anticipated, it may impact the Company's ability to comply with financial covenants in the future, which would require the Company to seek an amendment or waivers from its lenders, limit access to or require accelerated repayment of the existing credit facilities, or require the Company to pursue alternative financing. There are no assurances that any such alternative financing, if required, could be obtained at terms acceptable to the Company, or at all.

As of September 30, 2020, the weighted average interest rate, net of the impact of the Company's interest rate swap, on its borrowings was 8.9%. The carrying value of the debt approximates fair value because the interest rate under the obligation approximates market rates of interest available to the Company for similar instruments.

On April 18, 2020, the Company entered into a promissory note with PNC Bank, National Association, which provided for a loan in the amount of $6.1 million (the "PPP Loan") pursuant to the Paycheck Protection Program (the "PPP") of the Coronavirus Aid, Relief, and Economic Security Act (the "CARES Act") administered by the U.S. Small Business Administration (the "SBA"). On April 23, 2020, the SBA, in consultation with the U.S. Department of the Treasury issued guidance regarding consideration of alternate available sources of liquidity and its impact on qualification for PPP loans. The Company reassessed its business plans and liquidity available under its existing credit facility and elected to repay all PPP funds. The PPP Loan was repaid in full on May 4, 2020.

11. Derivatives

The Company uses interest-rate-related derivative instruments to manage its exposure related to changes in interest rates on its variable-rate debt instruments. The Company does not enter into derivative instruments for any purpose other than cash flow hedging. The Company does not speculate using derivative instruments.

By using derivative financial instruments to hedge exposures to changes in interest rates, the Company exposes itself to credit risk and market risk. Credit risk is the failure of the counterparty to perform under the terms of the derivative contract. When the fair value of a derivative contract is positive, the counterparty owes the Company, which creates credit risk for the Company. When the fair value of a derivative contract is negative, the Company owes the counterparty and, therefore, the Company is not exposed to the counterparty's credit risk in those circumstances. The Company minimizes counterparty credit risk in derivative instruments by entering into transactions with carefully selected major financial institutions based upon their credit profile.

Market risk is the adverse effect on the value of a derivative instrument that results from a change in interest rates. The market risk associated with interest-rate contracts is managed by establishing and monitoring parameters that limit the types and degree of market risk that may be undertaken.

The Company assesses interest rate risk by continually identifying and monitoring changes in interest rate exposures that may adversely impact expected future cash flows and by evaluating hedging opportunities. The Company maintains risk management control systems to monitor interest rate risk attributable to both the Company's outstanding and forecasted debt obligations as well as the Company's offsetting hedge positions. The risk management control systems involve the use of analytical techniques, including cash flow sensitivity analysis, to estimate the expected impact of changes in interest rates on the Company's future cash flows.

The Company uses variable-rate LIBOR debt to finance its operations. The debt obligations expose the Company to variability in interest payments due to changes in interest rates. Management believes that it is prudent to limit the variability of a portion of its interest payments. To meet this objective, management enters into LIBOR based interest rate swap agreements to manage fluctuations in cash flows resulting from changes in the benchmark interest rate of LIBOR. These swaps change the variable-rate cash flow exposure on the debt obligations to fixed cash flows. Under the terms of the interest rate swaps, the Company receives LIBOR based variable interest rate payments and makes fixed interest rate payments, thereby creating the equivalent of fixed-rate debt for the notional amount of its debt hedged.

As disclosed in Note 10, on January 31, 2018, the Company entered into the Financing Agreement with the Lenders, comprised of a $64.0 million term loan and up to a $25.0 million revolving line of credit. Shortly after entering into the Financing Agreement, the Company entered into an interest rate swap contract with PNC Bank with a notional amount of $36.0 million and a termination date of January 1, 2023 in order to hedge the risk of changes in the effective benchmark interest rate (LIBOR) associated with the Company's term loan. The swap contract converted specific variable-rate debt into fixed-rate debt and fixed the LIBOR rate associated with a portion of the term loan under the Financing Agreement at 2.72%. The interest rate swap was designated as a cash flow hedge instrument in accordance with ASC 815 "Derivatives and Hedging".

The following table presents the notional amount and fair value of the Company's derivative instruments as of September 30, 2020 and December 31, 2019:

		September 30, 2020	
		Notional Amount	Fair Value (a)
Derivatives instruments	**Balance sheet classification**	(in thousands)	
Interest rate swaps	Other long term liabilities	$ 24,077	$ (569)

		December 31, 2019	
		Notional Amount	Fair Value (a)
Derivatives instruments	**Balance sheet classification**	(in thousands)	
Interest rate swaps	Other long term liabilities	$ 28,821	$ (603)

(a) See Note 12 for the fair value measurements related to these financial instruments.

All of the Company's derivative instruments are designated as hedging instruments. The Company has structured its interest rate swap agreements to be fully effective in accordance with ASC 815 and as a result, there was no impact to earnings resulting from hedge ineffectiveness. Changes in the fair value of interest rate swaps designated as hedging instruments that effectively offset the variability of cash flows associated with variable-rate, long-term debt obligations are reported in accumulated other comprehensive income (AOCI). These amounts subsequently are reclassified into interest expense as a yield adjustment of the hedged interest payments in the same period in which the related interest affects earnings.

The following table summarizes the effect of derivatives designated as cash flow hedging instruments and their classification within comprehensive loss for the three and nine months ended September 30, 2020 and 2019:

Derivatives in Hedging Relationships	**Amount of gain (loss) recognized in OCI on derivative (effective portion)**			
	Three Months Ended		**Nine Months Ended**	
	September 30, 2020	**September 30, 2019**	**September 30, 2020**	**September 30, 2019**
	(in thousands)			
Interest rate swaps	$ (1)	$ (78)	$ (228)	$ (572)

The following table summarizes the reclassifications out of accumulated other comprehensive loss for the three and nine months ended September 30, 2020 and 2019:

Details about AOCI Components	**Amount reclassified from AOCI into income (effective portion)**				**Location of amount reclassified from AOCI into income (effective portion)**
	Three Months Ended		**Nine Months Ended**		
	September 30, 2020	**September 30, 2019**	**September 30, 2020**	**September 30, 2019**	
	(in thousands)				
Interest rate swaps	$ 93	$ 37	$ 262	$ 73	Interest expense

As of September 30, 2020, $0.3 million of deferred losses on derivative instruments accumulated in AOCI are expected to be reclassified to earnings during the next twelve months. Transactions and events expected to occur over the next twelve months that will necessitate reclassifying these derivatives' losses to earnings include the repricing of variable-rate debt.

12. Fair Value of Financial Instruments

The carrying values of the Company's cash and cash equivalents, trade accounts receivable and trade accounts payable and short-term debt approximate their fair values because of the short maturities of those instruments. The fair value of the Company's long-term debt approximates its carrying value and is based on the amount of future cash flows associated with the debt discounted using current borrowing rates for similar debt instruments of comparable maturity.

Fair value measurement is defined as the price that would be received to sell an asset or paid to transfer a liability in the principal or most advantageous market for the asset or liability in an orderly transaction between market participants at the measurement date. A fair value hierarchy is established, which prioritizes the inputs used in measuring fair value into three broad levels 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 based on the Company's own assumptions.

The following tables present the fair value hierarchy for those assets or liabilities measured at fair value on a recurring basis:

	Fair Value as of September 30, 2020			
(in thousands)	Level 1	Level 2	Level 3	Total
Assets (Liabilities):				
Interest rate swap agreements	$ -	$ (569)	$ -	$ (569)

	Fair Value as of December 31, 2019			
	Level 1	Level 2	Level 3	Total
Assets (Liabilities):				
Interest rate swap agreements	$ -	$ (603)	$ -	$ (603)

The Company uses the market approach technique to value its financial liabilities. The Company's financial assets and liabilities carried at fair value include derivative instruments used to hedge the Company's interest rate risks. The fair value of the Company's interest rate swap agreements was based on LIBOR yield curves at the reporting date.

13. Revenues

The following table represents a disaggregation of revenue from contracts with customers. Revenue originating from the following geographic areas for the three and nine months ended September 30, 2020 and 2019 consist of:

	Three Months Ended September 30, 2020				
(in thousands)	United States	United Kingdom	Germany	Rest of the world	Total
Instruments, equipment, software and accessories	$ 16,128	$ 1,933	$ 2,215	$ 1,575	$ 21,851
Service, maintenance and warranty contracts	1,914	229	36	7	2,186
Total revenues	$ 18,042	$ 2,162	$ 2,251	$ 1,582	$ 24,037

	Three Months Ended September 30, 2019				
(in thousands)	United States	United Kingdom	Germany	Rest of the world	Total
Instruments, equipment, software and accessories	$ 19,388	$ 2,285	$ 2,772	$ 1,878	$ 26,323
Service, maintenance and warranty contracts	822	198	51	24	1,095
Total revenues	$ 20,210	$ 2,483	$ 2,823	$ 1,902	$ 27,418

	Nine Months Ended September 30, 2020				
(in thousands)	United States	United Kingdom	Germany	Rest of the world	Total
Instruments, equipment, software and accessories	$ 48,574	$ 6,432	$ 7,170	$ 4,681	$ 66,857
Service, maintenance and warranty contracts	3,459	644	109	47	4,259
Total revenues	$ 52,033	$ 7,076	$ 7,279	$ 4,728	$ 71,116

	Nine Months Ended September 30, 2019				
(in thousands)	United States	United Kingdom	Germany	Rest of the world	Total
Instruments, equipment, software and accessories	$ 58,979	$ 7,814	$ 8,956	$ 5,675	$ 81,424
Service, maintenance and warranty contracts	2,874	624	227	55	3,780
Total revenues	$ 61,853	$ 8,438	$ 9,183	$ 5,730	$ 85,204

Deferred revenue

The Company had deferred revenue from service contracts and advance payments from customers of approximately $3.6 million and $3.6 million as of September 30, 2020 and 2019, respectively. Changes in deferred revenue from service contracts and advance payments from customers were as follows:

	Three Months Ended September 30, 2020		
(in thousands)	Service Contracts	Customer Advances	Total
Balance at June 30, 2020	$ 1,413	$ 2,239	$ 3,652
Deferral of revenue	1,126	198	1,324
Recognition of deferred revenue	(1,041)	(387)	(1,428)
Effect of foreign currency translation	11	-	11
Balance at September 30, 2020	$ 1,509	$ 2,050	$ 3,559

	Three Months Ended September 30, 2019		
(in thousands)	Service Contracts	Customer Advances	Total
Balance at June 30, 2019	$ 1,593	$ 1,939	$ 3,532
Deferral of revenue	471	310	781
Recognition of deferred revenue	(358)	(421)	(779)
Effect of foreign currency translation	16	-	16
Balance at September 30, 2019	$ 1,722	$ 1,828	$ 3,550

	Nine Months Ended September 30, 2020		
(in thousands)	Service Contracts	Customer Advances	Total
Balance at December 31, 2019	$ 1,587	$ 2,362	$ 3,949
Deferral of revenue	1,956	542	2,498
Recognition of deferred revenue	(2,029)	(854)	(2,883)
Effect of foreign currency translation	(5)	-	(5)
Balance at September 30, 2020	$ 1,509	$ 2,050	$ 3,559

	Nine Months Ended September 30, 2019		
(in thousands)	Service Contracts	Customer Advances	Total
Balance at December 31, 2018	$ 1,659	$ 2,161	$ 3,820
Deferral of revenue	1,597	561	2,158
Recognition of deferred revenue	(1,550)	(894)	(2,444)
Effect of foreign currency translation	16	-	16
Balance at September 30, 2019	$ 1,722	$ 1,828	$ 3,550

Allowance for Doubtful Accounts

Allowance for doubtful accounts is based on the Company's assessment of the collectability of accounts receivable. A rollforward of the allowance for doubtful accounts for the nine months ended September 30, 2020 and 2019 is as follows:

	Nine Months Ended September 30, 2020	Nine Months Ended September 30, 2019
Balance, beginning of period	$ 325	$ 332
Bad debt expense	24	394
Charge-offs and other recoveries	(60)	(354)
Effect of foreign currency translation	4	(8)
Balance, end of period	$ 293	$ 364

Concentrations

No customer accounted for more than 10% of the revenues for the three and nine months ended September 30, 2020, and 2019. At September 30, 2020, and December 31, 2019, no customer accounted for more than 10% of net accounts receivable.

14. Income Tax

Income tax benefit was approximately $(0.3) million for the three months ended September 30, 2020 and income tax benefit was $(0.1) million for the three months September 30, 2019. The effective tax rate was 22.4% for the three months ended September 30, 2020 compared with 2.0% for the same period in 2019.

Income tax expense was approximately $0.5 million for the nine months ended September 30, 2020 and income tax benefit was $(0.4) million for the nine months ended September 30, 2019. The effective tax rate was (6.7)% for the nine months ended September 30, 2020 compared with 6.5% for the same period in 2019.

The difference between the Company's effective tax rates in 2020 and 2019 compared to the U.S. statutory tax rate of 21% is primarily due to the mix of 2020 forecasted income or losses in the U.S. and foreign tax jurisdictions, the impact of different tax rates in certain foreign jurisdictions, changes to uncertain tax positions, and the impact of the inclusion of foreign income in U.S. taxable income under the GILTI (Global Intangible Low-Taxed Income) tax rules. The effective tax rate in 2020 was also impacted by increases to valuation allowances and changes made by the CARES Act to the limitation on interest expense deductions, including a retroactive change to the calendar year 2019 deduction.

15. Commitments and Contingent Liabilities

On April 14, 2017, representatives for the estate of an individual plaintiff filed a wrongful death complaint with the Suffolk Superior Court, in the County of Suffolk, Massachusetts, against the Company and other defendants, including Biostage, Inc. (f/k/a Harvard Apparatus Regenerative Technology, Inc.), the Company's former subsidiary that was spun off in 2013, as well as another third party. The complaint seeks payment for an unspecified amount of damages and alleges that the plaintiff sustained terminal injuries allegedly caused by products, including synthetic trachea scaffolds and bioreactors, provided by certain of the named defendants and utilized in connection with surgeries performed by third parties in 2012 and 2013. The Company intends to vigorously defend this case and has contacted the liability insurance carrier for Biostage, Inc. to request defense and indemnification of any losses incurred in connection with this lawsuit. The Company has been informed by such insurance provider that the case has been accepted as an insurable claim under Biostage, Inc.'s product liability insurance policy and that the Company is a named insured under the policy. While the Company believes that such claim is without merit, the Company is unable to predict the ultimate outcome of this litigation.

The Company is involved in various other claims and legal proceedings arising in the ordinary course of business. Based on the consultation with the Company's legal counsel, the ultimate disposition of such proceedings is not likely to have a material adverse effect on the Company's business, financial condition, results of operations or cash flows. The Company has not accrued for loss contingencies relating to any such matters because the Company believes that, although unfavorable outcomes in the proceedings are possible, they are not considered by management to be probable and reasonably estimable. If one or more of these matters are resolved in a manner adverse to the Company, the impact on its business, financial condition, results of operations and cash flows could be material.

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

Forward-Looking Statements

This Quarterly Report on Form 10-Q contains statements that are not statements of historical fact and are forward-looking statements within the meaning of Section 27A of the Securities Act of 1933 and Section 21E of the Securities Exchange Act of 1934 (the "Exchange Act"). The forward-looking statements are principally, but not exclusively, contained in "Item 2: Management's Discussion and Analysis of Financial Condition and Results of Operations." These statements involve known and unknown risks, uncertainties and other factors that may cause our actual results, performance, or achievements to be materially different from any future results, performance or achievements expressed or implied by the forward-looking statements. Forward-looking statements include, but are not limited to, statements about management's confidence or expectations, and our plans, objectives, expectations and intentions that are not historical facts. In some cases, you can identify forward-looking statements by terms such as "may," "will," "should," "could," "would," "seek," "expects," "plans," "aim," "anticipates," "believes," "estimates," "projects," "predicts," "intends," "think," "potential," "objectives," "optimistic," "strategy," "goals," "sees," "new," "guidance," "future," "continue," "drive," "growth," "long-term," "projects," "develop," "possible," "emerging," "opportunity," "pursue" and similar expressions intended to identify forward-looking statements. These statements reflect our current views with respect to future events and are based on assumptions and subject to risks and uncertainties. Given these uncertainties, you should not place undue reliance on these forward-looking statements. Factors that may cause our actual results to differ materially from those in the forward-looking statements include the duration and severity of the COVID-19 pandemic and its impact on our business; reductions in customers' research budgets or government funding; domestic and global economic conditions; economic, political and other risks associated with international revenues and operations; recently enacted U.S. government tax reform; currency exchange rate fluctuations; economic and political conditions generally and those affecting pharmaceutical and biotechnology industries; the seasonal nature of purchasing in Europe; our failure to expand into foreign countries and international markets; our inability to manage our growth; competition from our competitors; our substantial debt and our ability to meet the financial covenants contained in our credit facility; failure or inadequacy of the our information technology structure; impact of difficulties implementing our enterprise resource planning systems; information security incidents or cybersecurity breaches; our failure to identify potential acquisition candidates and successfully close such acquisitions with favorable pricing or integrate acquired businesses or technologies; unanticipated costs relating to acquisitions and known and unknown costs arising in connection with our consolidation of business functions and our current and any future restructuring initiatives; failure of any banking institution in which we deposit our funds or its failure to provide services; our failure to raise or generate capital necessary to implement our acquisition and expansion strategy; the failure of Biostage to indemnify us for any liabilities associated with Biostage's business; impact of any impairment of our goodwill or intangible assets; our ability to retain key personnel; failure or inadequacy or our information technology structure; rising commodity and precious metals costs; our ability to protect our intellectual property and operate without infringing on others' intellectual property; exposure to product and other liability claims; global stock market volatility, currency exchange rate fluctuations and regulatory changes caused by the United Kingdom's exit from the European Union; plus other factors described under the heading "Item 1A. Risk Factors" in our Annual Report on Form 10-K for year ended December 31, 2019, and our Quarterly Report on Form 10-Q for the quarter ended March 31, 2020, or described in our other public filings. Our results may also be affected by factors of which we are not currently aware. We may not update these forward-looking statements, even though our situation may change in the future, unless we have obligations under the federal securities laws to update and disclose material developments related to previously disclosed information.

Unless the context requires otherwise, references in this Quarterly Report to "we," "us" and "our" refer to Harvard Bioscience, Inc., and its subsidiaries.

Overview

Harvard Bioscience is a leading developer, manufacturer and seller of technologies, products and services that enable fundamental research, discovery, and pre-clinical testing for drug development. Our customers range from renowned academic institutions and government laboratories to the world's leading pharmaceutical, biotechnology and contract research organizations. With operations in North America, Europe, and China, we sell through a combination of direct and distribution channels to customers around the world.

Recent Developments

COVID-19

On March 11, 2020, the World Health Organization declared the outbreak of a novel coronavirus (COVID-19) as a pandemic. The COVID-19 pandemic has had a negative impact on our operations to date and the future impacts of the pandemic and any resulting economic impact are largely unknown and rapidly evolving. Since the COVID-19 outbreak in the United States, Europe and elsewhere, many customers, particularly academic research institutions, have been unable to maintain laboratory work which has negatively impacted, and will continue to, negatively impact our sales. Additionally, to ensure business continuity while maintaining a safe environment for employees aligned with guidance from government and health organizations, we transitioned the majority of our workforce to work-from-home while implementing social distancing requirements and other measures in factories to allow manufacturing and other personnel essential to production to continue work within our facilities. Business travel was significantly reduced during this period. While we have maintained operations under these conditions, these measures represent disruptions which can impact productivity including sales and marketing activities. Accordingly, these conditions in addition to the overall impact on the global economy has negatively impacted our results of operations and cash flows.

As a result of market and economic conditions, in accordance with the guidelines set forth in ASC 350 and ASC 360, we performed an analysis for potential interim impairment indicators of our intangible and other long-lived assets. As of September 30, 2020, we concluded there were no impairments of goodwill, other indefinite-lived intangibles, or long-lived assets that resulted from triggering events due to COVID-19.

Revenue for the nine months ending September 30, 2020 was negatively impacted due to the conditions noted, and is likely to continue to be negatively impacted by delayed or partial reopening of academic research institutions. In April 2020, we implemented a COVID-19 mitigation plan designed to reduce expenses. Actions taken to date include work hour and salary reductions, reductions-in-force and a realignment of our organizational structure to reduce management layers. During the three months ended September 30, 2020 a portion of employees returned to regular work hours in areas of the business based on sequential improvements in revenue from the three months ended June 30, 2020. These cost reductions are in addition to the significant restructuring actions we initiated in the fourth quarter of 2019 as discussed below. If business interruptions resulting from COVID-19 were to be prolonged or expanded in scope, our business, financial condition, results of operations and cash flows would be negatively impacted. We will continue to actively monitor this situation and will implement actions necessary to maintain business continuity.

Restructuring Plan

In July 2019, we announced the appointment by the Board of Directors of James Green as President and Chief Executive Officer and the appointment of Michael Rossi as Chief Financial Officer. Immediately thereafter we began a process to identify opportunities to improve profitability, increase cash flow and enhance internal capabilities to position the business for organic growth. As a result of this assessment, in September 2019 we announced a strategic action plan for 2020 and 2021. Key elements of this plan include:

- Capitalizing on the strong existing Harvard Bioscience and Data Science franchises and products;
- Adding new senior leadership with significant experience with turnarounds and driving growth and operational improvements within global, middle market life science manufacturing businesses;
- Consolidation of sub-scale operations and integration of existing functions and processes to drive scale and reduce fixed costs;
- Increasing effectiveness of sales and product management to deliver organic sales growth; and
- Improving cash flow and reducing debt.

In December 2019, the Board of Directors approved a restructuring program (the "2019 Restructuring Plan") to support delivery of the strategic action plan. The 2019 Restructuring Plan includes consolidation of our Connecticut manufacturing plant to our existing Massachusetts site, downsizing of operations in the United Kingdom and a reduction in force across the business equal to approximately 10% of our prior headcount. The 2019 Restructuring Plan is expected to deliver annualized run-rate savings of $4.0 million to $5.0 million. A portion of the savings generated is expected to be reinvested to drive profitable growth.

We have continued to execute the 2019 Restructuring Plan during the COVID-19 pandemic and expanded the scope of the restructuring by realigning our organizational structure to reduce management layers and accelerated our efforts to move to a leaner organization and operation. As a result of this expanded scope, we eliminated additional headcount, which is expected to generate additional annualized cost savings of approximately $1.0 million.

As a result of the actions taken under the 2019 Restructuring Plan and incremental cost reduction actions taken to date in 2020, we expect to incur costs associated with headcount reductions, program management and other transition costs required to effect the site consolidations and other business improvements totaling $5.0 million to $6.0 million, substantially all of which is expected to result in cash outlays. Through the nine months ended September 30, 2020, approximately $4.4 million of cash payments were made related to these restructuring activities.

We believe these strategic actions will improve our profitability and position the business for improved organic revenue growth.

Selected Results of Operations

Three months ended September 30, 2020 compared to three months ended September 30, 2019

	Three Months Ended September 30,			
	2020	% of revenue	2019	% of revenue
	(dollars in thousands)			
Revenues	$ 24,037		$ 27,418	
Cost of revenues	10,542	43.9%	12,439	45.4%
Sales and marketing expenses	4,588	19.1%	5,294	19.3%
General and administrative expenses	5,399	22.5%	6,604	24.1%
Research and development expenses	1,949	8.1%	2,564	9.4%
Amortization of intangible assets	1,377	5.7%	1,422	5.2%
Impairment charges	-	-	460	1.7%
Interest expense	1,205	5.0%	1,348	4.9%
Income tax expense (benefit)	(317)	-1.3%	(54)	-0.2%

Revenues

Revenues for the three months ended September 30, 2020 were $24.0 million, a decrease of approximately $3.4 million, or 12.3%, compared to revenues of $27.4 million for the three months ended September 30, 2019. The decrease in revenue was primarily due to the impact of the COVID-19 pandemic on our business, and in particular, lower sales to academic labs and other institutions that were temporarily closed or operating at reduced levels as a result of the pandemic.

Cost of revenues

Cost of revenues were $10.5 million for the three months ended September 30, 2020, a decrease of $1.9 million, or 15.3%, compared with $12.4 million for the three months ended September 30, 2019. Gross margin as a percentage of revenues increased to 56.1% for the three months ended September 30, 2020 compared with 54.6% for the three months ended September 30, 2019. The increase in gross margin was primarily due to product mix and cost reductions initiatives partially offset by lower volumes.

Sales and marketing expenses

Sales and marketing expenses decreased $0.7 million, or 13.3%, to $4.6 million for the three months ended September 30, 2020 compared to $5.3 million during the same period in 2019. This decrease was primarily due to ongoing restructuring and cost reduction initiatives, as well as lower travel costs and variable sales costs due to the revenue reductions noted.

General and administrative expenses

General and administrative expenses were $5.4 million for the three months ended September 30, 2020, a decrease of $1.2 million, or 18.2%, compared with $6.6 million for the three months ended September 30, 2019. The decrease was primarily due to lower employee severance and other restructuring costs compared to the prior period as well as reduced costs due to ongoing cost reduction initiatives.

Research and development expenses

Research and development expenses were $1.9 million for the three months ended September 30, 2020, a decrease of $0.6 million, or 24.0%, compared with $2.6 million for the three months ended September 30, 2019. The decrease was primarily due to lower employee compensation including part-time work programs, and related costs due to ongoing restructuring and cost reduction initiatives.

Amortization of intangible assets

Amortization of intangible asset expenses was $1.4 million for the three months ended September 30, 2020 and did not change materially as compared to the three months ended September 30, 2019.

Interest expense

Interest expense was $1.2 million for the three months ended September 30, 2020, a decrease of $0.1 million, or 10.6%, compared with $1.3 million for the three months ended September 30, 2019. The decrease was primarily due to reduced borrowings under our financing agreement.

Income tax expense (benefit)

Income tax benefit was approximately $(0.3) million for the three months ended September 30, 2020 compared to approximately $(0.1) million for the three months ended September 30, 2019. The effective tax rate was 22.4% for the three months ended September 30, 2020 compared with 2.0% for the same period in 2019. The difference between our effective tax rates in 2020 and 2019 compared to the U.S. statutory tax rate of 21% is primarily due to the mix of 2020 forecasted income or losses in the U.S. and foreign tax jurisdictions, the impact of different tax rates in certain foreign jurisdictions, changes to uncertain tax positions, and the impact of the inclusion of foreign income in U.S. taxable income under the Global Intangible Low-Taxed Income (“GILTI”) tax rules. The effective tax rate in 2020 was also impacted by increases to valuation allowances and changes made by the Coronavirus Aid, Relief, and Economic Security Act (the “CARES Act”) to the limitation on interest expense deductions, including a retroactive change to our calendar year 2019 deduction.

Nine months ended September 30, 2020 compared to nine months ended September 30, 2019

	Nine Months Ended September 30,			
	2020	**% of revenue**	**2019**	**% of revenue**
	(dollars in thousands)			
Revenues	$ 71,116		$ 85,204	
Cost of revenues	30,783	43.3%	38,116	44.7%
Sales and marketing expenses	14,446	20.3%	17,370	20.4%
General and administrative expenses	17,828	25.1%	17,215	20.2%
Research and development expenses	6,336	8.9%	8,070	9.5%
Amortization of intangible assets	4,258	6.0%	4,289	5.0%
Impairment charges	-	0.0%	1,401	1.6%
Interest expense	3,737	5.3%	4,129	4.8%
Income tax expense (benefit)	451	0.6%	(363)	-0.4%

Revenues

Revenues for the nine months ended September 30, 2020 were $71.1 million, a decrease of approximately $14.1 million, or 16.5%, compared to revenues of $85.2 million for the nine months ended September 30, 2019. The decrease in revenue was primarily due to the impact of the COVID-19 pandemic and in particular, lower sales to academic labs and other institutions that are temporarily closed as a result of the pandemic.

Cost of revenues

Cost of revenues were $30.8 million for the nine months ended September 30, 2020, a decrease of $7.3 million, or 19.2%, compared with $38.1 million for the nine months ended September 30, 2019. Gross margin as a percentage of revenues increased to 56.7% for the nine months ended September 30, 2020 compared with 55.3% for the nine months ended September 30, 2019. The increase in gross margin was primarily due to improved product mix with and cost reductions initiatives partially offset by lower volumes.

Sales and marketing expenses

Sales and marketing expenses decreased $2.9 million, or 16.8%, to $14.4 million for the nine months ended September 30, 2020 compared to $17.4 million during the same period in 2019. The decrease in these expenses was primarily due to ongoing restructuring and cost reduction initiatives, as well as lower travel costs and variable sales costs due to the revenue reductions noted.

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General and administrative expenses

General and administrative expenses were $17.8 million for the nine months ended September 30, 2020, an increase of $0.6 million, or 3.6%, compared with $17.2 million for the nine months ended September 30, 2019. The increase was primarily due to higher employee severance, other restructuring costs and stock-based compensation. Excluding these costs, general and administrative costs declined due to ongoing restructuring and cost reduction initiatives.

Research and development expenses

Research and development expenses were $6.3 million for the nine months ended September 30, 2020, a decrease of $1.7 million, or 21.5%, compared with $8.1 million for the nine months ended September 30, 2019. The decrease was primarily due to lower employee compensation including part-time work programs, and related costs due to ongoing restructuring and cost reduction initiatives.

Amortization of intangible assets

Amortization of intangible asset expenses was $4.3 million and did not change materially as compared to the nine months ended September 30, 2019.

Interest expense

Interest expense was $3.7 million for the nine months ended September 30, 2020, a decrease of $0.4 million, or 9.5%, compared with $4.1 million for the nine months ended September 30, 2019. The decrease was primarily due to reduced borrowings under our financing agreement.

Income tax expense (benefit)

Income tax expense was $0.5 million for the nine months ended September 30, 2020 and income tax benefit was $(0.4) million for the nine months ended September 30, 2019. The effective tax rate was (6.7)% for the nine months ended September 30, 2020 compared with 6.5% for the same period in 2019. The difference between our effective tax rates in 2020 and 2019 compared to the U.S. statutory tax rate of 21% is primarily due to the mix of 2020 forecasted income or losses in the U.S. and foreign tax jurisdictions, the impact of different tax rates in certain foreign jurisdictions, changes to uncertain tax positions, and the impact of the inclusion of foreign income in U.S. taxable income under the GILTI tax rules. The effective tax rate in 2020 was also impacted by increases to valuation allowances and changes made by the CARES Act to the limitation on interest expense deductions, including a retroactive change to our calendar year 2019 deduction.

Liquidity and Capital Resources

Our primary sources of liquidity are cash and cash equivalents, internally generated cash flow from operations and our revolving credit facility. Our expected cash outlays relate primarily to cash payments due under our financing agreement described below as well as capital expenditures, severance and other payments associated with ongoing restructuring and cost reduction initiatives.

On January 31, 2018, we and certain of our subsidiaries entered into a financing agreement with Cerberus Business Finance, LLC, as collateral agent and administrative agent for the lenders under the agreement (the "Financing Agreement"), which is comprised of a $64.0 million term loan that was used in connection with the acquisition of Data Sciences International in 2018 and a line of credit of up to $25.0 million.

As of September 30, 2020, we held cash and cash equivalents of $2.8 million, compared with $8.3 million at December 31, 2019. As of September 30, 2020, and December 31, 2019, we had $44.4 million and $55.0 million of borrowings outstanding under our financing agreement, respectively. Total debt, net of cash and cash equivalents, was $41.6 million at September 30, 2020, compared to $46.7 million at December 31, 2019.

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Cash provided by operations was $6.8 million and $5.8 million for the nine months ended September 30, 2020 and 2019, respectively. The increase in net cash flow from operations was primarily due to reductions in working capital as a result of lower revenue volume due to the COVID-19 pandemic, as well as improved working capital management.

Cash used in investing activities was $1.1 million for the nine months ended September 30, 2020 consisting of capital expenditures, including payments associated with ongoing site consolidations and integrations. Our investing activities provided cash of $0.2 million for the nine months ended September 30, 2019 consisting of $0.8 million used for capital expenditures and the receipt of $1.0 million in connection with the release of an escrow amount associated with the sale of substantially all of the assets of our wholly-owned subsidiary, Denville Scientific, Inc. (the "Denville Transaction").

Cash used in financing activities was $11.3 million and $7.2 million for the nine months ended September 30, 2020 and 2019, respectively. During the nine months ended September 30, 2020 we made payments of $11.1 million to reduce our term loan borrowings, including $2.4 million in installment payments, an excess cash flow payment of $4.0 million, and an additional payment of $4.7 million. Net borrowings under our revolving facility were $0.5 million during the nine months ended September 30, 2020.

On April 18, 2020, we entered into a promissory note with PNC Bank, National Association that provided for a loan in the amount of $6.1 million (the "PPP Loan") pursuant to the Paycheck Protection Program (the PPP) of the CARES Act administered by the U.S. Small Business Administration (the "SBA"). On April 23, 2020, the SBA, in consultation with the U.S. Department of the Treasury, issued guidance regarding consideration of alternate available sources of liquidity and its impact on qualification for PPP loans. We reassessed our business plans and liquidity available under our existing credit facility and elected to repay all PPP funds. The PPP Loan was repaid in full on May 4, 2020.

During the nine months ended September 30, 2019 we made payments of $6.8 million of term loan borrowings, including $1.8 million in installment payments, an excess cash flow payment of $4.0 million and a payment of $1.0 million in connection with the release of an escrow amount associated with the Denville Transaction as required by the Financing Agreement.

Borrowing Arrangements

See Note 10 to the consolidated financial statements for a detailed discussion regarding our Financing Agreement and credit facilities.

As of September 30, 2020, we had borrowings of $44.4 million, and as of December 31, 2019, we had borrowings of $55.0 million. We had available borrowing capacity under the revolving line of credit of $7.3 million as of September 30, 2020. As of September 30, 2020, the weighted effective interest rate on our borrowings, net of the impact of our interest rate swap, was 8.9%.

We were compliant with all covenants under the Financing Agreement as of September 30, 2020.

Our covenants under the Financing Agreement include a requirement to maintain a maximum leverage ratio among other financial and non-financial covenants, as defined in the Financing Agreement. The maximum permitted leverage is the ratio of total debt to consolidated EBITDA, as defined in the Financing Agreement, with a maximum ratio of 3.25 as of June 30, 2020 and for all quarters thereafter until the maturity of the Financing Agreement in 2023. Due to the negative impact of the COVID-19 pandemic on our revenue and consolidated EBITDA, the gap between the leverage ratio and maximum permitted leverage has reduced. During the nine months ended September 30, 2020, we made an additional payment of $4.7 million.

Based on our current operating plans, including actions taken to mitigate the impact of COVID-19, we expect that our available cash, cash generated from current operations and debt capacity will be sufficient to finance current operations, any costs associated with restructuring activities and capital expenditures for at least the next 12 months. This assessment includes consideration of our best estimates of the impact of the COVID-19 pandemic on our financial results described above. If the negative impact of the COVID-19 pandemic is more significant than anticipated, it may impact our ability to comply with financial covenants in the future, which would require us to seek an amendment or waivers from our lenders, limit access to or require accelerated repayment of the existing credit facilities, or require us to pursue alternative financing. There are no assurances that any such alternative financing, if required, could be obtained at terms acceptable to us, or at all.

Our forecast of the period of time through which our financial resources will be adequate to support our operations is a forward-looking statement that involves risks and uncertainties, and actual results could vary as a result of a number of factors.

Critical Accounting Policies

The critical accounting policies underlying the accompanying unaudited consolidated financial statements are those set forth in Part II, Item 7 included in our Annual Report on Form 10-K for the fiscal year ended December 31, 2019, which was filed with the SEC on March 16, 2020.

Impact of Foreign Currencies

Our international operations in some instances operate in a natural hedge as we sell our products in many countries and a substantial portion of our revenues, costs and expenses are denominated in foreign currencies, especially the British pound, the euro, the Canadian dollar and the Swedish krona.

During the three months ended September 30, 2020, changes in foreign currency exchange rates resulted in a favorable translation effect on our consolidated revenues of approximately $0.4 million and an unfavorable effect on expenses of approximately $(0.3) million. During the nine months ended September 30, 2020, changes in foreign currency exchange rates resulted in a negligible translation effect on our consolidated revenues and an unfavorable effect on expenses of approximately $(0.7) million.

The gain associated with the translation of foreign equity into U.S. dollars included as a component of comprehensive income (loss) during the three months ended September 30, 2020 was approximately $1.6 million, compared to a loss of $(1.5) million for the three months ended September 30, 2019. The gain associated with the translation of foreign equity into U.S. dollars included as a component of comprehensive income (loss) during the nine months ended September 30, 2020 was approximately $0.7 million, compared to a loss of $(1.7) million for the nine months ended September 30, 2019.

In addition, currency exchange rate fluctuations included as a component of net income resulted in currency gains (losses) of approximately $(0.3) million and $0.1 million during the three months ended September 30, 2020 and 2019, respectively, and $(0.2) million and $0.1 million during the nine months ended September 30, 2020 and 2019, respectively.

Recently Issued Accounting Pronouncements

For information on recent accounting pronouncements impacting our business, see “Note 2 - Recent Accounting Pronouncements" to our Condensed Consolidated Financial Statements.

Item 3. Quantitative and Qualitative Disclosures about Market Risk.

Most of our manufacturing and testing of products occurs in our facilities in the United States, Germany, Sweden and Spain. We sell our products globally through our distributors, direct sales force, websites and catalogs. As a result, our financial results are affected by factors such as changes in foreign currency exchange rates and weak economic conditions in foreign markets. In addition, we are subject to the broad market risk that is created by the global market disruptions and uncertainties resulting from the COVID-19 pandemic.

We collect amounts representing a substantial portion of our revenues and pay amounts representing a substantial portion of our operating expenses in foreign currencies. As a result, changes in currency exchange rates from time to time may affect our operating results.

We are exposed to market risk from changes in interest rates primarily through our financing activities. As of September 30, 2020, we had $44.4 million outstanding under our Financing Agreement. We entered into an interest rate swap contract with PNC Bank with an initial notional amount of $36.0 million and a termination date of January 31, 2023 in order to hedge a portion of the risk of changes in the effective benchmark interest rate (LIBOR) associated with the Financing Agreement. The notional value of the interest rate swap contract as of September 30, 2020 was $24.1 million. The swap contract converted specific variable-rate debt into fixed-rate debt and fixed the LIBOR rate associated with a portion of the term loan under the Financing Agreement at 2.72%.

As of September 30, 2020, the weighted effective interest rate, net of the impact of our interest rate swaps, on our term loan under the Financing Agreement was 8.9%. Assuming no other changes which would affect the margin of the interest rate, the estimated effect of interest rate fluctuations on outstanding borrowings under our Financing Agreement for the nine months ended September 30, 2020 is quantified and summarized as follows:

If compared to the rate as of September 30, 2020	Approximate Interest expense increase
Interest rates increase by 1%	$ 0.1 million
Interest rates increase by 2%	$ 0.2 million

Item 4. Controls and Procedures.

Evaluation of Disclosure Controls and Procedures

As of September 30, 2020, the end of the period covered by this report, our management, including our Chief Executive Officer and our Chief Financial Officer, reviewed and evaluated the effectiveness of our disclosure controls and procedures (as defined in Rule 13a-15(e) or 15d-15(e) of the Exchange Act). Based upon management's review and evaluation, our Chief Executive Officer and Chief Financial Officer have concluded that, as of the end of the period covered by this Quarterly Report on Form 10-Q, our disclosure controls and procedures were effective to provide reasonable assurance that information required to be disclosed in our Exchange Act reports is recorded, processed, summarized and reported within the time periods specified by the SEC and is accumulated and communicated to management, including the Chief Executive Officer and Chief Financial Officer, as appropriate, to allow timely decisions regarding required disclosure.

Changes in Internal Control over Financial Reporting

There were no changes in our internal control over financial reporting during the third quarter of fiscal 2020 that have materially affected, or are reasonably likely to materially affect, our internal control over financial reporting. We continue to monitor the impact of the COVID-19 pandemic and, despite many of our employees working remotely, have not experienced any changes that materially affected, or are reasonably likely to materially affect, our internal control over financial reporting.

Limitations on Effectiveness of Controls and Procedures

In designing and evaluating our controls and procedures, management recognizes that any controls and procedures, no matter how well designed and operated, can provide only reasonable assurance of achieving the desired control objectives, and management is required to apply its judgment in evaluating the cost-benefit relationship of possible controls and procedures. Because of the inherent limitations in all control systems, no evaluation of controls can provide absolute assurance that all control issues and instances of fraud within the Company have been detected.

PART II. OTHER INFORMATION

Item 1. Legal Proceedings.

The information included in Note 15 to the Condensed Consolidated Financial Statements (Unaudited) included in Part I, Item 1 of this quarterly report is incorporated herein by reference.

Item 1A. Risk Factors.

You should carefully consider the factors discussed in Part I, “Item 1A. Risk Factors” in our Annual Report on Form 10-K for the fiscal year ended December 31, 2019, and in Part II, “Item 1A. Risk Factors” in our Quarterly Report on Form 10-Q for the fiscal quarter ended March 31, 2020, which could materially affect our business, financial position, or future results of operations. The risks described in those filings are not the only risks we face. Additional risks and uncertainties not currently known to us or that we currently deem to be immaterial may also materially adversely affect our business, financial position, or future results of operations. To our knowledge, and except to the extent additional factual information disclosed in this Quarterly Report on Form 10-Q relates to such risk factors, there have been no material changes in the risk factors described in our Annual Report on Form 10-K for the fiscal year ended December 31, 2019 and in our Quarterly Report on Form 10-Q for the fiscal quarter ended March 31, 2020.

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

There were no unregistered sales of equity securities during the period covered by this report.

Item 3. Defaults Upon Senior Securities.

None.

Item 4. Mine Safety Disclosures.

Not applicable.

Item 5. Other Information.

None.

Item 6. Exhibits

31.1	Certification of Chief Financial Officer of Harvard Bioscience, Inc., pursuant to Rules 13a-14(a) and 15d-14(a), as adopted pursuant to Section 302 of the Sarbanes-Oxley Act of 2002.
31.2	Certification of Chief Executive Officer of Harvard Bioscience, Inc., pursuant to Rules 13a-14(a) and 15d-14(a), as adopted pursuant to Section 302 of the Sarbanes-Oxley Act of 2002.
32.1*	Certification of Chief Financial Officer of Harvard Bioscience, Inc., 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 Chief Executive Officer of Harvard Bioscience, Inc., pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002.
101.INS	Inline XBRL Instance Document
101.SCH	Inline XBRL Taxonomy Extension Schema Document
101.CAL	Inline XBRL Taxonomy Extension Calculation Linkbase Document
101.DEF	Inline XBRL Taxonomy Extension Definition Linkbase Document
101.LAB	Inline XBRL Taxonomy Extension Labels Linkbase Document
101.PRE	Inline XBRL Taxonomy Extension Presentation Linkbase Document
104	Cover Page Interactive Data File (formatted in Inline XBRL and contained in Exhibit 101)

* This certification shall not be deemed “filed” for purposes of Section 18 of the Securities Exchange Act of 1934, or otherwise subject to the liability of that section, nor shall it be deemed to be incorporated by reference into any filing under the Securities Act of 1933 or the Securities Exchange Act of 1934.

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SIGNATURES

Pursuant to the requirements of the Securities Exchange Act of 1934, the registrant has duly caused this report to be signed on its behalf by undersigned thereunto duly authorized.

Date: November 6, 2020

HARVARD BIOSCIENCE, INC.

By: /s/ JAMES GREEN
James Green
Chief Executive Officer

By: /s/ MICHAEL A. ROSSI
Michael A. Rossi
Chief Financial Officer

EXHIBIT 31.1

Certification

I, Michael A. Rossi, certify that:

1. I have reviewed this Quarterly Report on Form 10-Q of Harvard Bioscience, 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 6, 2020	/s/ MICHAEL A. ROSSI
	Michael A. Rossi Chief Financial Officer

EXHIBIT 31.2

Certification

I, James Green, certify that:

1. I have reviewed this Quarterly Report on Form 10-Q of Harvard Bioscience, 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 6, 2020

/s/ JAMES GREEN

James Green
Chief Executive Officer

EXHIBIT 32.1

CERTIFICATION OF PERIODIC FINANCIAL REPORT

PURSUANT TO 18 U.S.C. SECTION 1350

The undersigned officer of Harvard Bioscience, Inc. (the "Company") hereby certifies to his knowledge that the Company's Quarterly Report on Form 10-Q for the quarterly period ended September 30, 2020 (the "Report") to which this certification is being furnished as an exhibit, as filed with the Securities and Exchange Commission on the date hereof, fully complies with the requirements of Section 13(a) or 15(d), as applicable, of the Securities Exchange Act of 1934, as amended (the "Exchange Act"), and that the information contained in the Report fairly presents, in all material respects, the financial condition and results of operations of the Company. This certification is provided solely pursuant to 18 U.S.C. Section 1350 and Item 601(b)(32) of Regulation S-K (Item 601(b)(32)) promulgated under the Securities Act of 1933, as amended (the "Securities Act"), and the Exchange Act. In accordance with clause (ii) of Item 601(b)(32), this certification (A) shall not be deemed "filed" for purposes of Section 18 of the Exchange Act, or otherwise subject to the liability of that section, and (B) shall not be deemed to be incorporated by reference into any filing under the Securities Act or the Exchange Act, except to the extent that the Company specifically incorporates it by reference.

Date: November 6, 2020

/s/ MICHAEL A. ROSSI

Name: Michael A. Rossi
Title: Chief Financial Officer

EXHIBIT 32.2

CERTIFICATION OF PERIODIC FINANCIAL REPORT

PURSUANT TO 18 U.S.C. SECTION 1350

The undersigned officer of Harvard Bioscience, Inc. (the “Company”) hereby certifies to his knowledge that the Company’s Quarterly Report on Form 10-Q for the quarterly period ended September 30, 2020 (the “Report”) to which this certification is being furnished as an exhibit, as filed with the Securities and Exchange Commission on the date hereof, fully complies with the requirements of Section 13(a) or 15(d), as applicable, of the Securities Exchange Act of 1934, as amended (the “Exchange Act”), and that the information contained in the Report fairly presents, in all material respects, the financial condition and results of operations of the Company. This certification is provided solely pursuant to 18 U.S.C. Section 1350 and Item 601(b)(32) of Regulation S-K (Item 601(b)(32)) promulgated under the Securities Act of 1933, as amended (the “Securities Act”), and the Exchange Act. In accordance with clause (ii) of Item 601(b)(32), this certification (A) shall not be deemed “filed” for purposes of Section 18 of the Exchange Act, or otherwise subject to the liability of that section, and (B) shall not be deemed to be incorporated by reference into any filing under the Securities Act or the Exchange Act, except to the extent that the Company specifically incorporates it by reference.

Date: November 6, 2020

/s/ JAMES GREEN

Name: James Green
Title: Chief Executive Officer