

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

FORM 10-K

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

For the fiscal year ended December 31, 2024
or

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

For the transition period from to

Commission File Number 001-33957

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

Delaware
(State or other jurisdiction of Incorporation or organization)

04-3306140
(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

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

None

Indicate by check mark if the registrant is a well-known seasoned issuer, as defined in Rule 405 of the Securities Act. Yes No

Indicate by check mark if the registrant is not required to file reports pursuant to Section 13 or Section 15(d) of the Act. Yes No

Indicate by 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. (Check one):

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

If securities are registered pursuant to Section 12(b) of the Act, indicate by check mark whether the financial statements of the registrant included in the filing reflect the correction of an error to previously issued financial statements.

Indicate by check mark whether any of those error corrections are restatements that required a recovery analysis of incentive-based compensation received by any of the registrant’s executive officers during the relevant recovery period pursuant to § 240.10D-1(b).

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

The aggregate market value of shares of voting common equity held by non-affiliates of the registrant as of June 28, 2024, the last business day of the registrant’s most recently completed second fiscal quarter, was approximately \$115.2 million based on the closing sales price of the registrant’s common stock, par value \$0.01 per share on that date. At March 5, 2025, there were 44,074,475 shares of the registrant’s common stock issued and outstanding.

DOCUMENTS INCORPORATED BY REFERENCE

Portions of the Company’s definitive Proxy Statement in connection with the 2025 Annual Meeting of Stockholders (the “Proxy Statement”), to be filed within 120 days after the end of the Registrant’s fiscal year, are incorporated by reference into Part III of this Form 10-K. Except with respect to information specifically incorporated by reference in this Form 10-K, the Proxy Statement is not deemed to be filed as part hereof.

HARVARD BIOSCIENCE, INC.
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For the Year Ended December 31, 2024
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This Annual Report on Form 10-K 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 1: Business” and “Item 7: 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, financial performance, or achievements to be materially different from any future results, financial 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. We discuss many of these risks in detail under the heading “Item 1A. Risk Factors” of this Annual Report on Form 10-K. Given these risks and uncertainties, you should not place undue reliance on our forward-looking statements. You should carefully review all of these factors, as well as other risks described in our public filings, and you should be aware that there may be other factors, including factors of which we are not currently aware, that could cause these differences. Also, these forward-looking statements represent our estimates and assumptions only as of the date of this report. 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. Harvard Bioscience, Inc. is referred to herein as “we,” “our,” “us,” and “the Company.”

PART I

Item 1. Business.

Overview

Harvard Bioscience, Inc., a Delaware corporation, is a leading developer, manufacturer and seller of technologies, products and services that enable fundamental advances in life science applications, including research, drug and therapy discovery, bioproduction and preclinical testing for pharmaceutical and therapy development. Our products and services are sold globally to customers ranging from renowned academic institutions and government laboratories to the world’s leading pharmaceutical, biotechnology and contract research organizations (“CROs”). With operations in the United States, Europe and China, we sell through a combination of direct and distribution channels to customers around the world.

Our History and Strategy

Our business began in 1901, under the name Harvard Apparatus. It was founded by Dr. William T. Porter, a Professor of Physiology at Harvard Medical School and a pioneer of physiology education. We have grown over the years with the development and evolution of modern life science research and education. Our early inventions included ventilators based on Dr. Porter’s design, the mechanical syringe pump for drug infusion in the 1950s, and the microprocessor-controlled syringe pump in the 1980s. In 1996, a group of investors acquired a majority of the then existing business of our predecessor, Harvard Apparatus, Inc. Harvard Bioscience, Inc. was incorporated in the State of Delaware in September 2000 and became the successor entity to Harvard Apparatus, Inc. by merger in November 2000. In 2018, we acquired Data Sciences International, Inc. (“DSI”), a global leader in products, services and solutions focused on preclinical testing. The DSI product portfolio, which is largely complementary to our cellular and molecular technology (“CMT”) product portfolio, expanded our product portfolio to address the continuum from research and discovery to preclinical testing with principal applications in drug and therapy testing.

Our strategy for driving revenue growth is focused in the following three areas.

- First, we intend to maintain and strengthen our established base business in the areas of therapy research and pre-clinical testing. This includes expanding our product offerings to address the needs of higher-volume industrial customers such as CROs, biotechnology and pharmaceutical companies, and government laboratories engaged in the development and testing of new therapeutics, where the ability to reduce costs and improve cycle times in pre-clinical testing has the potential to drive additional demand.

- Second, we are expanding our product offerings for biotechnology and pharmaceutical customers in the field of bioproduction, where we believe there are opportunities to provide innovative products and services that bridge from research and development to production in applications that scale with production volume.
- Third, we are expanding our product offerings in the emerging field of organoid research and testing. Organoids, which serve as *in vitro* models that emulate human organs, provide new opportunities for academic research and for streamlined testing early in the pharmaceutical development cycle, especially in the area of neurological and cardiac research and testing. We believe that our microelectrode array products, including our recently introduced MeshMEA™ system, will be attractive to a range of customers, including academic researchers as well as biotechnology, pharmaceutical, and CRO customers engaged in therapy, discovery, development and testing.

In addition, we have taken steps to rationalize our product portfolio and improve our operating cost structure. These activities have included the discontinuation of certain non-strategic products, the consolidation of our global operating footprint, and the reduction of our headcount in Europe and North America. In 2024, we also consolidated our enterprise resource planning (“ERP”) system in the United States. We believe that these actions will allow us to focus on product opportunities that drive sustainable revenue growth with attractive gross margins and improved profitability.

Our Products

Our products, consumables, software and services enable fundamental advances in life science applications, including research, pharmaceutical and therapy discovery, bioproduction and preclinical testing.

We have organized our product line activities into two product families, CMT and Preclinical. Our CMT product family is primarily composed of products supporting research related to molecular, cellular, organ and organoid technologies. Our CMT products also have application in the emerging field of bioproduction of pharmaceuticals and therapeutics as well as in *in vitro* testing of cell lines and organoids in the therapy development. The principal customers for our CMT products include academic and government laboratories, biotechnology and pharmaceutical companies, and CROs. Our Preclinical product family includes products that support the preclinical research and testing phase for drug development, and in particular testing related to data collection and analysis for safety and regulatory compliance. Preclinical products are primarily sold to pharmaceutical and biotechnology companies and CROs, as well as to larger academic laboratories.

Our solutions range from simple to complex, and generally consist of hardware/firmware and software products, augmented with consumables, options, upgrades and post-sales (scientific, installation and data) services. Sales prices of these products and services range typically from \$1,000 to over \$100,000.

Below is a description of each product family.

Cellular and Molecular Technologies (“CMT”) Product Family

Our CMT product family includes products designed primarily to support academic research and the discovery phase of new drug development. The CMT product family includes the Harvard Apparatus, Biochrom, BTX, HEKA, KD Scientific, MCS and Warner brands. CMT products include:

- electroporation and electrofusion instruments, including the bioproduction configuration of our BTX electroporation system, which leverages our electroporation technology to bridge from therapy to production in the emerging field of bioproduction;
- amino acid analyzers which support protein analysis of buffers and solutions in clinical and bioproduction environments;
- spectrophotometers and other equipment which primarily support molecular level testing and research;
- high precision syringe and peristaltic pumps for infusion applications in research;
- precision scientific measuring instrumentation and equipment in the field of electrophysiology such as: data acquisition systems with custom amplifier configurations for cellular analysis, complete micro electrode array solutions for in vivo recordings and in vitro systems for extracellular recordings; and
- our recently introduced MeshMEA™ system, which builds on our existing micro-electrode array technology to support the emerging field of organoid research, especially in the areas of cardiac and neurological research and testing.

Sales of our CMT product family made up approximately 49% of our global revenues for each of the years ended December 31, 2024 and 2023.

Preclinical Product Family

Our Preclinical product family provides a complete platform to assess physiological data from organisms for research ranging from basic research to drug discovery, and drug development services. The Preclinical product family includes the DSI, Panlab, Hugo Sachs and Buxco brands. It includes:

- implantable and externally worn telemetry systems, which are commonly used in research to collect cardiovascular, central nervous system, respiratory, metabolic data; including our new SoHo™ Small Animal Implantable Telemetry System that enables data collection in high-density group housing environments;
- behavioral products; isolated organ and surgical products, a broad range of instruments and accessories for tissue, organ-based lab research, including surgical products, infusion systems, and behavior research systems;
- turn-key respiratory system solutions encompassing plethysmograph chambers, data acquisition hardware, physiological signal analysis software, and final report generation;
- inhalation and exposure systems providing precise, homogenous aerosol delivery for up to 42 subjects, while integrating respiratory parameters for the ultimate delivered dose system;
- powerful GLP-capable data acquisition and analysis systems, capable of integrating third party sensors for a more comprehensive study design; and
- our VivaMars™ behavioral monitoring system, launched in 2023, which is directed to the high throughput testing needs of higher-volume industrial customers such as CROs, biotechnology and pharmaceutical companies, and government laboratories engaged in the development and testing of new therapeutics.

Sales of our Preclinical product family made up approximately 51% of our global revenues for each of the years ended December 31, 2024 and 2023.

Other Products

In addition to our proprietary manufactured products, we distribute products developed by other manufacturers. Resale of such products enables us to act as a single source for our customers' research needs. They consist primarily of instruments or accessories as well as consumables used in experiments involving fluid handling, molecular and cell analysis and tissue, organ and animal research. Sales of third-party products that we distribute accounted for approximately 12% and 13% of our revenues for the years ended December 31, 2024 and 2023, respectively.

Customers

Our end-user customers are primarily pharmaceutical and biotechnology companies, universities, hospitals, government laboratories, including laboratories operated by the United States National Institutes of Health ("NIH"), U.S. Army and CROs. Our pharmaceutical and biotechnology customers include pharmaceutical companies and research laboratories such as Abbott, Amgen, AstraZeneca, Bayer, Glaxo Smith Kline, Johnson & Johnson, Merck, Novartis, Pfizer and Regeneron. Our academic customers include colleges and universities such as Baylor College of Medicine, Cambridge University, Harvard University, Imperial College of London, Johns Hopkins University, Stanford, the University of California system, University of Pennsylvania, University of Pittsburgh, University of Texas and Yale University. Our CRO customers include Charles River Laboratories, Labcorp and Wuxi AppTec. We have a wide range of U.S. and international customers, and no customer accounted for more than 10% of our revenues in 2024.

Sales

We conduct direct sales and sales through distributors in the United States, China and major European markets. We engage distributors for the sales of our own branded and private label products in certain areas of the world and for certain product lines. For the year ended December 31, 2024, revenues from direct sales to end-users represented approximately 63% of our revenues; and revenues from sales of our products through distributors represented approximately 37% of our revenues.

Marketing

Our marketing activities encompass product management and marketing communications. Marketing maintains value-proposition based product roadmaps, collaborates with research and development on timing and investment for new products, develops marketing and sales strategies, supports direct and distributor sales activities, and sets the global pricing of our products. Our marketing team also maintains digital presence across the web and social media platforms, creates electronic leads and analyzes opportunities for new product portfolio extensions. Our websites and marketing collateral serve as the primary sales tool for our product lines, which includes both proprietary manufactured products and complementary products from various suppliers.

Research and Development

Our research and development activities are focused primarily on maintaining and strengthening our existing product and technology portfolio and expanding our portfolio to support new opportunities consistent with our growth strategy. We maintain development staff in many of our manufacturing facilities to design and develop new products and to re-engineer existing products to bring them to the next generation. Our research and development expenses were approximately \$10.4 million and \$11.8 million for the years ended December 31, 2024 and 2023, respectively. We anticipate that we will continue to make investments in research and development activities to advance our position in the industry as a provider of life science equipment, software and services. We plan to pursue a balanced development portfolio strategy of originating new products from internal research and evaluate acquiring products and technologies through business and technology acquisitions or collaborations, as appropriate.

Manufacturing

We manufacture and test the majority of our products in our principal manufacturing facilities located in the United States, Germany and Spain. We have considerable manufacturing flexibility at our various facilities, and each facility can manufacture multiple products at the same time. We maintain in-house manufacturing expertise, technologies and resources. We seek to maintain multiple suppliers for key components that are not manufactured in-house, although some of our products are dependent on sole-source suppliers. The consolidation of our ERP system, which we completed during 2024, is expected to enable operational improvements in our sales and operations planning processes and management of inventory levels and customer service. Our manufacturing operations primarily involve assembly and testing activities along with some machine-based processes. Going forward we will continue to evaluate our manufacturing facilities and operations in order to optimize our manufacturing footprint. See “Part I, Item 2. Properties” of this report for additional information regarding our manufacturing facilities.

Competition

The markets into which we sell our products are highly competitive, and we expect the intensity of competition to continue or increase. We compete with many companies engaged in developing and selling tools for life science research. Many of our competitors have greater financial, operational, sales and marketing resources and more experience in research and development and commercialization than we have. Moreover, our competitors may have broader product offerings and greater name recognition than we do, and many offer discounts as a competitive tactic. These competitors and other companies may have developed or in the future could develop new technologies that compete with our products, which could render our products obsolete. We cannot provide assurance that we will be able to make the enhancements to our technologies necessary to compete successfully with newly emerging technologies. While we provide a broad selection of differentiated products, we have numerous competitors across our product lines. We believe that we compete favorably with our competitors on the basis of product performance, including quality, reliability, speed, technical support, price and delivery time.

We compete with several companies that provide products for life science research including Agilent, Becton, Dickinson and Company, Bio-Rad Laboratories, Inc., Danaher Corporation, Emka Technologies, Eppendorf AG, Hitachi, Instem plc, Kent Scientific Corporation, Lonza Group Ltd., PerkinElmer, Inc., Thermo Fisher Scientific, Inc., TSE Systems and Waters Corporation.

We cannot forecast if or when these or other companies may develop competitive products. We expect that other products will compete with our products and potential products based on efficacy, safety, cost and intellectual property positions. While we believe that these will be the primary competitive factors, other factors include, in certain instances, the availability of supply, manufacturing, marketing and sales expertise and capability.

Seasonality

Sales and earnings in our third quarter are usually flat or down from the second quarter primarily because there are a large number of holidays and vacations during such quarter, especially in Europe. Our fourth quarter revenues and earnings are often the highest in any fiscal year compared to the other three quarters, primarily because many of our customers tend to spend budgeted money before their own fiscal year ends.

Intellectual Property

To establish and protect our proprietary technologies and products, we rely on a combination of patent, copyright, trademark and trade secret laws, as well as confidentiality provisions in our contracts. Patents or patent applications cover certain of our new technologies. Most of our product lines are protected principally by trade names and trade secrets.

We have implemented a patent strategy designed to provide us with freedom to operate and facilitate commercialization of our current and future products. Our success depends, to a significant degree, upon our ability to develop proprietary products and technologies. We intend to continue to file patent applications covering new products and technologies where it is appropriate to do so taking into account factors such as the likely scope of coverage, strategic value, and cost.

Patents provide some degree of protection for our intellectual property. However, the assertion of patent protection involves complex legal and factual determinations and is therefore uncertain. The scope of any of our issued patents may not be sufficiently broad to offer meaningful protection. In addition, our issued patents or patents licensed to us may be successfully challenged, invalidated, circumvented or unenforceable so that our patent rights would not create an effective competitive barrier. Moreover, the laws of some foreign countries may protect our proprietary rights to a greater or lesser extent than the laws of the United States. In addition, the laws governing patentability and the scope of patent coverage continue to evolve, particularly in areas of interest to us. As a result, there can be no assurance that patents will be issued from any of our patent applications or from applications licensed to us. As a result of these factors, our intellectual property positions bear some degree of uncertainty.

We also rely in part on trade secret protection of our intellectual property. We attempt to protect our trade secrets by entering into confidentiality agreements with third parties, employees and consultants. Our employees and consultants also sign agreements requiring that they assign to us their interests in patents and copyrights arising from their work for us. Although many of our United States employees have signed agreements not to compete unfairly with us during their employment and after termination of their employment, through the misuse of confidential information, soliciting employees, soliciting customers and the like, the enforceability of these provisions varies from jurisdiction to jurisdiction and, in some circumstances, they may not be enforceable. In addition, it is possible that these agreements may be breached or invalidated and if so, there may not be an adequate corrective remedy available. Despite the measures we have taken to protect our intellectual property, we cannot provide assurance that third parties will not independently discover or invent competing technologies or reverse engineer our trade secrets or other technologies. Therefore, the measures we are taking to protect our proprietary rights may not be adequate.

We do not believe that our products infringe on the intellectual property rights of any third party. It is possible, however, that third parties will claim such infringement by us or our licensors with respect to current or future products. Any such claims, with or without merit, could be time-consuming, result in costly litigation and diversion of management's attention and resources, cause product shipment delays or require us to enter into royalty or licensing agreements. Moreover, such royalty or licensing agreements, if required, may not be on terms advantageous to us, or acceptable at all, which could seriously harm our business or financial condition.

"Harvard" is a registered trademark of Harvard University. The marks "Harvard Apparatus" and "Harvard Bioscience" are being used pursuant to a license agreement entered into in December 2002 between us and Harvard University.

Government Regulation

We are generally not subject to direct governmental regulation other than the laws and regulations generally applicable to businesses in the domestic and foreign jurisdictions in which we operate. Other than our amino acid analyzer products, which are registered with, but otherwise exempt from United States Food and Drug Administration ("U.S. FDA") pre-clearance requirements, our current products are not subject to pre-market clearance or approval by the U.S. FDA for use on human clinical patients. In addition, we believe we are materially in compliance with all relevant environmental laws.

Human Capital

As of December 31, 2024, we employed 355 employees, which included 330 full-time employees. Some of our employees in Europe have statutory collective bargaining rights. We have never experienced a general work stoppage or strike, and management believes that our relations with our employees are good. Additional information about our employees follows:

Country	Full-time	Part-time
United States	206	10
Germany	52	12
United Kingdom	26	3
Spain	20	-
China	16	-
Rest of World	10	-
Total	330	25

Function	Full-time	Part-time
Manufacturing	120	5
Sales and marketing	123	6
Research and development	40	8
General and administrative	47	6
Total	330	25

We make employment decisions without regard to age, color, national origin, citizenship status, physical or mental disability, race, religion, creed, gender, sex, sexual orientation, gender identity and/or expression, genetic information, marital status, status with regard to public assistance, veteran and military status or any other characteristic protected by federal, state or local law. We take steps to employ and advance in employment qualified protected veterans and qualified individuals with disabilities.

Geographic Area

Financial information regarding geographic areas in which we operate is provided in Notes 3 and 6 to the Consolidated Financial Statements included in “Part IV, Item 15. Exhibits, Financial Statement Schedules” of this report.

Available Information and Website

Our website address is www.harvardbioscience.com. Our Annual Report on Form 10-K, Quarterly Reports on Form 10-Q, Current Reports on Form 8-K, and exhibits and amendments to those reports filed or furnished with the Securities and Exchange Commission pursuant to Section 13(a) of the Exchange Act are available for review on our website and the Securities and Exchange Commission’s website at www.sec.gov. Any such materials that we file with, or furnish to, the SEC in the future will be available on our website as soon as reasonably practicable after they are electronically filed with, or furnished to, the SEC. The information on our website is not incorporated by reference into this Annual Report on Form 10-K.

Item Risk Factors

1A.

The following factors should be reviewed carefully, in conjunction with the other information contained in this Annual Report on Form 10-K. As previously discussed, our actual results could differ materially from the information included in our forward-looking statements. Our business faces a variety of risks. These risks include those described below and may include additional risks and uncertainties not presently known to us or that we currently deem immaterial. If any of the events or circumstances described in the following risk factors occur or develop, our business operations, financial performance and financial condition could be materially and adversely affected, and the trading price of our common stock could decline.

Risks Related to Going Concern

There is substantial doubt about our ability to continue as a going concern.

As of December 31, 2024, there was indebtedness of \$37.4 million outstanding under our term loan and senior revolving credit facility (collectively, the “Credit Agreement”). We were not in compliance with the consolidated net leverage ratio covenant contained in the Credit Agreement as of the December 31, 2024 test date. On March 10, 2025, we entered into an amendment to the Credit Agreement (the “March 2025 Amendment”) pursuant to which the lenders and administrative agent agreed to waive such non-compliance, subject to the terms contained in the March 2025 Amendment. The March 2025 Amendment provides, among other things, that our failure to achieve certain refinancing milestones, including receipt of a term sheet or commitment letter from one or more potential lenders, by the dates provided in the March 2025 Amendment or our failure to consummate a refinancing of the Credit Agreement by June 30, 2025, would, in either case, constitute an event of default under the Credit Agreement. In such event, in addition to other actions our lenders may require, the amounts outstanding under the Credit Agreement may become immediately due and payable. See “Part II, Item 7. Management’s Discussion and Analysis of Financial Condition and Results of Operations - Liquidity and Capital Resources” of this report for additional information regarding the March 2025 Amendment.

We are exploring alternative sources of capital that would allow us to refinance our outstanding indebtedness by June 30, 2025, in order to avoid default under the Credit Agreement, but our ability to access such other sources of capital is uncertain. There is no assurance that such capital will be available to us, be obtainable on commercially acceptable terms, or provide us with sufficient funds to meet our objectives. Based on our anticipated cash flows from operations, unless we are able to access other sources of capital or extend the date for repayment under the Credit Agreement, we will be unable to pay our debt obligations and fund our operations for at least twelve months from the date of issuance of the consolidated financial statements contained in this Annual Report on Form 10-K. As a result, there is substantial doubt about our ability to continue as a going concern.

As discussed in Note 2 to the Consolidated Financial Statements included in “Part IV, Item 15. Exhibits, Financial Statement Schedules” of this report, our consolidated financial statements include an explanatory paragraph that such financial statements were prepared assuming that we will continue as a going concern, continue our operations for the foreseeable future and realize assets and settle liabilities in the normal course of business. The financial statements do not give effect to any adjustments to the amounts and classification of assets and liabilities that may be necessary should we be unable to continue as a going concern. Such adjustments could be material.

Risks Related to Our Industry

The life sciences industry is very competitive.

We expect to encounter increased competition from both established and development-stage companies that continually enter the market. These include companies developing and marketing life science instruments, systems and lab consumables, health care companies that manufacture laboratory-based tests and analyzers, diagnostic and pharmaceutical companies, analytical instrument companies, and companies developing life science or drug discovery technologies. Currently, our principal competition comes from established companies that provide products that perform many of the same functions for which we market our products. Many of our competitors have substantially greater financial, operational, marketing and technical resources than we do. Moreover, these competitors may offer broader product lines and tactical discounts and may have greater name recognition. In addition, we may face competition from new entrants into the field. We may not have the financial resources, technical expertise or marketing, distribution or support capabilities to compete successfully in the future. In addition, we face changing customer preferences and requirements, including increased customer demand for more environmentally friendly products.

The life sciences industry is also subject to rapid technological change and discovery. The development of new or improved products, processes or technologies by other companies may render our products or proposed products obsolete or less competitive. In some instances, our competitors may develop or market products that are more effective or commercially attractive than our current or future products. To meet the evolving needs of customers, we must continually enhance our current products and develop and introduce new products. However, we may experience difficulties that may delay or prevent the successful development, introduction and marketing of new products or product enhancements. In addition, our product lines are based on complex technologies that are subject to change as new technologies are developed and introduced in the marketplace. We may have difficulty in keeping abreast of the changes affecting each of the different markets we serve or intend to serve, and our new products may not be accepted by the marketplace or may generate lower than anticipated revenues. Our failure to develop and introduce products in a timely manner in response to changing technology, market demands, or the requirements of our customers could cause our product sales to decline, and we could experience significant losses.

We offer, and plan to continue to offer, a broad range of products and have incurred, and expect to continue to incur, substantial expenses for the development of new products and enhancements to our existing products. The speed of technological change in our market may prevent us from being able to successfully market some or all of our products for the length of time required to recover development costs. Failure to recover the development costs of one or more products or product lines could decrease our profitability or cause us to experience significant losses.

A portion of our revenues is derived from customers in the pharmaceutical and biotechnology industries and is subject to the risks faced by those industries. Such risks may materially and adversely affect our financial results.

We derive a significant portion of our revenues from pharmaceutical and biotechnology companies and CROs serving these companies. We expect that pharmaceutical and biotechnology companies and CROs will continue to be a significant source of our revenues for the foreseeable future, including in our CMT and Preclinical product families. As a result, we are subject to risks and uncertainties that affect the pharmaceutical and biotechnology industries, such as government regulation, ongoing consolidation, uncertainty of technological change, and reductions and delays in research and development expenditures by companies in these industries.

In particular, the biotechnology industry is largely dependent on raising capital to fund its operations. If biotechnology companies that are our customers are unable to obtain the financing necessary to purchase our products, our business and results of operations could be materially and adversely affected. In addition, we are dependent, both directly and indirectly, upon general health care spending patterns, particularly in the research and development budgets of the pharmaceutical and biotechnology industries, as well as upon the financial condition and purchasing patterns of various governments and government agencies. As it relates to both the biotechnology and pharmaceutical industries, many companies have significant patents that have expired or are about to expire, which could result in reduced revenues for those companies. If pharmaceutical or biotechnology companies that are our customers suffer reduced revenues as a result of these patent expirations, they may be unable to purchase our products and our business and results of operations could be materially and adversely affected.

Changes in government regulations may reduce demand for our products, adversely impact our revenues, or increase our expenses.

We operate in many markets in which we and our customers must comply with federal, state, local and international regulations. We develop, configure and market our products to meet customer needs created by, and in compliance with, those regulations. These requirements include, among other things, regulations regarding manufacturing practices, product labeling, and advertising and post marketing reporting. We must incur expense and spend time and effort to ensure compliance with these complex regulations. Possible regulatory actions for non-compliance could include warning letters, fines, damages, injunctions, civil penalties, recalls, seizures of our products, and criminal prosecution. These actions could result in, among other things, substantial modifications to our business practices and operations; refunds, recalls, or seizures of our products; a total or partial shutdown of production in one or more of our facilities while we or our suppliers remedy the alleged violation; and withdrawals or suspensions of current products from the market. Any of these events could disrupt our business and have a material adverse effect on our revenues, profitability and financial condition.

Risks Related to Our Business

Reductions in customers' research budgets due to reductions in government funding or delays in government funding may adversely affect our business.

Many of our customers are universities, government research laboratories, private foundations and other institutions whose funding is dependent on both the level and timing of funding from government agencies such as the NIH and similar domestic and foreign agencies. These customers represent a significant portion of our revenue. The level of funding and reimbursement rates under government programs relied on by these customers is subject to the political process and is often unpredictable. For example, the NIH announced on February 7, 2025, a policy significantly reducing research grants by limiting payments for indirect overhead. Further, government proposals to reduce or eliminate budget deficits have sometimes included reduced allocations to the NIH and other government agencies that fund our customers' activities. Our revenue may be adversely affected if our customers forgo or delay purchases of our products and services as a result of uncertainties resulting from the NIH announcement or other government budget proposals, including reduced allocations to government agencies that fund our customers' activities. NIH funding may not be directed towards projects and studies that require the use of our products and services. These factors could adversely affect our business and financial results.

Our business is subject to economic, political and other risks associated with international sales and operations.

We manufacture and sell our products internationally and, as a result, our business is subject to risks associated with doing business internationally. A substantial amount of our revenues is derived from international operations, and we anticipate that a significant portion of our sales will continue to come from outside the United States in the future. We anticipate that revenues from international operations will likely continue to increase as a result of our efforts to expand our business in markets abroad. In addition, a number of our manufacturing facilities and suppliers are located outside the United States.

Our foreign operations subject us to certain risks, including: effects of fluctuations in foreign currency exchange rates; the impact of local economic conditions; fluctuations or reductions in economic growth in overseas markets including Asia and Europe; product preferences and seasonality and product requirements in foreign markets; difficulties in effectively establishing and expanding our business and operations in international markets; disruptions in foreign capital markets and trading markets; restrictions and potentially negative tax implications of transfers of capital across borders; differing labor regulations; the imposition of tariffs or import or export restrictions by the United States or foreign governments; other factors beyond our control, including potential political instability, terrorism, acts of war, natural disasters and diseases, pandemics; unexpected changes and increased enforcement of regulatory requirements and various state, federal and international, intellectual property, environmental, antitrust, anti-corruption, fraud and abuse (including anti-kickback and false claims laws) and employment laws; interruption to transportation flows for delivery of parts to us and finished goods to our customers; and laws and regulations on foreign investment in the United States under the jurisdiction of the Committee on Foreign Investment in the United States, or CFIUS, and other agencies, including the Foreign Investment Risk Review Modernization Act, or FIRRMA.

A small percentage of our products are subject to export control regulations administered by the U.S. Department of the Treasury's Office of Foreign Assets Control ("OFAC") and by the Export Administration Regulations administered by the U.S. Department of Commerce's Bureau of Industry and Security ("BIS"). Based on the nature of the product, its ultimate end use and country of destination, we are sometimes subject to foreign assets control and economic sanctions regulations administered by OFAC, which restrict or prohibit our ability to transact with certain foreign countries, certain individuals and entities identified on the Treasury Department's "Denied Parties List." Under the OFAC regulations, the sale or transfer of certain equipment to a location outside the United States may require prior approval in the form of an export license issued by the BIS or the U.S. Department of State's Directorate of Defense Trade Controls. Some potential international transactions may also be restricted or prohibited based on the location, nationality or identity of the potential end user, customer or other parties to the transaction or may require prior authorization in the form of an OFAC license. These risks may be exacerbated by geopolitical tensions in various regions of the world such as China, the Asia-Pacific region and the Middle East. Any delay in obtaining required governmental approvals could affect our ability to conclude a sale or timely commence a project, and the failure to comply with all such controls could result in criminal and/or civil penalties.

Our overall success as a global business depends, in part, upon our ability to succeed in differing economic, social and political conditions. In order to continue to succeed in our international sales strategy, we must continue developing and implementing policies and strategies that are effective in each location where we do business, which could negatively affect our profitability.

Rising inflation and interest rates could negatively impact our revenues, profitability and borrowing costs. In addition, if our costs increase and we are not able to correspondingly adjust our commercial relationships to account for this increase, our net income would be adversely affected, and the adverse impact may be material.

Sustained or increased inflation may result in decreased demand for our products, increased operating costs (including our labor costs), reduced liquidity, and limitations on our ability to access credit or otherwise raise debt and equity capital. In addition, the United States Federal Reserve has raised interest rates in response to concerns about inflation. Increases in interest rates have had, and could continue to have, a material impact on our borrowing costs. In an inflationary environment, we may be unable to raise the sales prices of our products at or above the rate at which our costs increase, which could reduce our profit margins and have a material adverse effect on our financial results and net income. We also may experience lower than expected sales if there is a decrease in spending on products in our industry in general or a negative reaction to our pricing. A reduction in our revenue would be detrimental to our profitability and financial condition and could also have an adverse impact on our future growth.

We have substantial debt, and our lenders have waived our non-compliance with certain of the covenants in our Credit Agreement. If we fail to comply with the terms and conditions of the waiver, or if we fail to comply with any covenants in the future, our lenders may require the amounts outstanding under the debt to become immediately due and payable.

As of December 31, 2024, we had outstanding borrowings of \$37.4 million under the Credit Agreement. We were not in compliance with the consolidated net leverage ratio covenant contained in the Credit Agreement as of the December 31, 2024 test date. Pursuant to the March 2025 Amendment, the lenders and administrative agent agreed to waive such non-compliance subject to the terms contained in the March 2025 Amendment. The March 2025 Amendment provides, among other things, that the lender's commitment under our revolving credit facility is capped at the amount outstanding thereunder as of the date thereof and thus we are unable to make additional borrowings under our revolving credit facility. The March 2025 Amendment also provides that our failure to achieve certain refinancing milestones, including receipt of a term sheet or commitment letter from one or more potential lenders, by the dates provided in the March 2025 Amendment or our failure to consummate a refinancing of the Credit Agreement by June 30, 2025, would, in either case, constitute an event of default under the Credit Agreement. The lenders also agreed not to assert the financial covenants included in the Credit Agreement for the first quarter of fiscal year 2025 provided that we continue to comply with our payment obligations, achieve the refinancing milestones, provide the administrative agent with certain financial reports and maintain a minimum level of liquidity as defined by the March 2025 Amendment. If we are not able to comply with the terms and conditions of the March 2025 Amendment, or if we are otherwise unable to regain and maintain compliance with the covenants under the Credit Agreement, as amended, or are unsuccessful in obtaining waivers or amendments for any covenant in the future, in addition to other actions our lenders may require, the amounts outstanding under the Credit Agreement may become immediately due and payable. See "Part II, Item 7. Management's Discussion and Analysis of Financial Condition and Results of Operations - Liquidity and Capital Resources" of this report for additional information regarding the March 2025 Amendment.

If we fail to satisfy these requirements, there can be no assurance that the lenders will not take action to collect payment of our debt or dispose of collateral securing the debt. Our cash flow and existing capital resources may be insufficient to repay our debt, in which such case prior thereto we would have to repay, refinance and or restructure the obligations under the Credit Agreement, including with proceeds from the sale of assets, and additional equity or debt capital. If we are unsuccessful in obtaining such extension, or entering into such repayment, refinance or restructure prior to maturity or acceleration of repayment, our lenders could foreclose against their collateral or seek other remedies, which would jeopardize our ability to continue our current operations.

Our inability to make additional borrowings under our revolving credit facility could materially affect our ability to fund our existing operations or execute our current business strategy. We may be unable to generate sufficient cash flow, and we may be forced to take actions, which may not be successful, to satisfy our obligations and fund our operations.

Due to the consolidated net leverage ratio requirements in the Credit Agreement and based on the terms of the March 2025 Amendment, we are unable to make additional borrowings under our revolving credit facility. Our financial and operating performance will continue to be subject to prevailing economic conditions and to financial, business and other factors, some of which are beyond our control. Depending on our revenues and operating performance, our inability to make such additional borrowings could materially affect our ability to fund our existing operations and maintain our current liquidity position.

Pursuant to the terms of the March 2025 Amendment, we must restructure or refinance the indebtedness underlying the Credit Agreement or seek additional capital to pay such indebtedness. If we are unable to raise sufficient capital on favorable terms and in a timely manner (if at all), our business and product development efforts could be seriously harmed, and we may be restricted in pursuing potential acquisitions or other business development opportunities as we may be forced to reduce or delay investments and capital expenditures. Our ability to restructure or refinance our debt will depend on, among other things, the condition of the credit markets, capital markets and our financial condition at such time. Any refinancing of our debt could be at higher interest rates and may require us to comply with more onerous covenants, which could further restrict our business operations. The terms of existing or future debt instruments may restrict us from adopting some of these alternatives. In addition, any failure to make payments of interest and principal on our outstanding indebtedness on a timely basis would likely result in a reduction of our credit rating, which could harm our ability to incur additional indebtedness. If we raise additional funds through collaborations or licensing arrangements, we may relinquish rights to certain of our technologies or products or grant licenses to third parties on terms that are unfavorable. In the absence of sufficient cash flows and resources, we could face substantial liquidity problems and might be required to dispose of material assets or operations to meet our debt service and other obligations.

The agreement governing our senior secured credit facility contains financial covenants and other covenants that may restrict our current and future operations, particularly our ability to respond to changes in our business or to take certain actions. Any failure to comply with these covenants could materially harm our business, financial condition, results of operations and liquidity.

Pursuant to the terms of the Credit Agreement, we are subject to various covenants, including negative covenants that restrict our ability to engage in certain transactions, which may limit our ability to respond to changing business and economic conditions. Such negative covenants include, among other things, limitations on our ability and the ability of our subsidiaries to incur debt or liens, make investments (including acquisitions), sell assets, and pay dividends on our capital stock. In addition, the Credit Agreement contains certain financial covenants, including a maximum consolidated net leverage ratio and a minimum consolidated fixed charge coverage ratio, each of which is to be tested at the end of each fiscal quarter of the Company. The March 2025 Amendment contains a minimum liquidity requirement, which will be tested on a biweekly basis. The operating and financial restrictions and covenants in the Credit Agreement and any future financing agreements may adversely affect our ability to finance future operations or capital needs or to engage in other business activities.

Our management has identified material weaknesses in our internal controls over financial reporting as of December 31, 2024. Failure to establish and maintain effective internal controls over financial reporting could have a material adverse effect on our ability to report our financial condition, results of operations, or cash flows accurately and on a timely basis.

As a publicly traded company, we are subject to the Sarbanes-Oxley Act of 2002 (“Sarbanes-Oxley Act”). The Sarbanes-Oxley Act requires that we maintain effective disclosure controls and procedures and internal controls over financial reporting. As part of its annual review of the effectiveness of our internal controls over financial reporting as of December 31, 2024, our management identified material weaknesses in our internal control over financial reporting. A material weakness is a deficiency or a combination of deficiencies in internal control over financial reporting such that there is a reasonable possibility that a material misstatement of our annual or interim financial statements will not be prevented or detected on a timely basis. The identified material weaknesses relate to the design and operating effectiveness of our internal controls over (i) our order to cash cycle and (ii) our physical count of inventories. As a result of these material weaknesses, our management also concluded that our disclosure controls and procedures were not effective as of December 31, 2024.

We are currently implementing a plan intended to remediate the material weaknesses described above. The identified material weaknesses will be considered remediated once additional internal controls are designed, implemented and operate effectively for a sufficient period of time to allow management to conclude that the material weaknesses have been fully remediated. However, there can be no assurance that we will be able to remediate fully the material weaknesses on a timely basis. We may also fail to identify other material weaknesses or significant deficiencies that could impair our ability to report our financial condition and results of operations accurately or on a timely basis.

Continued or future failure to maintain effective internal control over financial reporting could result in financial statements that do not accurately reflect our financial condition or results of operations, may result in material misstatements in our financial statements and may also restrict our future access to the capital markets. Further, because of the inherent limitations in any system of controls, even effective internal control over financial reporting could fail to prevent or detect inaccuracies or misstatements.

For a discussion of our internal control over financial reporting and a description of the identified material weaknesses and remediation plans, see “Part II, Item 9A. Controls and Procedures” of this Annual Report on Form 10-K.

Foreign currency exchange rate fluctuations may have a negative impact on our reported earnings.

We are subject to the risks of fluctuating foreign currency exchange rates, which could have an adverse effect on the sales price of our products in foreign markets, as well as the costs and expenses of our foreign subsidiaries. A substantial amount of our revenues is derived from international operations, and we anticipate that a significant portion of revenues will continue to come from outside the United States in the future. As a result, currency fluctuations among the United States dollar, British pound, euro and the other currencies in which we do business have caused and will continue to cause foreign currency translation and transaction gains and losses. We have not used forward exchange contracts to hedge our foreign currency exposures. We attempt to manage foreign currency risk through the matching of assets and liabilities. In the future, we may undertake to manage foreign currency risk through hedging methods, including foreign currency contracts. We recognize foreign currency gains or losses arising from our operations in the period incurred. We cannot guarantee that we will be successful in managing foreign currency risk or in predicting the effects of exchange rate fluctuations upon our future operating results because of the number of currencies involved, the variability of currency exposure and the potential volatility of currency exchange rates. We cannot predict with certainty any changes in foreign currency exchange rates or the degree to which we can address these risks.

Issues in the development, deployment, and use of artificial intelligence technologies in our business operations, services and products may result in reputational harm, regulatory action, or legal liability, and any failure to adapt to such technological developments or industry trends could adversely affect the competitiveness of our business.

Use of artificial intelligence (“AI”) to improve our internal business operations, or in the development or provision of products or services, poses risks and challenges. The use of AI, particularly generative AI, presents opportunities as well as risks that could negatively impact the business. The development, deployment, and use of AI, including within the life sciences industry, is still in its early stages, where the use of insufficiently developed AI technologies and premature deployment practices could result in unintended outcomes that harm the business. AI technologies may be developed using inaccurate, incomplete, flawed or biased algorithms, training methodologies or data, which could result in competitive harm, regulatory penalties, legal liability, or brand or reputational harm. Further, a failure to timely and effectively use or deploy AI and integrate it into new product offerings and services could negatively impact our competitiveness, particularly ahead of evolving industry trends and evolving consumer demands. We may be unable to devote adequate financial resources to develop or acquire new AI technologies and systems in the future.

AI can pose risks from an intellectual property, confidential data leakage, data protection, privacy perspective, as well as raise ethical concerns, compliance issues, and security risks. The input of confidential information or trade secrets into AI systems may result in the loss of intellectual property, proprietary rights, or attorney-client privilege in such information or trade secrets. The use of AI technologies for developing products or services may adversely affect or preclude the company’s intellectual property rights in such products or services, or may expose the company to liability related to the infringement, misappropriation or other violation of third-party intellectual property. The use of AI technologies with personally identifiable information may also result in legal liability. Further, particularly given the nascent stage of the technology, the use of AI can lead to unintended consequences, including the generation of outputs that appear correct but are factually inaccurate, misleading, or that result in unintended biases and discriminatory outcomes, or are otherwise flawed, which could harm our reputation and business and expose us to risks related to such inaccuracies or errors in these outputs.

Moreover, AI is subject to a dynamic and rapidly evolving legal and regulatory environment, which, without appropriate review, governance and risk management, could expose the company to unforeseen legal or regulatory scrutiny and liabilities. As such, it remains uncertain how AI laws and regulations will impact our business or the associated cost or risks related to compliance therewith or with respect to embedding compliance mechanisms appropriately and effectively into our operations. The use of AI may be subject to new legal or regulatory requirements, the impact of which may be prohibitive or pose further risks from a legal or regulatory action perspective.

Failure or inadequacy of our information technology infrastructure or software could adversely affect our day-to-day operations and decision-making processes and have an adverse effect on our performance.

We depend on accurate and timely information and numerical data from key software applications to aid our day-to-day business, financial reporting and decision-making and, in many cases, proprietary and custom-designed software is necessary to operate our business. Disruption caused by the failure of these systems, the underlying equipment, or communication networks could delay or otherwise adversely impact day-to-day business and decision making, could make it impossible for us to operate critical equipment, and could have an adverse effect on our performance. Our disaster recovery plans may not fully mitigate the effect of any such disruption. Disruptions could be caused by a variety of factors, such as catastrophic events or weather, power outages, or cyber-attacks on our systems by outside parties.

Our ERP systems are critical to our ability to accurately maintain books and records, record transactions, provide important information to our management and prepare our financial statements. The implementation of any IT systems, including ERP systems, has required in the past, and may continue to require investment of significant financial and human resources. In addition, we may not be able to successfully complete the implementation of the ERP systems without experiencing difficulties. Any disruptions, delays or deficiencies in the design and implementation of any information technology (“IT”) system, including ERP systems, could adversely affect our ability to process orders, ship products, provide services and customer support, send invoices and track payments, fulfill contractual obligations or otherwise operate our business.

An information security incident, including a cybersecurity breach, could have a negative impact on our business or reputation.

To meet business objectives, we rely on both internal IT systems and networks, and those of third parties and their vendors, to process and store sensitive data, including confidential research, business plans, financial information, intellectual property, and personal data that may be subject to legal protection. The extensive information security and cybersecurity threats, which affect companies globally, pose a risk to the security and availability of these IT systems and networks, and the confidentiality, integrity, and availability of our sensitive data. We continually assess these threats and make investments to increase internal protection, detection, and response capabilities, as well as ensure our third-party providers have the required capabilities and controls to address this risk. We have been, and may continue to be, subject to cybersecurity risks and incidents related to our business. While we have not experienced any material impact to the business or operations resulting from information or cybersecurity incidents, because of the frequently evolving tactics adopted by threat actors, along with the increased volume and sophistication of attacks by such threat actors, there is the potential for us to be materially adversely impacted in the future. This impact could result in reputational, competitive, operational or other business harm as well as financial costs and regulatory action. Additionally, the California Consumer Privacy Act of 2018 (the “CCPA”), which became effective on January 1, 2020, provides private rights of action for data breaches and requires companies that process information on California residents to make new disclosures to consumers about their data collection, use and sharing practices and allow consumers to opt out of certain data sharing with third parties. Compliance with the CCPA and other current and future applicable privacy, cybersecurity and related laws can be costly and time-consuming. Significant capital investments and other expenditures could also be required to remedy cybersecurity problems and prevent future breaches, including costs associated with additional security technologies, personnel, experts and credit monitoring services for those whose data has been breached. These costs, which could be material, could adversely impact our results of operations in the period in which they are incurred and may not meaningfully limit the success of future attempts to breach our information technology systems.

We may be unable to renew leases or enter into new leases on favorable terms or at all.

Our facilities are located in leased premises. When such leases expire, we may be unable to renew such leases or enter into new leases on favorable terms or at all. Further, a significant rise in real estate prices or real property taxes could also result in an increase in lease expenses, and thereby negatively impact the Company’s results of operations and cash flow. As a result, we may incur additional costs including increased rent and other costs related to our renegotiation of lease terms for our facilities or for a new lease in a desirable location.

We may incur additional restructuring costs or not realize the expected benefits of our initiatives to reduce operating expenses in the future.

We may not realize the expected benefits from our recent realignment and restructuring initiatives or similar restructuring initiatives that we may undertake in the future. In addition, we may incur additional restructuring costs in implementing such realignment and restructuring plans or other similar future plans in excess of our expectations. The implementation of our restructuring efforts, including the reduction of our workforce, may not improve our operational and cost structure or result in greater efficiency of our organization; and we may not be able to support sustainable revenue growth and profitability following such restructurings.

If we are not able to manage our growth, our operating profits may be adversely impacted.

Our success will depend on the expansion of our operations through organic growth, and we may execute acquisitions in the future to augment this growth. Effective growth management will place increased demands on our management team, operational and financial resources and expertise. To manage growth, we must optimize our operational, financial and management processes and systems, and information technology infrastructure and hire and train additional qualified personnel. While we continue to evaluate potential improvements to and consolidation of many of our processes and systems, we may not be able to implement these changes in an efficient or timely manner. Failure to manage our growth effectively, including failure to improve our systems and processes timely or efficiently, could impair our ability to generate revenues or could cause our expenses to increase more rapidly than revenues, resulting in operating losses or reduced profitability.

We may incur a variety of costs in connection with acquisitions we may seek to consummate in the future, and we may never realize the anticipated benefits of our acquisitions due in part to difficulties integrating the businesses, operations and product lines.

Our business strategy has historically included the acquisition of businesses, technologies, services or products that we believe are a strategic fit with our business. If we were to undertake future acquisitions, the process of integrating the acquired business, technology, service and/or product(s) may result in unforeseen operating difficulties and expenditures and potentially absorb significant management attention that would otherwise be available for ongoing development of our business. Moreover, we may fail to realize the anticipated benefits of an acquisition as rapidly as expected, or at all. Such transactions are inherently risky, and any such recent or future acquisitions could reduce stockholders' ownership, cause us to incur debt, expose us to future liabilities and result in amortization expenses related to intangible assets with definite lives, which may adversely impact our ability to undertake future acquisitions on substantially similar terms. We may also incur significant expenditures in anticipation of an acquisition that is never realized.

Our ability to achieve the benefits of acquisitions depends in part on the integration and leveraging of technology, operations, sales and marketing channels and personnel. Integration is a complex, time-consuming and expensive process and may disrupt our business if not completed in a timely and efficient manner. We may have difficulty successfully integrating acquired businesses, and their domestic and foreign operations or product lines, and as a result, we may not realize any of the anticipated benefits of the acquisitions we make. We cannot assure that our growth rate will equal the growth rates that have been experienced by us, and these other acquired companies, respectively, operating as separate companies in the past.

If we fail to retain key personnel and hire, train and retain qualified employees, we may not be able to compete effectively, which could result in reduced revenue or increased costs.

Our success is highly dependent on the continued services of key management, technical and scientific personnel. Our management and other employees may voluntarily terminate their employment at any time upon short notice. The loss of the services of any member of the senior management team, including the Chief Executive Officer or Chief Financial Officer or any of our managerial, technical or scientific staff, may significantly delay or prevent the achievement of product development, our growth strategies and other business objectives. Our future success will also depend on our ability to identify, recruit and retain additional qualified scientific, technical and managerial personnel. We operate in several geographic locations where labor markets are particularly competitive, including the Boston, Massachusetts and Minneapolis, Minnesota metropolitan areas, England, and Germany where demand for personnel with these skills is extremely high and is likely to remain high. As a result, competition for qualified personnel is intense, particularly in the areas of general management, finance, information technology, engineering and science, and the process of hiring suitably qualified personnel is often lengthy and expensive and may become more expensive in the future. If we are unable to hire and retain a sufficient number of qualified employees, our ability to conduct and expand our business could be seriously reduced.

Our success will depend partly on our ability to operate without infringing on or misappropriating the intellectual property rights of others.

We may be sued for infringing on the intellectual property rights of others, including the patent rights, trademarks and trade names of third parties. Intellectual property litigation is costly, and the outcome is uncertain. If we do not prevail in any intellectual property litigation, in addition to any damages we might have to pay, we could be required to stop the infringing activity or obtain a license to or design around the intellectual property in question. If we are unable to obtain a required license on acceptable terms, or are unable to design around any third-party patent, we may be unable to sell some of our products and services, which could result in reduced revenue.

Third parties may seek to hold us responsible for Harvard Apparatus Regenerative Technologies, Inc.'s ("HRGN") (formerly known as Biostage, Inc.) liabilities, including liabilities that HRGN has assumed from us.

Third parties may continue to seek to hold us responsible for HRGN's liabilities, including any of the liabilities that HRGN agreed to retain or assume in connection with the separation of the HRGN business from our businesses, and related spin-off distribution. For example, in April 2022, we and HRGN entered into a settlement of a litigation relating to injuries allegedly caused by products produced by us and HRGN and utilized in connection with surgeries performed by third parties (the "HRGN Settlement"). The HRGN Settlement resolved and dismissed all claims by and between the parties.

Risks Related to Our Common Stock

Our stock price has fluctuated in the past and could experience substantial additional declines in the future.

The market price of our common stock has experienced significant fluctuations and may become volatile and could decline further in the future, perhaps substantially, in response to various factors including, but not limited to:

- the substantial doubt with regard to our ability to continue as a going concern;
- our business performance;
- volatility of the financial markets;
- uncertainty regarding the prospects of the domestic and foreign economies; and
- technological innovations by competitors or in competing technologies.

In addition, public stock markets have experienced extreme price and trading volatility. The stock market and the Nasdaq Global Market in general, and the biotechnology and life science tools industry and small cap markets in particular, have experienced significant price and volume fluctuations that at times may have been unrelated or disproportionate to the operating performance of those companies. These broad market and industry factors may further harm the market price of our common stock, regardless of our operating performance. In the past, securities class action litigation has often been instituted following periods of volatility in the market price of a company's securities. A securities class action suit against us could result in substantial costs, potential liabilities and the diversion of management's attention and resources.

If we raise additional funds through the sale of equity or convertible debt or other equity-linked securities, investors may experience significant dilution of their ownership interest.

We may raise additional funds through the sale of equity or convertible debt or other equity-linked securities to repay our existing indebtedness, implement our acquisition strategy, expand our operations or invest in the development of new products. If we raise additional funds through such sales, investors may experience significant dilution of their ownership interest. We may issue securities that have rights, preferences and privileges senior to our common stock. If we raise additional funds by obtaining loans from third parties, the terms of those financing arrangements may include negative covenants or other restrictions on our business that could impair our operational flexibility and would also require us to incur additional interest expense.

General Risks

We are currently operating in a period of economic uncertainty and capital markets disruption, which has been significantly impacted by geopolitical instability due to military conflicts. Our business, financial condition and results of operations may be materially adversely affected by any negative impact on the global economy and capital markets resulting from the conflict in Ukraine, the Middle East or any other geopolitical tensions.

U.S. and global markets are experiencing volatility and disruption following the escalation of geopolitical tensions globally, including military conflicts (such as the conflict between Russia and Ukraine and the conflicts in Israel and the Middle East). Although the length and impact of these conflicts are highly unpredictable, these conflicts could lead to market disruptions, including significant volatility in commodity prices, credit and capital markets, supply chain interruptions, and additional economic and financial sanctions.

Any of the abovementioned factors could affect our business, prospects, financial condition, and operating results. The extent and duration of the military action, sanctions and resulting market disruptions are impossible to predict, but could be substantial. Any such disruptions may also magnify the impact of other risks described in this Annual Report on Form 10-K.

Epidemics and pandemics have had, and in the future may have, a material adverse impact on our business.

Our operations and financial performance have been, and in the future may be, negatively impacted by public health crises, epidemics and pandemics. Such events have caused, and may in the future cause, impacts such as reductions in economic activity (including volatility in demand for our products, services, and solutions, disruptions in global supply chains, and volatility in financial markets). Additionally, we have in the past experienced, and may in the future experience, operational challenges such as workplace disruptions, restrictions on the movement of people, raw materials, and goods (both at our own facilities and at those of our customers and suppliers), global supply chain disruptions, delays or disruptions in orders and order fulfillment, and price inflation.

If we incur higher costs as a result of trade policies, treaties, government regulations or tariffs, we may become less profitable.

There continues to be uncertainty about the relationship between the United States and foreign countries, including with respect to trade policies, treaties, government regulations and tariffs. The United States has recently instituted or proposed changes in trade policies that include the negotiation or termination of trade agreements, the imposition of higher tariffs on imports into the United States, economic sanctions on individuals, corporations or countries, and other government regulations affecting trade between the United States and other countries where we conduct our business. A number of other nations have proposed or instituted similar measures directed at trade with the United States in response. As a result of these developments, there may be greater restrictions and economic disincentives on international trade that could materially and adversely affect our business.

We may be the subject of lawsuits from counterparties to acquisitions and divestitures, including an acquiring company or its stockholders, an acquired company's previous stockholders, a divested company's stockholders or our current stockholders.

We may be the subject of lawsuits from either an acquiring company or its stockholders, an acquired company's previous stockholders, a divested company's stockholders or our current stockholders. Such lawsuits could result from the actions of the acquisition or divestiture target prior to the date of the acquisition or divestiture, from the acquisition or divestiture transaction itself or from actions after the acquisition or divestiture. Defending potential lawsuits could cost us significant expense and detract management's attention from the operation of the business. Additionally, these lawsuits could result in the cancellation of or the inability to renew certain insurance coverage that would be necessary to protect our assets

Rising commodity and precious metals costs could adversely impact our profitability.

Raw material commodities, such as resins, and precious metal commodities, such as platinum, are subject to wide price variations. Increases in the costs of these commodities and the costs of energy, transportation and other necessary services may adversely affect our profit margins if we are unable to pass along any higher costs in the form of price increases or otherwise achieve cost efficiencies such as in manufacturing and distribution.

Provisions of Delaware law, or of our charter and bylaws may make a takeover more difficult, which could cause our stock price to decline.

Provisions in our certificate of incorporation and bylaws and in the Delaware corporate law may make it difficult and expensive for a third party to pursue a tender offer, change in control or takeover attempt, which is opposed by management and the board of directors. Public stockholders who might desire to participate in such a transaction may not have an opportunity to do so. We have a staggered board of directors that makes it difficult for stockholders to change the composition of the board of directors in any one year. These anti-takeover provisions could substantially impede the ability of public stockholders to change our management and board of directors. Such provisions may also limit the price that investors might be willing to pay for shares of our common stock in the future.

Item 1B. Unresolved Staff Comments.

None.

Item 1C. Cybersecurity.

Cybersecurity Risk Management and Strategy

We have implemented a cybersecurity risk management program intended to protect the confidentiality, integrity, and availability of our critical systems and information. Our cybersecurity risk management program is an element of and is integrated into our overall enterprise risk management program. Our framework is informed in part by the National Institute of Standards and Technology (NIST) Cybersecurity Framework and International Organization for Standardization 27001 (ISO 27001) Framework, although we have not been audited to, and may not be in compliance with, all technical standards, specifications or requirements under the NIST or ISO 27001 frameworks. Our cybersecurity risk management program includes:

- risk assessments designed to help identify material cybersecurity risks to our critical systems, information, products and services, and our broader enterprise IT environment;
- a security team that is principally responsible for managing (1) our cybersecurity risk assessment processes, (2) our security controls, and (3) our response to cybersecurity incidents;
- the use of external service providers, where appropriate, to assess, test, or otherwise assist with aspects of our security controls;
- cybersecurity awareness training for our employees, incident response personnel, and senior management;
- assessment of material cybersecurity risks posed by third-party service providers, including risks to employee, customer and financial information; and
- a cybersecurity incident response protocol that includes procedures for responding to cybersecurity incidents.

We have been, and expect to continue to be, subject to cybersecurity risks and incidents related to our business. To date, such risks and incidents have not materially affected our business strategy, results of operations or financial condition. For more information about the cybersecurity risks we face, see Item 1A – Risk Factors.

Cybersecurity Governance

Our Board considers cybersecurity risk as part of its enterprise risk management oversight function. This oversight includes periodic reports from management, including our Vice President of IT, concerning cybersecurity related risks.

Our management team, including our Vice President of IT, is responsible for assessing and managing risks from cybersecurity threats. Our Vice President of IT has extensive information technology and program management experience, including broad experience in corporate and consulting environments across a range of organizations and industries. Where appropriate, she engages external cybersecurity consultants to assist with cybersecurity related matters. Our management team has primary responsibility for our overall cybersecurity risk management program and, under the leadership of our Vice President of IT, supervises both our internal personnel and external cybersecurity consultants. Our program includes efforts to prevent, detect, mitigate, and remediate cybersecurity risks. These efforts employ information from various sources, such as security tools deployed in our IT environment, internal personnel, external security consultants, and governmental sources.

Item 2. Properties.

Our facilities incorporate manufacturing, research and development, sales and marketing, and administration functions. As of December 31, 2024, we leased the following principal facilities:

Location	Description of Facility	Approximate Square Footage	Expiration
New Brighton, Minnesota	Manufacturing facility	75,000	2030
	Manufacturing facility and corporate headquarters		
Holliston, Massachusetts	headquarters	52,000	2029
Reutlingen, Germany	Manufacturing facility	23,000	2025*
Barcelona, Spain	Manufacturing facility	16,000	2025+
March-Hugstetten, Germany	Manufacturing facility	11,000	2025

* After December 31, 2024, this lease was extended through January 2030.

+ This lease is renewed on a month-to-month basis.

We also lease facilities in Cambridge, England; Kista, Sweden; Beijing, China; and Shanghai, China. We believe our current facilities are adequate for our needs for the foreseeable future.

Item 3. Legal Proceedings.

For information related to legal proceedings, see the discussion in Note 16 to the Consolidated Financial Statements included in “Part IV, Item 15. Exhibits, Financial Statement Schedules” of this report, which information is incorporated by reference into this Item 3.

Item 4. Mine Safety Disclosures

Not Applicable.

PART II**Item 5. Market for Registrant’s Common Equity, Related Stockholder Matters and Issuer Purchases of Equity Securities****Market Information**

Our common stock is quoted on the Nasdaq Global Market under the symbol “HBIO.”

Stockholders

There were 86 holders of record of our common stock as of March 5, 2025. The number of record holders was determined from the records of our transfer agent and does not include beneficial owners of our common stock whose shares are held in the names of various security brokers, dealers, and registered clearing agencies.

Dividend Policy

We have never declared or paid cash dividends on our common stock in the past and do not intend to pay cash dividends on our common stock in the foreseeable future. Any future determination to pay cash dividends will be at the discretion of our board of directors and will depend on our financial condition, results of operations, capital requirements and other factors our board of directors deems relevant.

Item 6. [Reserved]**Item 7. Management's Discussion and Analysis of Financial Condition and Results of Operations.**

7.

Forward-Looking Statements

The following section of this Annual Report on Form 10-K contains statements that are not statements of historical fact and are forward-looking statements within the meaning of federal securities laws. These statements involve known and unknown risks, uncertainties and other factors that may cause our actual results, financial performance or achievements to be materially different from any future results, financial performance or achievements expressed or implied by the 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. Factors that may cause our actual results to differ materially from those in the forward-looking statements include those factors described in "Item 1A. Risk Factors" in this Annual Report on Form 10-K. You should carefully review all of these factors, as well as the comprehensive discussion of forward-looking statements on page 1 of this Annual Report on Form 10-K.

Overview

Harvard Bioscience is a leading developer, manufacturer and seller of technologies, products and services that enable fundamental advances in life science applications, including research, pharmaceutical and therapy discovery, bioproduction and preclinical testing for pharmaceutical and therapy development. Our products and services are sold globally to customers ranging from renowned academic institutions and government laboratories to the world's leading pharmaceutical, biotechnology and CROs. With operations in the United States, Europe and China, we sell through a combination of direct and distribution channels to customers around the world.

Restructuring Activities

During the year ended December 31, 2023, the Company initiated a restructuring and incurred \$0.4 million in inventory charges, severance and other expenses related to the restructuring program. During the year ended December 31, 2024, the Company continued and completed additional restructurings and incurred expenses of \$0.8 million, primarily consisting of severance recorded in connection with headcount reductions in Europe and North America.

Selected Results of Operations

In the table below, we provide an overview of selected operating metrics for the year ended December 31, 2024, compared to the year ended December 31, 2023.

(dollars in thousands)	Year Ended December 31,			
	2024	% of revenue	2023	% of revenue
Revenues	\$ 94,135		\$ 112,250	
Gross profit	54,766	58.2%	66,071	58.9%
Sales and marketing expenses	22,212	23.6%	24,060	21.4%
General and administrative expenses	21,493	22.8%	22,757	20.3%
Research and development expenses	10,406	11.1%	11,764	10.5%
Amortization of intangible assets	5,255	5.6%	5,525	4.9%
Other operating expenses	1,611	1.7%	71	0.1%
Interest expense	3,209	3.4%	3,591	3.2%
Loss on equity securities	1,593	1.7%	632	0.6%
Income tax expense	740	0.8%	859	0.8%

Revenues

Revenues decreased \$18.2 million, or 16.1%, to \$94.1 million for the year ended December 31, 2024, compared to \$112.3 million for the year ended December 31, 2023. The decrease in revenues was primarily due to softening of worldwide demand from distributors, CRO's and academic medical research institutions. Changes in foreign currency exchange rates had a \$0.2 million favorable effect on revenues during the year ended December 31, 2024.

Gross profit

Gross profit decreased \$11.3 million, or 17.1%, to \$54.8 million for the year ended December 31, 2024, compared with \$66.1 million for the year ended December 31, 2023, primarily due to the decreases in revenues. Gross margin decreased to 58.2% for the year ended December 31, 2024, compared with 58.9% for the year ended December 31, 2023. Gross margin was unfavorably impacted by the under-absorption of fixed manufacturing overhead costs due to the decrease in revenues which was partially offset by a better mix of high margin products and lower labor costs.

Sales and marketing expenses

Sales and marketing expenses decreased \$1.9 million, or 7.7%, to \$22.2 million for the year ended December 31, 2024, compared to \$24.1 million for the year ended December 31, 2023. The decrease was primarily due to a decrease in compensation costs of \$1.3 million, a decrease in consulting costs of \$0.2 million and a decrease in travel costs of \$0.2 million, in each case as compared to the year ended December 31, 2023.

General and administrative expenses

General and administrative expenses decreased by \$1.3 million, or 5.6%, to \$21.5 million for the year ended December 31, 2024, compared with \$22.8 million for the year ended December 31, 2023. The decrease was primarily due to a decrease in compensation costs of \$1.3 million, a decrease of \$0.5 million due to the capitalization of labor and consulting expenses associated with our U.S. ERP consolidation project and a decrease in travel and entertainment costs of \$0.2 million, partially offset by an increase in professional fees of \$0.4 million and an increase in depreciation expense of \$0.2 million, in each case as compared to the year ended December 31, 2023.

Research and development expenses

Research and development expenses decreased \$1.4 million, or 11.5%, to \$10.4 million for the year ended December 31, 2024, compared with \$11.8 million for the year ended December 31, 2023. The decrease was primarily due to a decrease in compensation costs of \$0.9 million and a decrease of \$0.3 million due the capitalization of software development costs, as compared to the year ended December 31, 2023.

Amortization of intangible assets

Amortization of intangible assets decreased \$0.2 million, or 4.9%, to \$5.3 million for the year ended December 31, 2024, compared with \$5.5 million for the year ended December 31, 2023.

Other operating expenses

Other operating expenses for the year ended December 31, 2024, were \$1.6 million and included restructuring costs of \$0.8 million in connection with headcount reductions, a fee of \$0.5 million in connection with the receipt of employee retention tax credits, and \$0.3 million related to settlement of an unclaimed property audit. Other operating expenses for the year ended December 31, 2023, were \$0.1 million and included restructuring costs in connection with headcount reductions.

Interest expense

Interest expense decreased \$0.4 million, or 10.6%, to \$3.2 million for the year ended December 31, 2024, compared with \$3.6 million for the year ended December 31, 2023. The decrease was primarily due to lower average borrowings during the period.

Loss on equity securities

As of December 31, 2023, we held shares of common stock of HRGN with an estimated fair value of \$3.5 million. These shares were received in connection with the settlement of indemnification obligations related to litigation which was resolved during the year ended December 31, 2022. During the year ended December 31, 2024, we sold all of our HRGN shares for \$1.9 million and recorded a loss on sale of \$1.6 million. During the year ended December 31, 2023, we recorded unrealized losses of \$0.6 million related to these shares.

Income tax expense

Income tax expense for the year ended December 31, 2024, was \$0.7 million compared to \$0.9 million for the year ended December 31, 2023. The effective tax rates for the years ended December 31, 2024 and 2023, were (6.3)% and (33.5)%, respectively. The lower effective tax rate during the year ended December 31, 2024, compared to the year ended December 31, 2023, was primarily related to changes to tax attribute carryforwards, a decrease in the Company's Global Intangible Low-Taxed Income ("GILTI") inclusion, and a difference in the company's excess tax benefits related to stock compensation. Our effective tax rate for the year ended December 31, 2024, was different than the U.S. statutory rate primarily due to changes in valuation allowances associated with our assessment of the likelihood of the recoverability of deferred tax assets and the impact of changes to prior year tax accruals. Our effective tax rate for the year ended December 31, 2023, was different than the U.S. statutory rate primarily due to the mix of forecasted income or losses in the U.S. and foreign tax jurisdictions, a GILTI inclusion to taxable income and the impact of changes to tax attribute carryforwards.

Liquidity and Capital Resources

Our primary sources of liquidity are cash and cash equivalents, internally generated cash flow from operations and our shelf registration statement that provides for the issuance of common stock, preferred stock, warrants and units up to an amount equal to \$100 million (the "2024 Shelf Registration Statement"). Our expected cash outlays relate primarily to cash payments due under our Credit Agreement described below as well as salaries, inventory, and capital expenditures. We held cash and cash equivalents of \$4.1 million and \$4.3 million as of December 31, 2024 and December 31, 2023, respectively. Borrowings outstanding were \$37.4 million and \$37.1 million as of December 31, 2024 and December 31, 2023, respectively.

The Coronavirus Aid, Relief, and Economic Security Act of 2020 ("CARES Act") provided an employee retention tax credit ("ERTC") that was a refundable tax credit against certain employer taxes. The Company received ERTC refunds of \$3.2 million during the year ended December 31, 2024. In January 2025, the Company received an additional \$1.0 million of ERTC refunds. The Company's compliance with the program's qualifications may be subject to audit until May 2028, which is when the statute of limitation expires.

We maintain a Credit Agreement that provides for a term loan of \$40.0 million and a \$25.0 million revolving credit facility both maturing on December 22, 2025. On March 28, 2024, we entered into an amendment to the Credit Agreement pursuant to which the Lenders and administrative agent modified the definition of Consolidated EBITDA used in the calculation of certain financial covenants to adjust for charges related to an abandoned property audit and commission fees in connection with our employee retention tax credit filings. On August 6, 2024, we entered into an amendment to the Credit Agreement that, among other things, modified the financial covenants relating to the consolidated net leverage ratio and consolidated fixed charge coverage ratio through the period ended December 31, 2024. The amendment also added a net leverage ratio requirement with respect to additional borrowing under our revolving credit facility and restrictions on certain additional indebtedness and investments. In addition, the applicable interest rate margin was increased by 50bps during such time as the consolidated net leverage ratio is greater than 3.0. We paid fees of \$0.2 million to the Lenders in connection with the August 6th amendment.

We were not in compliance with the consolidated net leverage ratio covenant contained in the Credit Agreement as of the December 31, 2024 test date. On March 10, 2025, we entered into an amendment to the Credit Agreement (the "March 2025 Amendment") pursuant to which the lenders and administrative agent agreed to waive such non-compliance, subject to the terms contained in the March 2025 Amendment. The March 2025 Amendment provides, among other things, that the lender's commitment under our revolving credit facility is capped at the amount outstanding thereunder as of the date thereof and thus we are unable to make additional borrowings under our revolving credit facility. The March 2025 Amendment also establishes certain milestones with respect to the refinancing of the debt underlying the Credit Agreement (the "Refinancing") and dates by which such milestones must be met. These milestones include: (1) continuing to retain an investment banker for the purpose of assisting with the consummation of the Refinancing; (2) by March 14, 2025, the engagement of a financial advisor acceptable to the administrative agent; (3) by April 30, 2025, the delivery to the administrative agent of an executed bona fide indication of interest from one or more potential lenders with respect to the Refinancing on terms and conditions acceptable to the administrative agent; (4) by May 23, 2025, the delivery to the administrative agent of a term sheet or commitment letter from one or more potential lenders that provides for the Refinancing on terms and conditions acceptable to the administrative agent; (5) by June 13, 2025, delivery to the administrative agent of: (i) a statement of sources and uses of transaction proceeds; and (ii) evidence that the potential lender's conditions to closing (other than customary closing deliveries) of the Refinancing, such as business commitments, are satisfied; and (6) by June 30, 2025, the closing of the Refinancing. The lenders also agreed not to assert the financial covenants included in the Credit Agreement for the first quarter of fiscal year 2025 provided that we continue to comply with our payment obligations, achieve the refinancing milestones, maintain minimum liquidity (defined as the sum of (a) unrestricted cash and cash equivalents and (b) the amount by which the aggregate amount committed under the Company's revolving credit facility exceeds the total amount drawn under the credit facility) of \$3.5 million and provide the administrative agent with certain financial reports. In addition, pursuant to the terms of the March 2025 Amendment the applicable interest rate margin is increased such that interest rate is equal to a rate per annum based on the Secured Overnight Financing Rate ("SOFR") plus 400 bps and amortization payments were revised so that a proportionate payment must be made on a monthly rather than a quarterly basis.

If we are not able to comply with the terms and conditions of the March 2025 Amendment, or if we are otherwise unable to regain and maintain compliance with the covenants under the Credit Agreement, as amended, or are unsuccessful in obtaining waivers or amendments for any covenant in the future, in addition to other actions our lenders may require, the amounts outstanding under the Credit Agreement may become immediately due and payable. We paid fees of \$0.1 million to the Lenders in connection with the March 2025 Amendment.

We continue to take actions intended to improve liquidity, including actions related to cost containment and inventory reduction. Based on its current operating plans, the Company expects that its available cash and cash generated from operations will be sufficient to finance operations and capital expenditures while the Company works to refinance the Credit Agreement.

Condensed Consolidated Cash Flow Statements

(in thousands)	Year Ended December 31,	
	2024	2023
Cash provided by operating activities	\$ 1,440	\$ 14,028
Cash used in investing activities	(1,344)	(1,799)
Cash used in financing activities	(131)	(12,134)
Effect of exchange rate changes on cash	(140)	(320)
Decrease in cash and cash equivalents	\$ (175)	\$ (225)

Cash provided by operations was \$1.4 million and \$14.0 million for the years ended December 31, 2024 and 2023, respectively. Cash flow from operations for the year ended December 31, 2024 was negatively impacted by \$8.1 million as a result of a larger net loss for the period adjusted for non-cash items, along with a \$7.7 million decrease due to changes in operating assets and liabilities, which was offset by the receipt of \$3.2 million of employee retention tax credits.

Cash used in investing activities was \$1.3 million for the year ended December 31, 2024, and consisted of \$3.2 million of capital expenditures for manufacturing and information technology infrastructure and software development, offset by \$1.9 million in proceeds from the sale of marketable equity securities. Cash used in investing activities was \$1.8 million for the year ended December 31, 2023, and primarily consisted of \$2.3 million of capital expenditures in manufacturing, information technology infrastructure, and capitalized software costs, offset by \$0.5 million from proceeds from the sale our Hoesfer product line.

Cash used by financing activities was \$0.1 million for the year ended December 31, 2024. During this period, debt outstanding under our credit facility increased by \$0.2 million, due to net borrowings under our revolver of \$6.2 million and payments of \$6.0 million against the term loan. Additionally, we paid debt issuance costs of \$0.2 million. We also received proceeds of \$0.4 million from the exercise of stock options and employee stock purchase plan purchases and paid \$0.6 million for taxes related to net share settlement of equity awards.

Cash used in financing activities was \$12.1 million for the year ended December 31, 2023. During this period, we made term loan installments payments under the Credit Agreement of \$4.1 million, with net payments of \$6.4 million under the revolving credit facility. We also received proceeds of \$0.9 million from the exercise of stock options and the employee stock purchase plan and paid \$2.5 million for taxes related to net share settlement of equity awards.

Impact of Foreign Currencies

Our international operations in some instances operate as 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, primarily the euro and the British pound. During the year ended December 31, 2024, changes in foreign currency exchange rates resulted in a favorable effect on revenues of \$0.2 million and an unfavorable effect on expenses of \$0.3 million.

During the years ended December 31, 2024 and 2023, the translation of foreign currency into U.S. dollars included as a component of comprehensive loss resulted in a (loss) gain of \$(1.4) million and \$1.5 million, respectively. In addition, the currency exchange rate fluctuations included as a component of net loss resulted in currency losses of \$(0.2) million during both years ended December 31, 2024 and 2023.

Going Concern and Management Plans

As of December 31, 2024, there was indebtedness of \$37.4 million outstanding under our term loan and senior revolving credit facility (collectively, the "Credit Agreement"). We were not in compliance with the consolidated net leverage ratio covenant contained in the Credit Agreement as of the December 31, 2024 test date. On March 10, 2025, we entered into an amendment to the Credit Agreement (the "March 2025 Amendment") pursuant to which the lenders and administrative agent agreed to waive such non-compliance, subject to the terms contained in the March 2025 Amendment. The March 2025 Amendment provides, among other things, that our failure to achieve certain refinancing milestones, including receipt of a term sheet or commitment letter from one or more potential lenders, by the dates provided in the March 2025 Amendment or our failure to consummate a refinancing of the Credit Agreement by June 30, 2025, would, in either case, constitute an event of default under the Credit Agreement. In such event, in addition to other actions our lenders may require, the amounts outstanding under the Credit Agreement may become immediately due and payable.

We are exploring alternative sources of capital that would allow us to refinance our outstanding indebtedness by June 30, 2025, in order to avoid default under the Credit Agreement, but our ability to access such other sources of capital is uncertain. There is no assurance that such capital will be available to us, be obtainable on commercially acceptable terms, or provide us with sufficient funds to meet our objectives. Based on our anticipated cash flows from operations, unless we are able to access other sources of capital or extend the date for repayment under the Credit Agreement, we will be unable to pay our debt obligations and fund our operations for at least twelve months from the date of issuance of the consolidated financial statements contained in this Annual Report on Form 10-K. As a result, there is substantial doubt about our ability to continue as a going concern.

As discussed in Note 2 to the Consolidated Financial Statements included in “Part IV, Item 15. Exhibits, Financial Statement Schedules” of this report, our consolidated financial statements include an explanatory paragraph that such financial statements were prepared assuming that we will continue as a going concern, continue our operations for the foreseeable future and realize assets and settle liabilities in the normal course of business. The financial statements do not give effect to any adjustments to the amounts and classification of assets and liabilities that may be necessary should we be unable to continue as a going concern. Such adjustments could be material.

Recent Accounting Pronouncements

For information on recent accounting pronouncements impacting our business, see “Recent Accounting Pronouncements” included in Note 2 to the Consolidated Financial Statements included in “Part IV, Item 15. Exhibits, Financial Statement Schedules” of this report.

Critical Accounting Policies and Estimates

The discussion and analysis of our financial condition and results of operations are based upon our consolidated financial statements, which have been prepared in accordance with accounting principles generally accepted in the United States. The preparation of these financial statements requires us to make estimates and judgments that affect the reported amounts of assets, liabilities, revenue and expenses, and related disclosure of contingent assets and liabilities. On an ongoing basis, we evaluate our estimates, including those related to revenue recognition, income taxes, litigation and other contingencies. We base our estimates on historical experience and on various other assumptions that are believed to be reasonable under the circumstances, the results of which form the basis for making judgments about the carrying values of assets and liabilities that are not readily apparent from other sources. Actual results may differ from these estimates under different assumptions or conditions.

We believe the following is one of the more significant judgments and estimates used in the preparation of our consolidated financial statements:

Impairment of Goodwill and Other Long-Lived Assets

Goodwill is tested for impairment annually or more frequently if events or changes in circumstances indicate that the asset might be impaired. The impairment analysis for goodwill consists of an qualitative assessment potentially followed by a quantitative analysis. If we determine that the carrying value of our reporting unit exceeds its fair value, an impairment charge to goodwill is recorded for the excess. The critical judgments involved in our annual qualitative test of goodwill include an assessment of unfavorable events and a judgment of whether those events put our goodwill at risk of impairment, which if determined to be at risk would require us to perform a quantitative test. The critical judgments and estimates in our quantitative tests for goodwill and long-lived assets include selection and weighting of available valuation methods and the selection of assumptions that may be used in those methods.

During the year ended December 31, 2024, we determined that indicators of impairment were present for our goodwill and certain assets included in a long-lived asset group, including liquidity risk associated with inability to borrow under our Credit Agreement and reduced operating profits. Based on the quantitative analysis, we concluded that our goodwill and certain assets included in a long-lived asset group were not impaired due to the excess of fair value over the carrying value of these assets at December 31, 2024. Based on declines in our stock price subsequent to December 31, 2024, the carrying value of our stockholders’ equity currently exceeds its fair value, which could lead to future impairment.

Income Taxes and Valuation Allowance

We are subject to income taxes in the U.S. and numerous foreign jurisdictions. Our annual tax rate is based on income, statutory tax rates, tax reserve changes and tax planning opportunities available to us in the various jurisdictions in which we operate. We regularly assess the likelihood of tax adjustments in each of the tax jurisdictions in which we have operations and account for the related financial statement implications. We have established tax reserves that we believe are appropriate given the possibility of tax adjustments. Determining the appropriate level of tax reserves requires significant judgment regarding the uncertain application of tax laws. Reserves are adjusted when information becomes available or when an event occurs indicating a change in the reserve is appropriate. Changes in tax reserves could have a material impact on our financial condition or results of operations.

Significant judgment is also required in determining the amount of deferred tax assets that will ultimately be realized and any corresponding deferred tax asset valuation allowance. When estimating the necessary valuation allowance, we consider all available evidence for each jurisdiction including historical operating results, estimates of future taxable income and the feasibility of ongoing tax planning strategies. If new information becomes available that would alter our estimate of the amount of deferred tax assets that will ultimately be realized, we adjust the valuation allowance through income tax expense. Changes in the deferred tax asset valuation allowance could have a material impact on our financial condition or results of operations.

Item 7A. *Quantitative and Qualitative Disclosures about Market Risk.*

Not Applicable.

Item 8. *Financial Statements and Supplementary Data.*

The information required by this item is contained in the financial statements referenced in “Part IV, Item 15. Exhibits, Financial Statement Schedules” of this report, which financial statements are appended to this report. An index of those financial statements is found on page F-1.

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

None.

Item 9A. *Controls and Procedures.*

This Report includes the certifications of our Chief Executive Officer and Chief Financial Officer required by Rule 13a-14 of the Securities Exchange Act of 1934, as amended (the “Exchange Act”). See Exhibits 31.1 and 31.2. This Item 9A includes information concerning the controls and control evaluations referred to in those certifications.

(a) *Evaluation of Disclosure Controls and Procedures*

Disclosure controls and procedures refer to controls and other procedures designed to ensure that information required to be disclosed in the reports we file or submit under the Exchange Act is recorded, processed, summarized and reported within the time periods specified in the rules and forms of the U.S. Securities and Exchange Commission. Disclosure controls and procedures include, without limitation, controls and procedures designed to ensure that information required to be disclosed by us in our reports that we file or submit under the Exchange Act is accumulated and communicated to our management, including our Chief Executive Officer and Chief Financial Officer, as appropriate to allow timely decisions regarding our required disclosure. In designing and evaluating our disclosure controls and procedures, our 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 was required to apply its judgment in evaluating and implementing possible controls and procedures.

We carried out an evaluation, under the supervision and with the participation of our Chief Executive Officer and Chief Financial Officer, of the effectiveness of the design and operation of our disclosure controls and procedures (as defined in Rules 13a-15(e) and 15d-15(e) under the Exchange Act) as of the end of the period covered in this Report. Based upon the evaluation described above, our Chief Executive Officer and Chief Financial Officer have concluded as a result of the material weaknesses described below that they believe that our disclosure controls and procedures were not effective, as of December 31, 2024, in providing reasonable assurance that information required to be disclosed by us in the reports that we file or submit under the Exchange Act is accumulated and communicated to our management, including our Chief Executive Officer and Chief Financial Officer, to allow timely decisions regarding required disclosures, and is recorded, processed, summarized and reported within the time periods specified in the Securities and Exchange Commission's rules and forms.

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

Our management is responsible for establishing and maintaining adequate internal control over financial reporting (as defined in Rules 13a-15(f) and 15d-15(f) under the Exchange Act). Our internal control over financial reporting is a process designed by and under the supervision of our Chief Executive Officer and Chief Financial Officer and effected by our management and other personnel, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of consolidated financial statements for external purposes in accordance with generally accepted accounting principles. Our internal control over financial reporting includes those policies and procedures that (1) pertain to the maintenance of records that, in reasonable detail, accurately and fairly reflect transactions and dispositions of assets, (2) provide reasonable assurance that transactions are recorded as necessary to permit preparation of consolidated financial statements for external purposes in accordance with generally accepted accounting principles, (3) provide reasonable assurance that receipts and expenditures are being made only in accordance with authorizations of management and directors, and (4) provide reasonable assurance regarding prevention or timely detection of unauthorized acquisition, use or disposition of assets that could have a material effect on the consolidated financial statements.

Because of inherent limitations, internal control over financial reporting may not prevent or detect misstatements. It is a process that involves human diligence and compliance and is therefore subject to human error and misjudgment. In general, evaluations of effectiveness for future periods are subject to risk as controls may become inadequate due to changes in conditions or the degree of compliance with key processes or procedures could deteriorate.

Our management is responsible for establishing and maintaining adequate internal control over financial reporting, as such term is defined in Exchange Act Rule 13a-15(f). Under the supervision and with the participation of our management, including our Chief Executive Officer and Chief Financial Officer, we conducted an evaluation of the effectiveness of our internal control over financial reporting as of December 31, 2024, based on the framework in Internal Control — Integrated Framework issued by the Committee of Sponsoring Organizations of the Treadway Commission. Based on our evaluation under the framework in Internal Control — Integrated Framework, management concluded that our internal control over financial reporting was not effective, as of December 31, 2024, as a result of the material weaknesses described below.

Material Weaknesses

A material weakness is a deficiency or a combination of deficiencies, in internal control over financial reporting, such that there is a reasonable possibility that a material misstatement of our annual or interim financial statements will not be prevented or detected on a timely basis.

Based on management's assessment of our internal control over financial reporting, management determined that we did not design and maintain effective controls over (i) our order to cash cycle and (ii) our physical count of inventories. Specifically, we did not design and maintain effective manual controls over the processing and review of a substantial portion of our revenue transactions. Additionally, we did not design and maintain an effective cycle count program to verify quantities of inventories held at Company locations that account for a substantial portion of inventories. The timeliness, level of precision, and appropriate segregation of duties in our review processes over revenue transactions and our physical counts of inventories were not sufficient to prevent, detect, and correct potential misstatements in a timely manner. These material weaknesses did not result in any identified material misstatement in any of our previously filed interim or annual financial statements.

Because of these material weaknesses, management concluded that the Company did not maintain effective internal controls over financial reporting as of December 31, 2024.

The effectiveness of our internal control over financial reporting as of December 31, 2024 has also been audited by Grant Thornton LLP, our independent registered public accounting firm, as stated in their report, which is included below in Item 9A(e).

Remediation Activities

In response to the material weaknesses, we implemented, and are continuing to implement, measures designed to improve our internal control over financial reporting. These efforts include:

- Redesigning and maintaining effective controls over the completeness and accuracy of inputs that are used in the order to cash cycle;
- Assessing the precision and frequency of the performance of the identified controls;
- Retraining staff involved in the process to ensure controls are adequately performed on a timely basis;
- Strengthening, formalizing, documenting and testing accounting processes and internal controls in the order to cash cycle and identify system controls that could supplement the manual reviews; and
- Strengthening the effectiveness of our cycle count program and controls while providing training on standard operating procedures and internal controls to employees responsible for the supply chain, logistics and inventory processes.

The material weaknesses will not be considered remediated until management completes the design and implementation of the measures described above and the controls operate for a sufficient period of time such that the effectiveness of those changes is demonstrated with an appropriate amount of consistency and management has concluded, through testing, that these controls are effective. We also may conclude that additional measures may be required to remediate the material weaknesses or determine to modify the remediation plans described above. Management believes that the remediation measures described above will be implemented in a manner such that the controls can be tested, and the identified material weaknesses can be determined to be remediated, however, no assurance can be made that such remediation will occur or that additional material weaknesses will not be identified.

Grant Thornton LLP has independently assessed the effectiveness of our internal control over financial reporting and its report is included below.

(c) Changes in Internal Controls Over Financial Reporting

Except for the remediation measures in connection with the material weaknesses described above, there has been no change in the Company's internal control over financial reporting as of December 31, 2024, that has materially affected, or is reasonably likely to materially affect, the Company's internal control over financial reporting.

(d) Inherent Limitations on Effectiveness of Controls

The design of any system of control is based upon certain assumptions about the likelihood of future events, and there can be no assurance that any design will succeed in achieving its stated objectives under all future events, no matter how remote, that controls may become inadequate because of changes in conditions, or that the degree of compliance with the policies or procedures may not deteriorate. Because of their inherent limitations, systems of control may not prevent or detect all misstatements. Accordingly, even effective systems of control can provide only reasonable assurance of achieving their control objectives.

(e) Report of Independent Registered Public Accounting Firm

REPORT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

Board of Directors and Stockholders
Harvard Bioscience, Inc.

Opinion on internal control over financial reporting

We have audited the internal control over financial reporting of Harvard Bioscience, Inc. (a Delaware corporation) and subsidiaries (the “Company”) as of December 31, 2024, based on criteria established in the 2013 *Internal Control—Integrated Framework* issued by the Committee of Sponsoring Organizations of the Treadway Commission (“COSO”). In our opinion, because of the effect of the material weaknesses described in the following paragraphs on the achievement of the objectives of the control criteria, the Company has not maintained effective internal control over financial reporting as of December 31, 2024, based on criteria established in the 2013 *Internal Control—Integrated Framework* issued by COSO.

A material weakness is a deficiency, or combination of control deficiencies, in internal control over financial reporting, such that there is a reasonable possibility that a material misstatement of the company’s annual or interim financial statements will not be prevented or detected on a timely basis. The following material weaknesses have been identified and included in management’s assessment.

The Company did not design and maintain effective manual controls over the processing and review of a substantial portion of its revenue transactions. Additionally, the Company did not design and maintain an effective cycle count program to verify quantities of a substantial portion of its inventory. The timeliness, level of precision, and appropriate segregation of duties in review processes over revenue transactions and physical counts of inventory were not sufficient to prevent, detect, and correct potential misstatements in the financial statements.

We also have audited, in accordance with the standards of the Public Company Accounting Oversight Board (United States) (“PCAOB”), the consolidated financial statements of the Company as of and for the year ended December 31, 2024. The material weaknesses identified above were considered in determining the nature, timing, and extent of audit tests applied in our audit of the 2024 consolidated financial statements, and this report does not affect our report dated March 13, 2025 which expressed an unqualified opinion on those financial statements.

Basis for opinion

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

We conducted our audit in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether effective internal control over financial reporting was maintained in all material respects. Our audit included obtaining an understanding of internal control over financial reporting, assessing the risk that a material weakness exists, testing and evaluating the design and operating effectiveness of internal control based on the assessed risk, and performing such other procedures as we considered necessary in the circumstances. We believe that our audit provides a reasonable basis for our opinion.

Definition and limitations of internal control over financial reporting

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

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

Other information

We do not express an opinion or any other form of assurance on the remediation activities described in Management’s Report.

/s/ GRANT THORNTON LLP

Hartford, Connecticut
March 13, 2025

Item 9B. Other Information.

Not applicable.

Item 9C. Disclosure Regarding Foreign Jurisdictions that Prevent Inspections.

Not applicable.

PART III

Item 10. Directors, Executive Officers and Corporate Governance.

Incorporated by reference to our definitive Proxy Statement to be filed pursuant to Regulation 14A under the Exchange Act in connection with our 2025 Annual Meeting of Stockholders.

Item 11. Executive Compensation.

Incorporated by reference to our definitive Proxy Statement to be filed pursuant to Regulation 14A under the Exchange Act in connection with our 2025 Annual Meeting of Stockholders.

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

Incorporated by reference to our definitive Proxy Statement to be filed pursuant to Regulation 14A under the Exchange Act in connection with our 2025 Annual Meeting of Stockholders.

Item 13. Certain Relationships and Related Transactions, and Director Independence.

Incorporated by reference to our definitive Proxy Statement to be filed pursuant to Regulation 14A under the Exchange Act in connection with our 2025 Annual Meeting of Stockholders.

Item 14. Principal Accounting Fees and Services.

Incorporated by reference to our definitive Proxy Statement to be filed pursuant to Regulation 14A under the Exchange Act in connection with our 2025 Annual Meeting of Stockholders.

PART IV

Item 15. Exhibits, Financial Statement Schedules.

- (a) The following documents are filed as part of this Annual Report on Form 10-K or incorporated by reference as indicated:
- (1) *Financial Statements, Schedules, and Exhibits.* We have listed our consolidated financial statements filed as part of this annual report in the index to consolidated financial statements on page F-1.
 - (2) *Financial Statement Schedules.* We have omitted all financial statement schedules because they are not applicable or not required or because we have included the necessary information in our consolidated financial statements or related notes.
 - (3) *Exhibits.* We have listed the exhibits filed as part of this annual report in the accompanying exhibit index, which follows our consolidated financial statements filed as part of this annual report.

Item 16. Form 10-K Summary.

None.

**INDEX TO CONSOLIDATED FINANCIAL STATEMENTS
HARVARD BIOSCIENCE, INC.**

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REPORT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

Board of Directors and Stockholders
Harvard Bioscience, Inc.

Opinion on the financial statements

We have audited the accompanying consolidated balance sheets of Harvard Bioscience, Inc. (a Delaware corporation) and subsidiaries (the “Company”) as of December 31, 2024 and 2023, the related consolidated statements of operations, comprehensive loss, stockholders’ equity, and cash flows for each of the two years in the period ended December 31, 2024, and the related notes (collectively referred to as the “financial statements”). In our opinion, the financial statements present fairly, in all material respects, the financial position of the Company as of December 31, 2024 and 2023, and the results of its operations and its cash flows for each of the two years in the period ended December 31, 2024, in conformity with accounting principles generally accepted in the United States of America.

We also have audited, in accordance with the standards of the Public Company Accounting Oversight Board (United States) (“PCAOB”), the Company’s internal control over financial reporting as of December 31, 2024, based on criteria established in the 2013 *Internal Control—Integrated Framework* issued by the Committee of Sponsoring Organizations of the Treadway Commission (“COSO”), and our report dated March 13, 2025, expressed an adverse opinion.

Basis for opinion

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

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

Emphasis of Matter - Going concern

The accompanying financial statements have been prepared assuming that the Company will continue as a going concern. As discussed in Note 2 to the financial statements, as of December 31, 2024, the Company was in default of certain debt covenants under its existing credit agreement, in which the Company had outstanding indebtedness of \$37.4 million. On March 10, 2025, the Company entered into an amendment to its credit agreement pursuant to which the lenders and administrative agent agreed to waive such non-compliance provided that, among other things, the Company’s failure to achieve certain refinancing milestones and consummate a refinancing of its credit agreement by June 30, 2025, would constitute an event of default which would render the amounts outstanding under the credit agreement as immediately due and payable. The Company’s business plan, which is also described in Note 2, contemplates exploring alternatives to refinance its outstanding debt by June 30, 2025. However, the Company’s ability to refinance its debt by June 30, 2025, is uncertain and raises substantial doubt about its ability to continue as a going concern. The financial statements do not include any adjustments that might result from the outcome of this uncertainty.

Critical audit matters

Critical audit matters are matters arising from the current period audit of the financial statements that were communicated or required to be communicated to the audit committee and that: (1) relate to accounts or disclosures that are material to the financial statements and (2) involved our especially challenging, subjective, or complex judgments. We determined that there are no critical audit matters.

/s/ GRANT THORNTON LLP

We have served as the Company’s auditor since 2017.

Hartford, Connecticut
March 13, 2025

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

	December 31,	
	2024	2023
Assets		
Current assets:		
Cash and cash equivalents	\$ 4,108	\$ 4,283
Accounts receivable, net	14,866	16,099
Inventories	23,245	24,716
Other current assets	2,898	3,940
Total current assets	45,117	49,038
Property, plant and equipment, net	5,106	3,981
Operating lease right-of-use assets	6,132	4,773
Goodwill	56,324	57,065
Intangible assets, net	11,132	16,036
Other long-term assets	2,833	6,473
Total assets	\$ 126,644	\$ 137,366
Liabilities and Stockholders' Equity		
Current liabilities:		
Current portion of long-term debt	\$ 36,956	\$ 5,859
Accounts payable	4,787	5,554
Contract liabilities	3,806	4,508
Other current liabilities	9,409	10,621
Total current liabilities	54,958	26,542
Long-term debt, net	-	30,704
Deferred tax liability	710	776
Operating lease liabilities	6,381	4,794
Other long-term liabilities	1,255	1,476
Total liabilities	63,304	64,292
Commitments and contingencies - Note 16		
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:		
44,074,475 shares issued and outstanding at December 31, 2024;		
43,394,509 shares issued and outstanding at December 31, 2023	441	434
Additional paid-in-capital	236,579	232,435
Accumulated deficit	(158,010)	(145,605)
Accumulated other comprehensive loss	(15,670)	(14,190)
Total stockholders' equity	63,340	73,074
Total liabilities and stockholders' equity	\$ 126,644	\$ 137,366

See accompanying notes to condensed consolidated financial statements.

HARVARD BIOSCIENCE, INC.
CONSOLIDATED STATEMENTS OF OPERATIONS
(In thousands, except per share data)

	Year Ended December 31,	
	2024	2023
Revenues	\$ 94,135	\$ 112,250
Cost of revenues	39,369	46,179
Gross profit	54,766	66,071
Sales and marketing expenses	22,212	24,060
General and administrative expenses	21,493	22,757
Research and development expenses	10,406	11,764
Amortization of acquired intangible assets	5,255	5,525
Other operating expenses - Note 2	1,611	71
Total operating expenses	60,977	64,177
Operating (loss) income	(6,211)	1,894
Other income (expense):		
Interest expense	(3,209)	(3,591)
Loss on equity securities - Note 12	(1,593)	(632)
Other income (expense), net	(652)	(227)
Total other expense	(5,454)	(4,450)
Loss before income taxes	(11,665)	(2,556)
Income tax expense	740	859
Net loss	\$ (12,405)	\$ (3,415)
Loss per share:		
Basic and diluted loss per share	\$ (0.28)	\$ (0.08)
Weighted-average common shares:		
Basic and diluted	43,538	42,420

See accompanying notes to condensed consolidated financial statements.

HARVARD BIOSCIENCE, INC.
CONSOLIDATED STATEMENTS OF COMPREHENSIVE LOSS
(In thousands)

	Year Ended December 31,	
	2024	2023
Net loss	\$ (12,405)	\$ (3,415)
Other comprehensive income (loss), net of tax:		
Foreign currency translation adjustments	(1,405)	1,507
Defined benefit pension plans, net of tax benefit of \$58 and \$137, respectively	(175)	(446)
Derivative instruments qualifying as cash flow hedges, net of tax of \$-0-	100	(199)
Other comprehensive (loss) income	(1,480)	862
Comprehensive loss	<u>\$ (13,885)</u>	<u>\$ (2,553)</u>

See accompanying notes to consolidated financial statements.

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

	Number of Shares Issued	Common Stock	Additional Paid-in Capital	Accumulated Deficit	Accumulated Other Comprehensive Loss	Total Stockholders' Equity
Balance at December 31, 2022	42,082	\$ 454	\$ 229,008	\$ (142,190)	\$ (15,052)	\$ 72,220
Stock option exercises	214	-	506	-	-	506
Stock purchase plan	137	-	424	-	-	424
Vesting of restricted stock units	1,460	-	-	-	-	-
Shares withheld for taxes	(498)	-	(2,523)	-	-	(2,523)
Stock-based compensation	-	-	5,000	-	-	5,000
Net loss	-	-	-	(3,415)	-	(3,415)
Other comprehensive income	-	-	-	-	862	862
Other adjustments	-	(20)	20	-	-	-
Balance at December 31, 2023	43,395	434	232,435	(145,605)	(14,190)	73,074
Stock option exercises	14	-	43	-	-	43
Stock purchase plan	161	2	335	-	-	337
Vesting of restricted stock units	769	8	-	-	-	8
Shares withheld for taxes	(265)	(3)	(574)	-	-	(577)
Stock-based compensation	-	-	4,340	-	-	4,340
Net loss	-	-	-	(12,405)	-	(12,405)
Other comprehensive loss	-	-	-	-	(1,480)	(1,480)
Balance at December 31, 2024	44,074	\$ 441	\$ 236,579	\$ (158,010)	\$ (15,670)	\$ 63,340

See accompanying notes to consolidated financial statements.

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

	Year Ended December 31,	
	2024	2023
Cash flows from operating activities:		
Net loss	\$ (12,405)	\$ (3,415)
Adjustments to reconcile net loss to net cash provided by operating activities:		
Depreciation	1,727	1,473
Amortization of intangible assets	5,430	5,525
Amortization of deferred financing costs	327	280
Stock-based compensation	4,340	5,000
Deferred income taxes and other	363	336
Loss on equity securities - Note 12	1,593	632
Gain on sale of product line - Note 17	-	(403)
Changes in operating assets and liabilities:		
Accounts receivable	974	810
Inventories	(64)	1,524
Other assets	1,642	1,651
Accounts payable and other liabilities	(1,785)	(523)
Contract liabilities	(702)	1,138
Net cash provided by operating activities	<u>1,440</u>	<u>14,028</u>
Cash flows from investing activities:		
Additions to property, plant and equipment	(2,644)	(1,788)
Capitalized software development costs	(619)	(523)
Proceeds from sale of product line	-	512
Proceeds from sale of marketable equity securities	1,919	-
Net cash used in investing activities	<u>(1,344)</u>	<u>(1,799)</u>
Cash flows from financing activities:		
Borrowing from revolving line of credit	8,800	4,500
Repayment of revolving line of credit	(2,550)	(10,950)
Repayment of term debt	(6,023)	(4,091)
Payment of debt issuance costs	(161)	-
Proceeds from exercise of stock options and employee stock purchase plan	380	930
Taxes paid related to net share settlement of equity awards	(577)	(2,523)
Net cash used in financing activities	<u>(131)</u>	<u>(12,134)</u>
Effect of exchange rate changes on cash	(140)	(320)
Decrease in cash and cash equivalents	(175)	(225)
Cash and cash equivalents at beginning of period	4,283	4,508
Cash and cash equivalents at end of period	<u>\$ 4,108</u>	<u>\$ 4,283</u>
Supplemental disclosures of cash flow information:		
Cash paid for interest	<u>\$ 3,235</u>	<u>\$ 3,795</u>
Cash paid for income taxes, net of refunds	<u>\$ (159)</u>	<u>\$ 207</u>

See accompanying notes to consolidated financial statements.

HARVARD BIOSCIENCE, INC.
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

1. Organization

Harvard Bioscience, Inc., a Delaware corporation (the “Company”), is a leading developer, manufacturer and seller of technologies, products and services that enable fundamental advances in life science applications, including research, pharmaceutical and therapy discovery, bioproduction and preclinical testing for pharmaceutical and therapy development. The Company’s products and services are sold globally to customers ranging from renowned academic institutions and government laboratories to the world’s leading pharmaceutical, biotechnology and contract research organizations (“CROs”). With operations in the United States, Europe and China, the Company sells through a combination of direct and distribution channels to customers around the world.

2. Summary of Significant Accounting Policies

Principles of Consolidation

The consolidated financial statements include the accounts of Harvard Bioscience, Inc. and its wholly owned subsidiaries. All intercompany balances and transactions have been eliminated in consolidation.

The consolidated financial statements for the fiscal year ended December 31, 2024, have been prepared assuming that the Company will continue as a going concern. A going-concern basis assumes that the Company will continue its operations for the foreseeable future and contemplates the realization of assets and the settlement of liabilities in the normal course of business. As noted below, there is substantial doubt about the Company’s ability to continue as a going concern.

As of December 31, 2024, there was indebtedness of \$37.4 million outstanding under the Company’s term loan and senior revolving credit facility (collectively, the “Credit Agreement”). The Company was not in compliance with the consolidated net leverage ratio covenant contained in the Credit Agreement as of the December 31, 2024 test date. On March 10, 2025, the Company entered into an amendment to the Credit Agreement (the “March 2025 Amendment”) pursuant to which the lenders and administrative agent agreed to waive such non-compliance, subject to the terms contained in the March 2025 Amendment. The March 2025 Amendment provides, among other things, that the Company’s failure to achieve certain refinancing milestones, including receipt of a term sheet or commitment letter from one or more potential lenders, by the dates provided in the March 2025 Amendment or the Company’s failure to consummate a refinancing of the Credit Agreement by June 30, 2025, would, in either case, constitute an event of default under the Credit Agreement. In such event, in addition to other actions the lenders may require, the amounts outstanding under the Credit Agreement may become immediately due and payable.

The Company is exploring alternative sources of capital that would allow it to refinance the outstanding indebtedness by June 30, 2025, in order to avoid default under the Credit Agreement, but its ability to access such other sources of capital is uncertain. There is no assurance that such capital will be available, be obtainable on commercially acceptable terms, or provide the Company with sufficient funds to meet its objectives. Based on its anticipated cash flows from operations, unless the Company is able to access other sources of capital or extend the date for repayment under the Credit Agreement, the Company will be unable to pay its debt obligations and fund its operations for at least twelve months from the date of issuance of the consolidated financial statements contained in this Annual Report on Form 10-K. As a result, there is substantial doubt about the Company’s ability to continue as a going concern.

Use of Estimates

The preparation of financial statements in conformity with generally accepted accounting principles in the United States requires the use of management estimates. Such estimates include the determination and establishment of certain accruals and provisions, including those for income taxes, credit losses on receivables, and defined benefit pension obligations. Estimates are also required to assess the value for inventories reported at lower of cost or net realizable value, stock-based compensation expense, and the recoverability of long-lived and intangible assets, including goodwill. On an ongoing basis, the Company assesses its previous estimates based upon currently available information. Actual results could differ materially from those estimates.

Revenue Recognition

Nature of contracts and customers

The Company’s contracts are primarily of short duration and are mostly based on the receipt and fulfilment of purchase orders. The purchase orders are binding and include pricing and all other relevant terms and conditions.

The Company's customers are primarily research scientists at pharmaceutical and biotechnology companies, universities, hospitals, government laboratories and contract research organizations. The Company also has global and regional distribution partners, and original equipment manufacturer customers who incorporate its products into their products under their own brands.

Performance obligations

The Company's performance obligations under its revenue contracts consist of its instruments, equipment, accessories, consumables, services, software licenses and enhancements, maintenance and extended warranties. Equipment also includes software that functions together with the tangible equipment to deliver its essential functionality. Contracts with customers may contain multiple promises such as delivery of hardware, software, professional services or post-contract support services. These promises are accounted for as separate performance obligations if they are distinct. For contracts with customers that contain multiple performance obligations, the transaction price is allocated to the separate performance obligations based on relative standalone selling price, which does not materially differ from the stated price in the contract. In general, the Company's list prices are indicative of standalone selling price, and the majority of the Company's contracts have a term of less than one year.

Instruments, equipment and accessories consist of a range of products that are used in life sciences research. Revenues from the sales of these items are recognized when transfer of control of these products to the customer occurs. Transfer of control occurs when the Company has the right to payment and the customer has legal title to the asset and the customer or their selected carrier has possession, which is typically upon shipment. Sales of these items are therefore generally recognized at a point in time.

The Company's consumables revenue includes the sale of wireless implantable monitors that are used for life science research purposes. The Company sells these wireless implantable monitors to pharmaceutical companies, contract research organizations and academic laboratories. In addition to sales generated from new and existing customers, these implantable devices are also sold under a program called the "exchange program." Under this program, customers may return an implantable monitor to the Company after use, and if the returned monitor can be reprocessed and resold, they may, in exchange, purchase a replacement implantable monitor of the same model at a lower price than a new monitor. The implantable monitors that are returned by customers are reprocessed and made available for future sale. The initial sale of implantable monitors and subsequent sale of replacement implantable monitors are independent transactions. The Company has no obligation in connection with the initial sale to sell replacement implantable monitors at any future date under any fixed terms and may refuse returned implantable monitors that cannot be recovered or are obsolete. The Company has concluded that the offer to its customers that they may purchase a discounted product in the future is not a material right as the discounted price represents the standalone selling price of the reprocessed implantable monitor.

Service revenue consists of installation, training, data analysis and surgeries performed on research animals. Service revenue is recognized when the service is performed. Maintenance revenue consists of post-contract support provided in relation to software that is embedded within the equipment that is sold to the customer. The Company provides standard warranties that promise the customer that the product will work as promised and are not a separate performance obligation. Extended warranties relate to warranties that are separately priced and purchased in addition to a standard warranty and are therefore a separate performance obligation. The Company has made the judgment that the customer benefits as the Company performs over the period of the contract, and therefore revenues from maintenance and warranty contracts are recognized over time. The Company uses the input method to recognize revenue over time, which is generally on a straight-line basis over the service period.

For sales for which transfer of control occurs upon shipment, the Company accounts for shipping and handling costs as fulfillment costs. As such, the Company records the amounts billed to the customer for shipping costs as revenue and the costs within cost of revenues upon shipment. For sales, for which control transfers to customers after shipment, the Company has elected to account for shipping and handling as activities to fulfill the promise to transfer the goods to the customer. The Company therefore accrues for the costs of shipping undelivered items in the period of shipment.

Variable Consideration

The nature of the Company's contracts gives rise to certain types of variable consideration, including in limited cases volume and payment discounts. The Company analyzes sales that could include variable consideration and estimates the expected or most likely amount of revenue after returns, trade-ins, discounts, rebates, credits, and incentives. Product returns are estimated and accrued for, based on historical information. In making these estimates, the Company considers whether the amount of variable consideration is constrained and is included in revenue only to the extent that it is probable that a significant reversal of the revenue recognized will not occur when the uncertainty associated with the variable consideration is subsequently resolved. Variable consideration, and its impact on the Company's revenue recognition, was not material in any of the periods presented.

The Company's payment terms are generally from zero to sixty days from the time of invoicing, which occurs at the time of shipment or prior to services being performed. Payment terms vary by the type of customers and the products or services offered.

Sales taxes, value added taxes, and certain excise taxes collected from customers and remitted to governmental authorities are accounted for on a net basis and are therefore excluded from revenues.

In certain subsidiaries the Company provides sales commissions to sales representatives based on annual sales volume. The Company has determined that the incentive portion of its sales commissions qualify as contract costs. The Company has elected the practical expedient in ASC 340-40-25-4 to expense sales commissions when incurred as the amortization period of the asset that would otherwise have been recognized is one year or less.

Contract Liabilities

The Company records contract liabilities when cash is collected from customers prior to satisfaction of the Company's performance obligation to the customer. Contract liabilities consist of amounts deferred related to service contracts and revenue deferred as a result of payments received in advance from customers. Contract liabilities are generally expected to be recognized within one year.

The amounts included in contract liabilities from advanced payments relate to amounts that are prepaid for wireless implantable monitors under the exchange program. The Company has made the judgment that these payments do not represent a significant financing component as the customer can exercise their discretion as to when they can obtain the products for which they have made a prepayment.

Disaggregation of revenue

Refer to Note 3 for revenue disaggregated by type and by geographic location as well as further information about contract liabilities.

Cash and Cash Equivalents

The Company considers all highly liquid instruments with original maturities of three months or less to be cash equivalents. The Company has cash holdings in financial institutions that exceed insured limits for such financial institutions. The Company mitigates this risk by utilizing financial institutions of high credit quality.

Approximately 66% of the Company's cash and cash equivalents at December 31, 2024, was held by the Company's foreign subsidiaries and subject to repatriation tax considerations. These foreign funds were held primarily by subsidiaries in the United Kingdom, Germany and Spain.

Marketable Equity Securities

Equity securities traded in active markets are marked to market at each balance sheet date based on prices as quoted on the relevant stock exchange. Fair value mark-to-market adjustments are recorded as non-operating gains (losses) in the consolidated statement of operations. The Company's investments in marketable equity securities are classified in the consolidated balance sheet based on the nature of the securities and their availability for use in current operations.

Allowance for Expected Credit Losses on Receivables

The allowance for expected credit losses on receivables is used to present accounts receivable, net, at an amount that represents the Company's estimate of the receivables expected to be collected from customers. The allowance represents an estimate of expected credit losses over the lifetime of the receivables, even if the loss is considered remote, and reflects expected recoveries of amounts previously written off. The Company estimates the allowance on the basis of specifically identified receivables that are evaluated individually for impairment and an analysis of the remaining receivables determined by reference to past default experience. The Company considers the need to adjust historical information to reflect the extent to which current conditions and reasonable forecasts are expected to differ from the conditions that existed for the historical period considered. Losses on receivables have not historically been significant.

Management judgments are used to determine when to charge off uncollectible trade accounts receivable. The Company bases these judgments on the age of the receivable, credit quality of the customer, current economic conditions, and other factors that may affect a customer's ability and intent to pay. Customers are generally not required to provide collateral for purchases.

Inventories

The Company values inventories at the lower of cost (determined on a first-in, first-out method) or net realizable value. The Company regularly reviews inventory quantities on hand and writes down excess and obsolete inventories to estimated net realizable value if less than cost, based primarily on historical inventory usage and estimated forecast of product demand.

Property, Plant and Equipment

Property, plant and equipment are stated at cost and depreciated using the straight-line method over the estimated useful lives of the assets as follows:

Machinery and equipment and automobiles (years)	3 - 10
Computer equipment and software (years)	3 - 7
Furniture and fixtures (years)	5 - 10

Leasehold improvements are amortized using the straight-line method over the shorter of the lease term or estimated useful life of the asset.

Software Development

Software development costs for software products to be sold, leased or otherwise marketed that are incurred before establishing technological feasibility are charged to operations. Software development costs incurred after establishing technological feasibility are capitalized on a product-by-product basis until the product is available for general release to customers at which time amortization begins.

Annual amortization, charged to cost of goods sold, is the amount computed using the ratio that current revenues for a product bear to the total current and anticipated future revenues for that product. In the event that future revenues are not estimable, such costs are amortized on a straight-line basis over the remaining estimated economic life of the product.

Goodwill

Goodwill acquired in a business combination and determined to have an indefinite useful life is not amortized, but instead is tested for impairment annually or more frequently if events or changes in circumstances indicate that the asset might be impaired.

For the purpose of its goodwill analysis, the Company has one reporting unit. The Company conducts its annual impairment analysis in the fourth quarter of the fiscal year and more frequently if there is an indicator of impairment. The Company assesses qualitative factors of the reporting unit to determine whether it is more likely than not that the fair value of the reporting unit is less than its carrying value. If the qualitative assessment indicates a potential impairment, a quantitative analysis is performed. The Company compares the fair value of the reporting unit with its carrying amount. The Company typically estimates fair value using market approaches but will also consider the income approach when appropriate. If the carrying amount of a reporting unit exceeds its fair value, goodwill is impaired, and the Company would recognize a loss equal to the excess.

During the year ended December 31, 2024, as a result of the Company's underperformance of recent operating results and liquidity risk and the current macroeconomic conditions impacting the life sciences industries, the Company assessed the current and future economic outlook and identified indicators for impairment of goodwill. Based on the quantitative analysis, the Company concluded that goodwill was not impaired due to the excess of fair value over the carrying value of the reporting unit. Based on declines in the Company's stock price subsequent to December 31, 2024, the carrying value of stockholders' equity currently exceeds its fair value, which could lead to future impairment.

Intangible Assets

Intangible assets are comprised of existing technology, customer contracts and contractual relationships, and other definite-lived intangible assets. Identifiable intangible assets resulting from the acquisitions of entities accounted for using the purchase method of accounting are estimated by the Company based on the fair value of assets received. Identifiable definite-lived intangible assets are being amortized over the period of estimated benefit using the straight-line method and estimated useful lives ranging from four to fifteen years.

Impairment of Long-Lived Assets

The Company assesses recoverability of its long-lived assets that are held for use, such as property, plant and equipment and amortizable intangible assets when events or changes in circumstances indicate that the carrying amount of an asset or asset group may not be recoverable. Factors which could trigger an impairment review include significant negative industry or economic trends, significant loss of clients, and significant changes in the manner of the Company's use of the assets or the strategy for its overall business.

The recoverability of assets or an asset group to be held and used is measured by a comparison of the carrying amount of an asset or asset group to estimated undiscounted future cash flows expected to be generated by the asset or the asset group. Cash flow projections are based on trends of historical performance and management's estimate of future performance. The Company's estimate of future cash flows requires significant judgment based on historical and anticipated results and are subject to many factors.

When the Company determines that the carrying value of the assets may not be recoverable based upon the existence of one or more of the above indicators of impairment, the Company measures the potential impairment based on a projected discounted cash flow method using a discount rate determined by management to be commensurate with the risk inherent in its current business model. An impairment loss is recognized only if the carrying amount of the asset is not recoverable and exceeds its fair value. Different assumptions and judgments could materially affect the calculation of the fair value of the Company's assets. For the year ended December 31, 2024, the Company concluded that there were triggering events requiring the Company to assess the recoverability of its long-lived assets. Based on its recoverability assessment, the Company determined that there was no impairment. If future operating performance of the reporting units is not consistent with these assumptions, the Company could be required to record non-cash impairment charges.

Commitments and Contingencies

Liabilities for loss contingencies arising from claims, assessments, litigation, fines and penalties, and other sources are recorded when it is probable that a liability has been incurred and the amount of the assessment can be reasonably estimated. If a loss is reasonably possible and the loss or range of loss can be reasonably estimated, the Company discloses the possible loss. If a loss is probable and the loss or range of loss cannot be reasonably estimated, the Company discloses or states that such an estimate cannot be made. Refer to Note 16 Commitments and Contingencies for additional information. The Company accrues and expenses legal costs associated with contingencies when incurred.

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 only enters into derivative contracts that it intends to designate as a hedge of a forecasted transaction or the variability of cash flows to be received or paid related to a recognized asset or liability (cash flow hedge) and does not use derivative financial instruments for trading or speculative purposes. The Company recognizes all derivative instruments as either assets or liabilities in the balance sheet at their respective fair values.

The Company formally documents the hedging relationship and its risk-management objective and strategy for undertaking the hedge, the hedging instrument, the hedged transaction, the nature of the risk being hedged, how the hedging instrument's effectiveness in offsetting the hedged risk will be assessed prospectively and retrospectively, and a description of the method used to measure ineffectiveness. For derivative instruments that are designated and qualify as part of a cash flow hedging relationship, the effective portion of the gain or loss on the derivative is reported as a component of other comprehensive income (loss) ("OCI") and reclassified into earnings in the same period or periods during which the hedged transaction affects earnings. Gains and losses on the derivative representing either hedge ineffectiveness or hedge components excluded from the assessment of effectiveness are recognized in current earnings.

By using derivative financial instruments to hedge exposure 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 major financial institutions based upon their credit profile. Market risk has an 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 monitors interest rate risk attributable to both its outstanding and forecasted debt obligations by the use of cash flow sensitivity analysis, which estimates the expected impact of changes in interest rates on the Company's future cash flows.

Leases

The Company leases office space, manufacturing facilities, automobiles and equipment. The Company concludes on whether an arrangement is a lease at inception. This determination as to whether an arrangement contains a lease is based on an assessment as to whether a contract conveys the right for the Company to control the use of the identified property, plant or equipment for a period of time in exchange for consideration. Leases with an initial term of 12 months or less are not recorded on the balance sheet. The Company recognizes these lease expenses on a straight-line basis over the lease term.

The Company has assessed its contracts and concluded that its leases consist of operating leases. Operating leases are included in operating lease right-of-use (“ROU”) assets, current portion of operating lease liabilities, and operating lease liabilities in the Company’s consolidated balance sheets.

ROU assets represent the Company’s right to use an underlying asset for the lease term and lease liabilities represent the Company’s obligation to make lease payments arising from the lease. Operating lease ROU assets and liabilities are recognized at the leases’ commencement date based on the present value of lease payments over the lease term. As most of the Company’s leases do not provide an implicit rate, the Company determines an incremental borrowing rate based on the information available at commencement date in determining the present value of lease payments. The incremental borrowing rate represents a significant judgment that is based on an analysis of the Company’s credit rating, country risk, treasury and corporate bond yields, as well as comparison to the Company’s borrowing rate on its most recent loan. The Company uses the implicit rate when readily determinable. The terms in our leases may include options to extend or terminate the lease. We recognize ROU assets and liabilities when it is reasonably certain that we will exercise those options. Judgement is required in our assessment as to whether renewal or termination options are reasonably certain to be exercised and factors such as contractual terms compared to current market rates and the importance of the facility and location to our operations, among others, are considered. The Company has lease agreements with lease and non-lease components, which are generally accounted for separately.

Preferred Stock

The Company’s board of directors has the authority to issue up to 5.0 million shares of preferred stock and to determine the price privileges and other terms of the shares. The board of directors may exercise this authority without any further approval from stockholders. As of December 31, 2024, and 2023, the Company had no preferred stock issued or outstanding.

Stock-based Compensation

The Company recognizes compensation expense for all stock-based payment awards made to employees and directors including stock options, restricted stock units, and restricted stock units with a market or performance condition. The Company issues awards under the 2021 Incentive Plan (the “2021 Incentive Plan”) and the Fourth Amended and Restated 2000 Stock Option and Incentive Plan (the “2000 Incentive Plan,” together with the 2021 Incentive Plan, together referred to as the “Incentive Plans”), as well as issues shares for employee stock purchases related to its Employee Stock Purchase Plan (as amended, the “ESPP”). The Company issues new shares from its registered but unissued stock pool to satisfy stock option exercises and vesting of the restricted stock units. Stock-based compensation expense is recorded on a straight-line basis over the applicable service period, which ranges from one to four years. The Company has elected as an accounting policy to account for forfeitures for service-based awards as they occur, with no adjustment for estimated forfeitures.

The fair value of restricted stock units is based on the market price of the Company’s stock on the date of grant. The Company values restricted stock units with a market condition using a Monte-Carlo valuation simulation. The determination of fair value of stock-based payment awards on the date of grant using a Monte-Carlo valuation simulation is affected by the Company’s stock price as well as assumptions regarding certain variables including, but are not limited to, the Company’s expected stock price volatility over the term of the awards, interest rate assumptions, and discounts to adjust for any holding period post-vest restrictions.

Performance-based RSU awards are contingent on the achievement of certain performance metrics. Compensation cost associated with performance-based RSUs are recognized based on the estimated number of shares that the Company ultimately expects will be earned. If the estimated number of shares to be earned is revised in the future, then stock-based compensation expense will be adjusted accordingly.

Income Taxes

Income taxes are accounted for under the asset and liability method. Deferred tax assets and liabilities are recognized for the future tax consequences attributable to differences between the financial statement carrying amounts of existing assets and liabilities and their respective tax bases. Deferred tax assets and liabilities are measured using enacted tax rates expected to be applied to taxable income in the years in which those temporary differences are expected to be recovered or settled. The effect on deferred tax assets and liabilities of a change in tax rates is recognized in income in the period that includes the enactment date. The Company uses the flow-through method to account for investment tax credits. Under this method, the investment tax credits are recognized as a reduction of income tax expense.

The Company recognizes the effect of income tax positions only if those positions are more likely than not of being sustained. Recognized income tax positions are measured at the largest amount that is more than 50% likely of being realized. Changes in recognition are reflected in the period in which the judgement occurs. The Company's policy is to account for Global Intangible Low-Taxed income ("GILTI") as a period cost.

Comprehensive Income (Loss)

Comprehensive income (loss) represents the change in equity resulting from items other than shareholder investments and distributions. The Company's foreign currency translation adjustments, interest rate swap - cash flow hedge and minimum pension liability adjustments are included in accumulated other comprehensive income ("AOCI"). The components of other comprehensive income are reclassified as net income, net of tax, when the underlying component impacts earnings. Comprehensive income (loss) and the components of AOCI are presented in the accompanying consolidated statements of comprehensive loss and consolidated statements of equity.

Fair Value of Financial Instruments

Financial reporting standards define a fair value hierarchy that consists of three levels:

- Level 1 includes instruments for which quoted prices in active markets for identical assets or liabilities accessible to the Company at the measurement date.
- Level 2 includes instruments for which the valuations are based on quoted prices for similar assets or liabilities, quoted prices in markets that are not active, or other inputs that are observable or can be corroborated by observable data for substantially the full term of the assets or liabilities.
- Level 3 includes valuations based on inputs that are unobservable and significant to the overall fair value measurement.

The carrying values of the Company's cash and cash equivalents, trade accounts receivable, 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 debt approximates its carrying value and is based on the amount of future cash flow associated with the debt discounted using current borrowing rates for similar debt instruments of comparable maturity (Level 2).

Foreign Currency

The functional currency of the Company's foreign subsidiaries is generally their local currency. All assets and liabilities of foreign subsidiaries are translated at exchange rates in effect at period-end. Income and expenses are translated at rates which approximate those in effect on the transaction dates. The resulting translation adjustment is recorded as a separate component of stockholders' equity in AOCI in the consolidated balance sheets. Gains and losses resulting from foreign currency transactions are included in other income (expense), net, in the Company's consolidated statements of operations.

Earnings per Share

Basic earnings (loss) per share is computed by dividing net income by the weighted average number of shares of common stock outstanding during the periods presented. The computation of diluted earnings (loss) per share is similar to the computation of basic earnings per share, except that the denominator is increased for the assumed exercise of dilutive options and other potentially dilutive securities using the treasury stock method unless the effect is antidilutive. The following table sets forth the computation of basic and diluted loss per share:

(in thousands, except per share data)	Year Ended December 31,	
	2024	2023
Net loss	\$ (12,405)	\$ (3,415)
Weighted average shares outstanding - basic	43,538	42,420
Dilutive effect of equity awards	-	-
Weighted average shares outstanding - diluted	43,538	42,420
Basic loss per share	\$ (0.28)	\$ (0.08)
Diluted loss per share	\$ (0.28)	\$ (0.08)
Shares excluded from diluted loss per share due to their anti-dilutive effect	3,577	3,868

Business Segment Information

The Company operates in one segment which involves the design, development, production and distribution of products and services that enable fundamental advances in life science applications, including research, pharmaceutical and therapy discovery, bioproduction and preclinical testing for pharmaceutical and therapy development. The Company has a single, company-wide management team that administers all properties as a whole rather than discrete operating segments. The chief operating decision maker ("CODM"), who is the Company's chief executive officer, measures financial performance as a single enterprise and allocates resources across the Company to maximize profitability, and not on geography, legal entity, or end market basis. The Company operates in a number of countries throughout the world in a variety of product lines. Information regarding product lines and geographic financial information is provided in Note 3, "Revenues" and Note 6, "Balance Sheet Information."

Other Operating Expenses

The components of other operating expenses for the year ended December 31, 2024 and 2023, were as follows:

(in thousands)	Year Ended December 31,	
	2024	2023
Restructuring expenses (see Note 7)	\$ 792	\$ 71
Unclaimed property audits expense (see Note 16)	347	-
Employee retention tax credit fees (see Note 18)	472	-
Total other operating expenses	\$ 1,611	\$ 71

Recently Issued Accounting Pronouncements Adopted

In November 2023, the Financial Accounting Standards Board ("FASB") issued Accounting Standards Update ("ASU") No. 2023-07, *Segment Reporting (Topic 280): Improvements to Reportable Segment Disclosures*, which improves reportable segment disclosure requirements, primarily through enhanced disclosures about significant segment expenses on an annual and interim basis. Entities with a single reportable segment must provide all the disclosures required by this ASU and all existing segment disclosures in Topic 280. ASU 2023-07 was effective for fiscal years beginning after December 15, 2023, and interim periods within fiscal years beginning after December 15, 2024. The adoption of this standard impacted footnote disclosures and did not have a material impact on the Company's consolidated financial statements.

Recently Issued Accounting Pronouncements Yet to be Adopted

In December 2023, the FASB issued ASU No. 2023-09, *Income Taxes (Topic 740): Improvements to Income Tax*, which enhances disclosures related to the effective tax rate reconciliation, income taxes paid, as well as other disclosures. The new standard impacts footnote disclosures and is effective for the Company's annual financial statements for the year ended December 31, 2025. The Company is currently evaluating the impact that adopting ASU No. 2023-09 will have on the footnote disclosures in its consolidated financial statements.

In November 2024, the FASB issued ASU No. 2024-03, *Income Statement (Subtopic 220-40): Reporting Comprehensive Income—Expense Disaggregation Disclosures*, which requires enhanced disclosure of income statement expense categories to improve transparency and provide financial statement users with more detailed information about the nature, amount and timing of expenses impacting financial performance. This new guidance is effective for annual reporting periods beginning after December 15, 2026, and interim reporting periods beginning after December 15, 2027, with early adoption permitted. The Company is currently evaluating the impact that adopting ASU No. 2024-03 will have on the footnote disclosures in its consolidated financial statements.

Correction of Unaudited Interim Financial Statements

In August 2024, the Company initiated the process of terminating one of its defined benefit plans by purchasing from plan assets a non-participating bulk annuity from an insurance company (a “buy-in” arrangement”). This bulk annuity will be used to purchase individual annuity contracts for each participant (a “buy-out” arrangement), which is expected to occur in 2025. During the three months ended September 30, 2024, the Company recorded a non-cash loss on pension settlement of \$1.2 million, including the immediate recognition of the portion of the AOCI balances related to this plan.

During the three months ended December 31, 2024, the Company determined that the buy-in transaction does not result in settlement accounting as the Company has not been relieved of primary responsibility for the benefit obligation. As a result, the Company identified an immaterial error associated with recording a loss on pension settlement in other income (expense), net, in its interim financial statements for the three and nine months ended September 30, 2024. This immaterial error overstated the loss before income taxes by \$1.2 million and the net loss by \$0.9 million for the three and nine months ended September 30, 2024, and overstated the loss per share loss by \$0.02 and \$0.03 for the three and nine months ended September 30, 2024, respectively. This error had no impact on the operating loss or cash flows from operations for the three and nine months ended September 30, 2024. The correction of this immaterial error is included in these unaudited consolidated financial statements.

Prior Period Financial Statement Reclassifications

Certain immaterial reclassifications have been made to the prior year financial statements to conform to the current presentation.

3. Revenues

The following table represents a disaggregation of revenue from contracts with customers for the years ended December 31, 2024, and 2023:

Revenues by type were as follows:

(in thousands)	Year Ended December 31,	
	2024	2023
Instruments, equipment, software and accessories	\$ 86,964	\$ 105,716
Service, maintenance and warranty contracts	7,171	6,534
Total revenues	\$ 94,135	\$ 112,250

Revenues by timing of recognition were as follows:

(in thousands)	Year Ended December 31,	
	2024	2023
Goods and services transferred at a point in time	\$ 90,420	\$ 108,558
Goods and services transferred over time	3,715	3,692
Total revenues	\$ 94,135	\$ 112,250

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Revenues by geographic destination were as follows:

(in thousands)	Year Ended December 31,	
	2024	2023
Americas		
United States	\$ 41,738	\$ 48,205
Americas - Other	3,596	3,517
Europe, Middle East and Africa	28,405	33,275
Asia		
Greater China	13,297	18,488
Asia - Other	7,099	8,765
	<u>\$ 94,135</u>	<u>\$ 112,250</u>

Contract Liabilities

The following table provides a summary of contract liabilities as of the periods indicated:

(in thousands)	December 31,			Change	
	2024	2023	2022	2024 vs. 2023	2023 vs. 2022
Service, maintenance and warranty contracts	\$ 2,366	\$ 2,849	\$ 1,530	\$ (483)	\$ 1,319
Customer advances	1,440	1,659	1,840	(219)	(181)
Total contract liabilities	<u>\$ 3,806</u>	<u>\$ 4,508</u>	<u>\$ 3,370</u>	<u>\$ (702)</u>	<u>\$ 1,138</u>

Changes in the Company's contract liabilities are primarily due to the timing of receipt of payments under service, maintenance and warranty contracts and lower revenue volumes. During the years ended December 31, 2024, and 2023, the Company recognized revenue of \$3.4 million and \$2.1 million from contract liabilities existing at December 31, 2023 and 2022, respectively.

Provision for Expected Credit Losses on Receivables

Activity in the provision for expected losses on receivables was as follows:

(in thousands)	December 31,	
	2024	2023
Balance, beginning of period	\$ 160	\$ 191
Provision for expected credit losses	60	29
Charge-offs and other	(5)	(60)
Balance, end of period	<u>\$ 215</u>	<u>\$ 160</u>

Concentrations

No customer accounted for more than 10% of revenue for the years ended December 31, 2024, and 2023, or for more than 10% of net accounts receivable at December 31, 2024 and 2023.

Warranties

Warranty activity was as follows:

(in thousands)	Year Ended December 31,	
	2024	2023
Balance, beginning of period	\$ 336	\$ 268
Provision for warranties	317	381
Warranty claims	(335)	(313)
Balance, end of period	<u>\$ 318</u>	<u>\$ 336</u>

4. Accumulated Other Comprehensive Loss

Changes in the components of accumulated other comprehensive loss, net of tax, for the years ended December 31, 2024 and 2023, respectively, were as follows:

(in thousands)	Foreign Currency Translation Adjustments	Defined Benefit Pension Plans	Derivatives Qualifying as Hedges	Total
Balance at December 31, 2022	\$ (11,392)	\$ (3,660)	\$ -	\$ (15,052)
Other comprehensive income (loss), net	1,507	(446)	(199)	862
Balance at December 31, 2023	(9,885)	(4,106)	(199)	(14,190)
Other comprehensive income (loss), net	(1,405)	(175)	100	(1,480)
Balance at December 31, 2024	\$ (11,290)	\$ (4,281)	\$ (99)	\$ (15,670)

5. Goodwill and Intangible Assets

The change in the carrying amount of goodwill was as follows:

(in thousands)	December 31,	
	2024	2023
Carrying amount at beginning of period	\$ 57,065	\$ 56,260
Effect of change in currency translation	(741)	805
Carrying amount at end of period	\$ 56,324	\$ 57,065

Intangible assets, net at December 31, 2024 and 2023 consisted of the following:

(in thousands)	Average Life*	December 31, 2024			December 31, 2023		
		Accumulated			Accumulated		
Amortizable intangible assets:		Gross	Amortization	Net	Gross	Amortization	Net
Customer relationships	5	\$ 15,603	\$ (10,450)	\$ 5,153	\$ 16,038	\$ (9,706)	\$ 6,332
Technology and software development	1	35,397	(30,556)	4,841	35,007	(27,029)	7,978
Trade names and patents	2	7,452	(6,509)	943	7,613	(6,094)	1,519
Total amortizable intangible assets		\$ 58,452	\$ (47,515)	\$ 10,937	\$ 58,658	\$ (42,829)	\$ 15,829
Indefinite-lived intangible assets:				195			207
Total intangible assets				\$ 11,132			\$ 16,036

* Weighted average remaining life in years as of December 31, 2024

The Company capitalized \$0.6 million and \$0.5 million of software development costs during the year ended December 31, 2024, and 2023, respectively.

Intangible asset amortization expense was \$5.4 million and \$5.5 million for the years ended December 31, 2024 and 2023, respectively.

(in thousands)	Year Ended December 31,	
	2024	2023
Cost of revenues	\$ 175	\$ -
Operating expense	5,255	5,525
Total amortization of intangible assets	\$ 5,430	\$ 5,525

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

(in thousands)		
2025	\$	4,397
2026		2,736
2027		1,464
2028		1,011
2029		935
Thereafter		394
Total	\$	10,937

6. Balance Sheet Information

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

<i>Inventories:</i>	December 31,	
(in thousands)	2024	2023
Finished goods	\$ 5,222	\$ 5,120
Work in process	2,754	4,188
Raw materials	15,269	15,408
Total	\$ 23,245	\$ 24,716

<i>Property, Plant and Equipment:</i>	December 31,	
(in thousands)	2024	2023
Machinery and equipment	\$ 8,139	\$ 8,154
Computer equipment and software	8,923	6,493
Leasehold improvements	2,565	2,417
Furniture and fixtures	1,243	1,244
Automobiles	56	58
	20,926	18,366
Less: accumulated depreciation	(15,820)	(14,385)
Property, plant and equipment, net	\$ 5,106	\$ 3,981

Depreciation expense was \$1.7 million and \$1.5 million for the years ended December 31, 2024 and 2023, respectively.

<i>Other Current Liabilities:</i>	December 31,	
(in thousands)	2024	2023
Compensation	\$ 1,714	\$ 3,929
Customer credits	1,286	3,201
Current portion of operating lease liabilities	1,158	1,416
Employee retention tax credit funds - Note 18	3,154	-
Professional fees	545	499
Warranty costs	318	336
Other	1,234	1,240
Total	\$ 9,409	\$ 10,621

Long-lived Assets by Geographic Area:

Long-lived assets by geographic area, which include operating lease right-of-use assets, property, plant and equipment, and amortizable intangible assets, were as follows:

(in thousands)	December 31,	
	2024	2023
United States	\$ 20,235	\$ 21,558
Germany	1,148	1,703
Rest of the world	792	1,322
Total long-lived assets	<u>\$ 22,175</u>	<u>\$ 24,583</u>

7. Restructuring 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 and align its cost base and infrastructure with customer needs and its strategic plans. In order to realize these goals, the Company undertakes activities from time to time to optimize its business.

During the year ended December 31, 2024 and 2023, the Company completed restructurings and incurred expenses of \$0.8 million and \$0.4 million, respectively. These costs primarily consisted of severance incurred in connection with headcount reductions in Europe and North America and purchase order cancellation costs.

The changes in the accrued liabilities for restructuring and other charges for the years ended December 31, 2024 and 2023 were as follows:

(in thousands)	Inventory- Related	Severance	Other	Total
Balance at December 31, 2022	\$ -	\$ 636	\$ -	\$ 636
Restructuring costs	320	42	29	391
Non-cash charges	(142)	-	-	(142)
Cash payments	(94)	(678)	(29)	(801)
Balance at December 31, 2023	<u>\$ 84</u>	<u>\$ -</u>	<u>\$ -</u>	<u>\$ 84</u>
Restructuring costs	43	792	-	835
Non-cash charges	(27)	-	-	(27)
Cash payments	(100)	(711)	-	(811)
Effect of change in currency translation	-	1	-	1
Balance at December 31, 2024	<u>\$ -</u>	<u>\$ 82</u>	<u>\$ -</u>	<u>\$ 82</u>

The severance and other costs detailed above have been included as a component of other operating expenses, and all inventory-related charges are included in cost of revenues.

8. Employee Benefit Plans
Employee Retirement Savings Plans

The Company sponsors various qualified employee retirement savings plans and makes contributions to match a certain portion of employee contributions. The Company contributed \$1.1 million to these plans for each of the years ended December 31, 2024 and 2023.

Employee Pension Plans

The Company's subsidiary in the United Kingdom, Biochrom Ltd., maintains defined benefit pension plans for its employees. In 2014, these defined benefit pension plans were closed to new employees, as well as closed to the future accrual of benefits for existing employees. The Company recognizes the funded status of the pension plans as an asset or liability in the consolidated balance sheets. The funded status equals the difference between the fair value of the plan's assets and their benefit obligations and has historically been measured each year as of December 31st. The Company records net period benefit expense (credit) as a component of other expense in the Consolidated Statement of Operations.

The components of the Company's net period benefit expense for the years ending December 31, 2024 and 2023, were as follows:

(in thousands)	Year Ended December 31,	
	2024	2023
Interest cost	\$ 667	\$ 670
Expected return on plan assets	(887)	(788)
Net amortization loss	408	328
Net periodic benefit expense	\$ 188	\$ 210

The following provides a reconciliation of the changes in the plans' fair value of assets and benefit obligations for the years ended December 31, 2024 and 2023, and a summary of the funded status as of December 31, 2024 and 2023:

(in thousands)	December 31,	
	2024	2023
Change in fair value of plan assets:		
Balance at beginning of year	\$ 16,940	\$ 15,576
Actual return on plan assets	(1,520)	351
Employer contributions	575	622
Benefits paid	(565)	(563)
Currency translation adjustment	(251)	954
Balance at end of year	\$ 15,179	\$ 16,940

(in thousands)	December 31,	
	2024	2023
Change in benefit obligation:		
Balance at beginning of year	\$ 14,663	\$ 13,263
Interest cost	662	665
Actuarial (gain) loss	(1,760)	479
Benefits paid	(565)	(563)
Currency translation adjustment	(211)	819
Balance at end of year	\$ 12,789	\$ 14,663

(in thousands)	December 31,	
	2024	2023
Fair value of plan assets	\$ 15,179	\$ 16,940
Benefit obligation	12,789	14,663
Net funded status	\$ 2,390	\$ 2,277

Changes in the actuarial (gain) loss disclosed above are primarily the result of changes in the discount rate and inflation assumptions due to underlying market conditions.

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The amounts recognized in the consolidated balance sheets consist of:

(in thousands)	December 31,	
	2024	2023
Other long-term assets	\$ 2,390	\$ 2,277
Accumulated other comprehensive loss	6,143	5,909

The weighted average assumptions used in determining the net pension cost for these plans follows:

	December 31,	
	2024	2023
Discount rate	5.5%	4.6%
Expected return on assets	5.5%	5.3%

The discount rate assumptions used for pension accounting reflect the prevailing rates available on high-quality, fixed-income debt instruments with terms that match the average expected duration of the Company's defined benefit pension plan obligations.

The Company's mix of pension plan investments among asset classes also affects the long-term expected rate of return on plan assets. As of December 31, 2024, the Company's actual asset mix approximated its target mix. Differences between actual and expected returns are recognized in the calculation of net periodic pension cost over the average remaining expected future working lifetime, which is approximately 12 years for active plan participants.

The asset allocations and fair value of the Company's pension benefits as of December 31, 2024 and 2023, were as follows:

(in thousands)	December 31,			
	2024		2023	
Asset category:				
Debt securities	\$ 12,310	81%	\$ 11,761	69%
Insurance contracts	1,461	10%	-	0%
Equity securities	712	5%	3,567	21%
Cash and cash equivalents	402	3%	304	2%
Other	294	2%	1,308	8%
Total	\$ 15,179	100%	\$ 16,940	100%

(in thousands)	December 31,	
	2024	2023
Quoted prices in active markets for identical assets (Level 1)	\$ 402	\$ 304
Significant other observable inputs (Level 2)	14,777	16,636
Significant other unobservable inputs (Level 3)	-	-
Total	\$ 15,179	\$ 16,940

Level 1 assets consist of cash and cash equivalents held in the pension plans. The Level 2 assets primarily consist of investments in private investment funds that are valued using the net asset values provided by the trust or fund, including an insurance contract. Although these funds are not traded in an active market with quoted prices, the investments underlying the net asset value are based on quoted prices.

The Company expects to contribute approximately \$0.3 million to its pension plan during 2025. The benefits expected to be paid from the pension plans are \$0.8 million in 2025, \$0.7 million in 2026, \$0.7 million in 2027, \$0.8 million in 2028, and \$0.9 million in 2029. The expected benefits to be paid in the five years from 2030 to 2034 are \$4.4 million. The expected benefits are based on the same assumptions used to measure the Company's benefit obligation at December 31, 2024.

9. Leases

The Company has non-cancelable operating leases for office space, manufacturing facilities, warehouse space, automobiles and equipment expiring at various dates through 2030.

The components of lease expense for the years ended December 31, 2024 and 2023, were as follows:

(in thousands)	Year Ended December 31,	
	2024	2023
Operating lease cost	\$ 2,049	\$ 2,013
Short-term lease cost	191	199
Sublease income	(68)	(102)
Total lease cost	<u>\$ 2,172</u>	<u>\$ 2,110</u>

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

(in thousands)	December 31,	
	2024	2023
Operating lease right-of-use assets	<u>\$ 6,132</u>	<u>\$ 4,773</u>
Current portion, operating lease liabilities	\$ 1,158	\$ 1,416
Operating lease liabilities, long-term	6,381	4,794
Total operating lease liabilities	<u>\$ 7,539</u>	<u>\$ 6,210</u>
Weighted average remaining lease term (years)	5.2	5.7
Weighted average discount rate	8.9%	9.5%

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

(in thousands)	Year Ended December 31,	
	2024	2023
Cash paid for amounts included in the measurement of lease liabilities	\$ 2,186	\$ 2,367
Right-of-use assets obtained in exchange for lease obligations	2,945	293

Future minimum lease payments for operating leases, with initial terms in excess of one year at December 31, 2024, are as follows:

Year Ending December 31,	
(in thousands)	
2025	\$ 1,783
2026	1,802
2027	1,779
2028	1,770
2029	1,575
Thereafter	833
Total lease payments	<u>9,542</u>
Less imputed interest	(2,003)
Total operating lease liabilities	<u>\$ 7,539</u>

10. Debt

As of December 31, 2024 and 2023, the Company's debt was as follows:

(in thousands)	<u>December 31, 2024</u>	<u>December 31, 2023</u>
Debt:		
Term loan	\$ 24,700	\$ 30,723
Revolving line	12,650	6,400
Less: unamortized deferred financing costs	(394)	(560)
Total debt	<u>36,956</u>	<u>36,563</u>
Less: current portion of long-term debt	(37,350)	(6,139)
Current unamortized deferred financing costs	394	280
Long-term debt	<u>\$ -</u>	<u>\$ 30,704</u>

The Company maintains a Credit Agreement (as amended, the "Credit Agreement") with Citizens Bank, N.A., Wells Fargo Bank, National Association, and First Citizens Bank & Trust Company (together, the "Lenders"). The Credit Agreement provides for a term loan of \$40.0 million and a \$25.0 million revolving credit facility (including a \$10.0 million sub-facility for the issuance of letters of credit and a \$10.0 million swingline loan sub-facility) (collectively, the "Credit Facility"). The Company's obligations under the Credit Agreement are secured by substantially all of the assets of Harvard Bioscience, Inc., including all or a portion of the equity interests in certain of the Company's domestic and foreign subsidiaries. The Company's obligations under the Credit Agreement are guaranteed by certain of the Company's direct, domestic wholly owned subsidiaries; none of the Company's direct or indirect foreign subsidiaries has guaranteed the Credit Facility. Issuance costs of \$1.6 million are amortized over the contractual term to maturity date on a straight-line basis, which approximates the effective interest method. Total revolver borrowing capacity is limited by the consolidated net leverage ratio as defined under the amended Credit Agreement. As of the date of this report, the Company is unable to make additional borrowings under its revolving credit facility due to net leverage ratio requirements set forth in the August 6, 2024 amendment to the Credit Agreement (the "August 2024 Amendment") and the terms of the March 10, 2025 amendment to the Credit Agreement (the "March 2025 Amendment"), as described below.

Borrowings under the Credit Facility will, at the option of the Company, bear interest at either (i) a rate per annum based on the Secured Overnight Financing Rate ("SOFR") for an interest period of one, two, three or six months, plus an applicable interest rate margin determined as provided in the Credit Agreement (a "SOFR Loan"), subject to a floor of 0.50%, or (ii) an alternative base rate plus an applicable interest rate margin, each as determined as provided in the Credit Agreement (an "ABR Loan"). The alternative base rate is based on the Citizens Bank prime rate or the federal funds effective rate of the Federal Reserve Bank of New York and is subject to a floor of 1.0%. Pursuant to the August 2024 Amendment, the applicable interest rate margin varies from 2.0% per annum to 3.75% per annum for SOFR Loans, and from 1.5% per annum to 3.5% per annum for ABR Loans, in each case depending on the Company's consolidated net leverage ratio and is determined in accordance with a pricing grid set forth in the Credit Agreement, as amended. There are no prepayment penalties in the event the Company elects to prepay and terminate the Credit Facility prior to its scheduled maturity date, subject to SOFR Loan breakage and redeployment costs in certain circumstances.

The effective interest rate on the Company's borrowings for both of the years ended December 31, 2024 and 2023, was 8.1%. The weighted average interest rate as of December 31, 2024, net of the effect of the Company's interest rate swap agreement, was 8.4%. 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.

As of December 31, 2024, the term loan requires quarterly installment payments of \$1.0 million with a balloon payment at maturity on December 22, 2025. Furthermore, within ninety days after the end of the Company's fiscal year, the term loan may be permanently reduced pursuant to certain mandatory prepayment events including an annual "excess cash flow sweep", as defined in the Credit Agreement, provided that, in any fiscal year, any voluntary prepayments of the term loan shall be credited against the Company's "excess cash flow" prepayment obligations on a dollar-for-dollar basis for such fiscal year. There is no excess cash flow sweep requirement for the year ended December 31, 2024. As of December 31, 2023, the current portion of long-term debt included amounts due under the excess cash flow sweep of \$2.0 million which was paid on March 29, 2024. Amounts outstanding under the revolving credit facility can be repaid at any time but are due in full at maturity.

The Credit Agreement includes various customary financial covenants and other affirmative and negative covenants binding on the Company. The negative covenants limit the ability of the Company, among other things, to incur debt, permit liens, make investments, sell assets, or pay dividends on its capital stock. The financial covenants include a maximum consolidated net leverage ratio and a minimum consolidated fixed charge coverage ratio. The Credit Agreement also includes customary events of default.

In March 2024, the Company entered into an amendment to the Credit Agreement pursuant to which the Lenders and administrative agent modified the definition of Consolidated EBITDA used in the calculation of certain financial covenants to adjust for charges related to an abandoned property audit (see Note 13) and commission fees in connection with ERTC filings (see Note 5).

In August 2024, the Company entered into an amendment to the Credit Agreement that, among other things, modified the financial covenants relating to the consolidated net leverage ratio and consolidated fixed charge coverage ratio through the period ended December 31, 2024. The amendment also added a net leverage ratio requirement with respect to additional borrowing under the Company's revolving credit facility and restrictions on certain additional indebtedness and investments. In addition, the applicable interest rate margin was increased by 50bps during such time as the Company's consolidated net leverage ratio is greater than 3.0. The Company paid fees of \$0.2 million to the Lenders in connection with the amendment.

The Company was not in compliance with the consolidated net leverage ratio covenant contained in the Credit Agreement as of the December 31, 2024 test date. On March 10, 2025, the Company entered into the March 2025 Amendment pursuant to which the lenders and administrative agent agreed to waive such non-compliance subject to the terms contained in the March 2025 Amendment. The March 2025 Amendment provides, among other things, that the lender's commitment under the Company's revolving credit facility is capped at the amount outstanding thereunder as of the date thereof and thus the Company is unable to make additional borrowings under the revolving credit facility. The March 2025 Amendment also provides that the Company's failure to achieve certain refinancing milestones, including receipt of a term sheet or commitment letter from one or more potential lenders, by the dates provided in the March 2025 Amendment or the Company's failure to consummate a refinancing of the Credit Agreement by June 30, 2025, would, in either case, constitute an event of default under the Credit Agreement. The lenders also agreed not to assert the financial covenants for the first quarter of fiscal year 2025 provided that the Company continues to comply with its payment obligations, achieves the refinancing milestones, provides the administrative agent with certain financial reports and maintains a minimum level of liquidity as defined by the March 2025 Amendment. If the Company is not able to comply with the terms and conditions of the March 2025 Amendment, or if the Company is otherwise unable to regain and maintain compliance with the covenants under the Credit Agreement, as amended, or are unsuccessful in obtaining waivers or amendments for any covenant in the future, in addition to other actions the Company's lenders may require, the amounts outstanding under the Credit Agreement may become immediately due and payable. The Company paid fees of \$0.1 million to the Lenders in connection with the March 2025 Amendment.

If the Company is not able to comply with the terms and conditions of the March 2025 Amendment, or if the Company is otherwise unable to regain and maintain compliance with the covenants under the Credit Agreement, as amended, or are unsuccessful in obtaining waivers or amendments for any covenant in the future, in addition to other actions the lenders may require, the amounts outstanding under the Credit Agreement may become immediately due and payable.

11. Derivatives

In February 2023, the Company entered into an interest rate swap contract to improve the predictability of cash flows from interest payments related to its variable, SOFR-based debt. The swap contract had a notional amount of \$21.7 million as of December 31, 2024, and matures on December 22, 2025. This swap contract effectively converts the SOFR-based variable portion of the interest payable under the Credit Agreement into fixed-rate debt at an annual rate of 4.75%. The swap contract does not impact the additional interest related to the applicable interest rate margin as discussed above in Note 10, Debt. The swap contract is considered an effective cash flow hedge, and as a result, net gains or losses are reported as a component of other comprehensive income ("OCI") in the consolidated financial statements and are reclassified when the underlying hedged interest impacts earnings. An assessment is performed quarterly to evaluate the ongoing hedge effectiveness.

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The following table presents the notional amount and fair value of the Company's derivative instrument as of December 31, 2024 and 2023:

(in thousands)	Balance Sheet Classification	December 31, 2024		December 31, 2023	
		Notional Amount	Fair Value (a)	Notional Amount	Fair Value (a)
Interest rate swap	Other current liabilities	\$ 21,658	\$ (99)	\$ -	\$ -
Interest rate swap	Other long-term liabilities	-	-	27,375	(199)

(a) See Note 13 for the fair value measurements related to this financial instrument.

The following table summarizes the effect of derivatives designated as cash flow hedging instruments for the years ended December 31, 2024 and 2023:

Derivatives Qualifying as Hedges, net of tax (in thousands)	December 31, 2024	December 31, 2023
Gain (loss) recognized in OCI on derivatives (effective portion)	\$ 100	\$ (199)
Amounts reclassified from AOCI to interest expense	136	120

12. Marketable Equity Securities

In April 2023, the Company received shares of common stock of Harvard Apparatus Regenerative Technology, Inc. ("HRGN", formerly known as Biostage, Inc.) in connection with settlement of indemnification obligations related to litigation which was resolved during the year ended December 31, 2022. As of December 31, 2023, these shares had an estimated fair value \$3.5 million and are included in the consolidated balance sheet as a component of other long-term assets. For the year ended December 31, 2023, the Company recognized a loss on equity securities of \$0.6 million. During the year ended December 31, 2024, the Company sold its HRGN shares for \$1.9 million and recorded a loss on equity securities of \$1.6 million.

13. Fair Value Measurements

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

Assets (Liabilities) (in thousands)	Fair Value as of December 31, 2024			
	Level 1	Level 2	Level 3	Total
Interest rate swap agreement	\$ -	\$ (99)	\$ -	\$ (99)

Assets (Liabilities) (in thousands)	Fair Value as of December 31, 2023			
	Level 1	Level 2	Level 3	Total
Equity securities - common stock	\$ 3,511	\$ -	\$ -	\$ 3,511
Interest rate swap agreement	\$ -	\$ (199)	\$ -	\$ (199)

The Company uses the market approach technique to value its financial assets and liabilities. The Company's financial assets and liabilities carried at fair value include, when applicable, investments in common stock and derivative instruments used to hedge the Company's interest rate risks. The fair value of the Company's interest rate swap agreement was based on SOFR-yield curves at the reporting date. The fair value of the Company's investment in common stock of Harvard Apparatus Regenerative Technologies ("HRGN" formerly known as Biostage, Inc.) was based on the closing price as quoted on the OTCQB Marketplace at the reporting date.

14. Stock-Based Compensation

Stock-based compensation expense for the years ended December 31, 2024 and 2023, was allocated as follows:

(in thousands)	Year Ended December 31,	
	2024	2023
Cost of revenues	\$ 122	\$ 308
Sales and marketing expenses	599	746
General and administrative expenses	3,165	3,560
Research and development expenses	454	386
Total stock-based compensation	<u>\$ 4,340</u>	<u>\$ 5,000</u>

As of December 31, 2024, the total compensation costs related to unvested awards not yet recognized is \$4.1 million and the weighted average period over which it is expected to be recognized is approximately 1.6 years. During the years ended December 31, 2024 and 2023, the Company did not capitalize any stock-based compensation.

Equity Incentive Plans

During 2021, the Company's board of directors and stockholders adopted the 2021 Incentive Plan which authorized additional shares available for grants to officers, employees, non-employee directors and other key persons of the Company and its subsidiaries. As of December 31, 2024, there were approximately 2.4 million shares available for issuance under the 2021 Incentive Plan.

Restricted Stock Units with a Market Condition

The Company granted deferred awards of market condition restricted stock units (the "Market Condition RSUs") to certain members of the Company's management team. The vesting of the Market Condition RSUs is linked to the achievement of a relative total shareholder return ("TSR") of the Company's common stock measured from the earlier of (i) the measurement period as set out in the award agreement or (ii) upon a change of control (measured relative to the Nasdaq Biotechnology or Russell 2000 index and based on a 20-day trading average price) and is subject to a one-year holding period after vesting.

For Market Condition RSUs with a measurement period that concluded during the years ended December 31, 2024 and 2023, the TSR of the Company's common stock relative to the applicable index resulted in achieving a weighted average vesting of 21% and 100% of the target, respectively. Market Condition RSUs outstanding as of December 31, 2024 remain subject to a TSR measurement which can result in vesting rates ranging from 0% to 150% of the target number.

The weighted average assumptions used in the valuation of the Market Condition RSUs granted during the year ended December 31, 2023, are as follows:

Volatility	56.8%
Risk-free interest rate	4.6%
Correlation coefficient	41.7%
Dividend yield	-%
Liquidity discount	14.1%

The Company used historical volatility to calculate the expected volatility matching the expected holding period. The risk-free interest rate assumption is based upon observed U.S. Treasury bill interest rates (risk-free) corresponding with the requisite service period. Additionally, the Company assumes a liquidity discount to adjust the fair value for the one-year holding period post-vest restrictions.

Restricted Stock Units with a Performance Condition

Performance-based RSU awards are contingent on the achievement of certain performance metrics. Compensation cost associated with performance-based RSUs are recognized based on the estimated number of shares that the Company ultimately expects will be earned. If the estimated number of shares to be earned is revised in the future, then stock-based compensation expense will be adjusted accordingly.

Stock-Based Payment Awards

Restricted stock unit (“RSU”) activity for the years ended December 31, 2024 and 2023, was as follows:

	Time-Based Restricted Stock Units	Grant Date Fair Value	Market- Based Restricted Stock Units	Grant Date Fair Value	Performance- Based Restricted Stock Units	Grant Date Fair Value
Balance at December 31, 2022	1,093,801	\$ 3.94	646,235	\$ 4.51	-	\$ -
Granted	1,350,125	2.87	558,958	2.61	-	-
Vested	(1,144,065)	3.38	(316,210)	4.01	-	-
Cancelled/Forfeited	(134,865)	3.71	(87,138)	4.64	-	-
Balance at December 31, 2023	1,164,996	\$ 3.28	801,845	\$ 3.37	-	\$ -
Granted	1,078,213	3.85	-	-	375,895	4.19
Vested	(717,119)	3.62	(51,732)	3.30	-	-
Forfeited	(147,095)	3.60	(191,155)	5.60	-	-
Balance at December 31, 2024	1,378,995	\$ 3.51	558,958	\$ 2.61	375,895	\$ 4.19

The aggregate fair value of RSUs that vested during the years ended December 31, 2024, and 2023 was \$1.8 million and \$7.5 million, respectively. Unvested shares related to market-based and performance-based vesting conditions are reflected at 100% of their target vesting amount in the table above. Actual vesting could range from zero to 150% of their target amounts.

Stock option activity for the years ended December 31, 2024 and 2023, was as follows:

	Number of Options	Weighted- Average Exercise Price	Weighted- Average Remaining Contractual Term	Aggregate Intrinsic Value (in thousands)
Outstanding at December 31, 2022	1,238,776	\$ 3.15		
Exercised	(213,644)	2.38		
Cancelled/Forfeited	(101,065)	2.71		
Outstanding and exercisable at December 31, 2023	924,067	\$ 3.37		
Exercised	(13,586)	3.18		
Cancelled/Forfeited	(83,023)	4.70		
Outstanding and exercisable at December 31, 2024	827,458	\$ 3.24	2.7	\$ -

There is no aggregate intrinsic value at December 31, 2024 because the Company’s closing stock price of \$2.11 is below the exercise price of the outstanding options. The aggregate intrinsic value of options exercised was nil and \$0.6 million for the years ended December 31, 2024 and 2023, respectively.

Employee Stock Purchase Plan (“ESPP”)

The Company has an employee stock purchase plan under which eligible employees may purchase a limited number of shares of common stock at a discount of up to 15% of the market value of such stock at pre-determined and plan-defined dates. There were 0.1 million and 0.2 million shares issued under the ESPP during the years ended December 31, 2024 and 2023, respectively. As of December 31, 2024, there were 0.1 million shares available for issuance under the ESPP.

15. Income Tax

Income tax expense for the years ended December 31, 2024 and 2023, consisted of:

(in thousands)	Year Ended December 31,	
	2024	2023
Current income tax expense:		
Federal and state	\$ 140	\$ 570
Foreign	290	61
	430	631
Deferred income tax (benefit) expense:		
Federal and state	(70)	132
Foreign	380	96
	310	228
Total income tax expense	\$ 740	\$ 859

The effective tax rate for the year ended December 31, 2024 was (6.3)% as compared with (33.5)% for the same period in 2023. The difference between the Company's effective tax rate year over year was primarily attributable to changes to tax attribute carryforwards, a decrease in the Company's GILTI inclusion, and a difference in the Company's excess tax benefits related to stock compensation.

Income tax expense for the years ended December 31, 2024 and 2023, differed from the amount computed by applying the U.S. federal income tax rate of 21% to pre-tax loss as a result of the following:

(in thousands)	Year Ended December 31,	
	2024	2023
Income tax benefit computed at federal statutory tax rate	\$ (2,450)	\$ (537)
Increase (decrease) in income taxes resulting from:		
Permanent differences, net	82	(89)
Non-deductible executive compensation	243	324
Global Intangible Low-Taxed Income (GILTI)	-	537
State income taxes, net of federal income tax benefit	(245)	(19)
Stock-based compensation	210	(329)
Tax credits	52	(51)
Net operating loss true-ups and expirations	(125)	1,140
Change in reserve for uncertain tax position	(233)	239
Impact of change to prior year tax accruals	398	(171)
Change in valuation allowance allocated to income tax	2,666	631
Other	142	(816)
Total income tax expense	\$ 740	\$ 859

Income tax expense was based on the following pre-tax (loss) income:

(in thousands)	Year Ended December 31,	
	2024	2023
Domestic	\$ (10,966)	\$ (2,951)
Foreign	(699)	395
Total	\$ (11,665)	\$ (2,556)

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The tax effects of temporary differences that give rise to significant components of the deferred tax assets and deferred tax liabilities at December 31, 2024 and 2023, were as follows:

(in thousands)	Year Ended December 31,	
	2024	2023
Deferred income tax assets:		
Inventory	\$ 1,036	\$ 1,489
Operating loss and credit carryforwards	12,371	11,550
Research and development	4,776	3,908
Employee retention credit	1,409	1,435
Lease liabilities	1,675	1,317
Accrued expenses	472	818
Stock compensation	699	670
Deferred interest expense	1,023	386
Other assets	204	934
Total gross deferred assets	23,665	22,507
Less: valuation allowance	(17,769)	(15,222)
Deferred tax assets	\$ 5,896	\$ 7,285
Deferred income tax liabilities:		
Indefinite-lived intangible assets	\$ 1,990	\$ 1,964
Definite-lived intangible assets	2,468	3,733
Lease right-of-use assets	1,339	959
Employee benefit plans	597	569
Other liabilities	120	400
Total deferred tax liabilities	6,514	7,625
Deferred income tax liabilities, net	\$ (618)	\$ (340)

Deferred income tax assets and liabilities by classification on the consolidated balance sheets were as follows:

(in thousands)	Year Ended December 31,	
	2024	2023
Deferred tax assets (included in other long-term assets)	\$ 92	\$ 436
Deferred income tax liabilities	(710)	(776)
Deferred income tax liability, net	\$ (618)	\$ (340)

As of December 31, 2024, the Company had federal net operating loss carryforwards of \$1.3 million, state net operating loss carryforwards of \$8.4 million, and foreign net operating loss carryforwards of \$7.8 million. The federal and foreign net operating losses can be carried forward indefinitely while the state net operating losses expire between 2025 and 2044, all of which are partially offset by valuation allowances. The Company had \$7.6 million of federal research and development tax credit carryforwards which begin to expire in 2025 and are partially offset by a reserve of \$0.8 million for uncertain tax positions. The Company had a total of \$2.7 million of state investment tax credit carryforwards, research and development tax credit carryforwards, and enterprise zone credit carryforwards, which begin to expire in 2025 and are partially offset by a reserve of \$0.3 million for uncertain tax positions. In addition, the Company had a total of \$0.4 million of international R&D credits which begin to expire in 2037. The Internal Revenue Code ("IRC") limits the amounts of net operating loss carryforwards or credits that a company may use in any one year in the event of a change in ownership under IRC Sections 382 or 383. The Company completed a study through December 31, 2023 and determined that no Section 382 ownership changes occurred.

As of December 31, 2024 and 2023, the Company maintained a total valuation allowance of \$17.8 million and \$15.2 million, respectively, which related to foreign, federal, and state deferred tax assets in both years. The valuation allowance was based on estimates of taxable income in each of the jurisdictions in which the Company operates and the period over which deferred tax assets will be recoverable. The net change in the total valuation allowance for the years ended December 31, 2024 and 2023, was an increase of \$2.5 million and \$0.7 million, respectively. During the year ended December 31, 2024, the Company increased the valuation allowance related to the estimate of realizability of Spanish deferred tax assets and deferred tax assets related to the net operating losses and credit carryforwards generated in the current year.

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As of December 31, 2024 and 2023, cash and cash equivalents held by the Company's foreign subsidiaries were \$2.7 million and \$2.1 million, respectively. As of December 31, 2024, the Company has determined the potential income tax and withholding liability related to available cash balances at foreign subsidiaries to be immaterial.

A summary of activity of unrecognized tax benefits is as follows:

(in thousands)	
Balance at December 31, 2022	\$ 1,983
Additions based on tax positions of prior years	13
Decreases based on tax positions of prior years	57
Additions based on tax positions of current year	245
Other decreases, net	(76)
Balance at December 31, 2023	2,222
Additions based on tax positions of prior years	172
Decreases based on tax positions of prior years	(382)
Additions based on tax positions of current year	111
Other decreases, net	(134)
Balance at December 31, 2024	\$ 1,989

The Company expects the amount of unrecognized tax benefits to change within the next twelve months, including the release of reserves of approximately \$0.2 million. Substantially all of the liability for uncertain tax benefits related to various federal, state and foreign income tax matters would benefit the Company's effective tax rate, if recognized. The Company classifies interest and penalties related to unrecognized tax benefits as a component of income tax expense, which has not been significant during the years ended December 31, 2024 and 2023, respectively.

With a few exceptions, the Company is no longer subject to income tax examinations by tax authorities in foreign jurisdictions for the years before 2020. In the U.S., the Company's net operating loss and tax credit carryforward amounts remain subject to federal and state examination for tax years starting in 2005 as a result of tax credits generated in the prior years. There are currently no pending federal or state tax examinations.

16. Commitments and Contingent Liabilities

The Company is involved in various claims and legal proceedings arising in the ordinary course of business. After consultation with legal counsel, the Company has determined that the ultimate disposition of such proceedings is not likely to have a material adverse effect on its business, financial condition, results of operations or cash flow. Although unfavorable outcomes in the proceedings are possible, the Company has not accrued loss contingencies relating to any such matters as they are not considered 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 the Company's business, financial condition, results of operations and cash flows could be material.

In addition, the Company has entered into indemnification agreements with its directors and officers. It is not possible to determine the maximum potential liability amount under these indemnification agreements due to the limited history of prior indemnification claims and the unique facts and circumstances involved in each particular agreement. The Company has not recorded any liability for costs related to contingent indemnification obligations as of December 31, 2024.

The Company is subject to unclaimed property laws in the ordinary course of its business. State escheat laws generally require entities to report and remit abandoned and unclaimed property to the state. Failure to timely report and remit the property can result in assessments that could include interest and penalties, in addition to the payment of the escheat liability itself. The Company recorded an expense of \$0.3 million during the year ended December 31, 2024, related to the completion of unclaimed property audits which have been included in other operating expenses in the consolidated statement of operations.

17. Product Line Disposition

In February 2023, the Company completed the disposition of its Hoefer product line for cash consideration of \$0.5 million. The carrying value of assets sold was \$0.1 million resulting in a gain on disposition of \$0.4 million which is recorded in other (expense) income, net, in the consolidated statement of operations for the year ended December 31, 2023. Revenue and gross profit of this disposed product line included in the condensed consolidated statement of operations for the year ended December 31, 2023 were not significant.

18. Government Assistance

As there is no authoritative guidance under U.S. GAAP on accounting for grants to for profit business entities from government entities, the Company accounts for government assistance by analogy to International Accounting Standards Topic 20, *Accounting for Government Grants and Disclosure of Government Assistance* (IAS 20). Under IAS 20, government grants are recognized when there is reasonable assurance that the grant will be received and that all conditions related to the grant will be met. Grants related to income are presented as part of the consolidated statements of operations either as a deduction of the related expense or reported separately in other income. The Company recognizes government assistance that supplements salaries or research activities as a reduction of the related operating expense over the period for which it is intended to compensate. Government assistance that is not directly related to expense reimbursement or relates to costs incurred in a previous fiscal period is recorded as other income.

The Coronavirus Aid, Relief, and Economic Security Act of 2020 (“CARES Act”) provided an employee retention tax credit (“ERTC”) that was a refundable tax credit against certain employer taxes. The Company elected to account for the credit as a government grant. The Company received ERTC refunds of \$3.2 million during the year ended December 31, 2024. Due to the subjectivity of the credit, the Company has included the refunds received in other current liabilities in the consolidated balance sheet as of December 31, 2024, subject to a determination that the refunds are recognizable. The Company engaged a professional services firm under a commission fee arrangement to assist with determining the Company’s eligibility to claim the ERTC refunds and accumulating the necessary support that was used as a basis in the filing. During the year ended December 31, 2024, the Company paid fees of \$0.5 million for these services, which are included in other operating expenses in the consolidated statement of operations. In January 2025, the Company received an additional \$1.0 million of ERTC refunds.

For the years ended December 31, 2024 and 2023, the Company received \$0.5 million and \$0.2 million, respectively, under other government assistance programs. The majority of the assistance was a result of the Company’s German subsidiaries participating in programs established to offset the costs of qualifying research and development activities and employee training.

19. Segment Information

The Company conducts business as a single operating segment which is based upon the Company’s organizational and management structure, as well as information used by the CODM to allocate resources and other factors. The accounting policies of the segment are the same as those described in Note 2.

The key measure of segment profitability that the CODM uses to allocate resources and assess performance is consolidated net income (loss), as reported on the consolidated statements of operations. The CODM utilizes consolidated net loss by comparing actual results against budgeted amounts on a quarterly basis. The following table presents the significant revenue and expense categories of the Company’s single operating segment:

	Year Ended December 31,	
	2024	2023
Revenues	\$ 94,135	\$ 112,250
Less:		
Cost of revenues (1)	39,247	45,871
Sales and marketing expenses (1)	21,613	23,362
General and administrative expenses (1)	18,328	19,149
Research and development expenses (1)	9,952	11,378
Amortization of acquired intangibles	5,255	5,525
Interest expense	3,209	3,591
Income tax expense	740	859
Other segment expenses (2)	8,196	5,930
Net loss	\$ (12,405)	\$ (3,415)

(1) Excludes stock-based compensation expense

(2) Includes stock-based compensation, other operating expenses, loss on equity securities and other expense

Asset information provided to the CODM is consistent with that reported on the consolidated balance sheets with particular emphasis on the Company's available liquidity, including its cash, accounts receivable, and inventory, reduced by current liabilities. Information relating to the Company's products and services and geographical distribution of revenues is disclosed in Note 3.

20. Subsequent Event

On March 10, 2025, the Company entered into the March 2025 Amendment to the Credit Agreement as described in Note 10 –Debt.

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EXHIBIT INDEX

The following exhibits are filed as part of this Annual Report on Form 10-K. Where such filing is made by incorporation by reference to a previously filed document, such document is identified.

<u>Exhibit</u>	<u>Description</u>	<u>Method of Filing</u>
2.1§	Separation and Distribution Agreement between Harvard Bioscience, Inc. and Biostage, Inc. (f/k/a Harvard Apparatus Regenerative Technology, Inc.) dated as of October 31, 2013.	Exhibit to the Current Report on Form 8-K filed November 6, 2013, and incorporated by reference thereto.
3.1	Second Amended and Restated Certificate of Incorporation of Harvard Bioscience, Inc.	Exhibit to the Registration Statement on Form S-1/A (File No. 333-45996) (filed November 9, 2000) and incorporated by reference thereto.
3.2	Amended and Restated By-laws of Harvard Bioscience, Inc.	Exhibit to the Registration Statement on Form S-1/A (File No. 333-45996) (filed November 9, 2000) and incorporated by reference thereto.
3.3	Amendment No. 1 to Amended and Restated Bylaws of Harvard Bioscience, Inc. (as adopted October 30, 2007).	Exhibit to the Current Report on Form 8-K (filed November 1, 2007) and incorporated by reference thereto.
4.1	Specimen certificate for shares of Common Stock, \$0.01 par value, of Harvard Bioscience, Inc.	Exhibit to the Registration Statement on Form S-1/A (File No. 333-45996) (filed November 9, 2000) and incorporated by reference thereto.
4.2	Description of Securities.	Exhibit to the Annual Report on Form 10-K (filed March 16, 2020) and incorporated by reference thereto.
10.1 #	Harvard Bioscience, Inc. Fourth Amended and Restated 2000 Stock Option and Incentive Plan.	Exhibit to the Quarterly Report on Form 10-Q filed August 10, 2020, and incorporated by reference thereto.
10.2	Harvard Bioscience, Inc. Employee Stock Purchase Plan, as amended.	Disclosed as Appendix A to the Proxy Statement on Schedule 14A filed April 7, 2022, and incorporated by reference thereto.
10.3	Form of Director Indemnification Agreement.	Exhibit to the Quarterly Report on Form 10-Q filed May 8, 2020, and incorporated by reference thereto.
10.4 +	Trademark License Agreement, dated December 19, 2002, by and between Harvard Bioscience, Inc. and President and Fellows of Harvard College.	Exhibit to the Annual Report on Form 10-K filed March 9, 2023, and incorporated by reference thereto.
10.5 #	Form of Incentive Stock Option Agreement (Executive Officers).	Exhibit to the Annual Report on Form 10-K filed March 16, 2006, and incorporated by reference thereto.
10.6 #	Form of Non-Qualified Stock Option Agreement (Executive Officers).	Exhibit to the Annual Report on Form 10-K filed March 16, 2006, and incorporated by reference thereto.

10.7 #	<u>Form of Non-Qualified Stock Option Agreement (Non-Employee Directors).</u>	Exhibit to the Annual Report on Form 10-K filed March 16, 2006, and incorporated by reference thereto.
10.8 #	<u>Form of Deferred Stock Award Agreement.</u>	Exhibit to the Annual Report on Form 10-K filed March 16, 2011, and incorporated by reference thereto.
10.9 #	<u>Form of Market Condition Deferred Stock Award Agreement.</u>	Exhibit to the Annual Report on Form 10-K filed March 16, 2020, and incorporated by reference thereto.
10.10 #	<u>Employment Agreement between Harvard Bioscience, Inc. and James Green.</u>	Exhibit to the Current Report on Form 8-K filed July 8, 2019, and incorporated by reference thereto.
10.11#	<u>Employment Agreement between Harvard Bioscience, Inc. and Jennifer Cote dated June 19, 2023</u>	Exhibit to the Current Report on Form 8-K filed June 20, 2023, and incorporated by reference thereto.
10.12	<u>Credit Agreement dated as of December 22, 2020 among Harvard Bioscience, Inc., as borrower, the lenders party thereto, and Citizens Bank, N.A., as administrative agent.</u>	Exhibit to the Current Report on Form 8-K filed December 23, 2020, and incorporated by reference thereto.
10.13	<u>Pledge and Security Agreement dated as of December 22, 2020 among Harvard Bioscience, Inc., certain of Harvard Bioscience's direct and indirect subsidiaries and Citizens Bank, N.A., as administrative agent.</u>	Exhibit to the Current Report on Form 8-K filed December 23, 2020, and incorporated by reference thereto.
10.14	<u>First Amendment to Credit Agreement and Amendment to Pledge and Security Agreement, dated April 28, 2022, among Harvard Bioscience, Inc., Citizens Bank, N.A., as the administrative agent, and the lenders party thereto.</u>	Exhibit to the Current Report on Form 8-K filed April 28, 2022, and incorporated by reference thereto.
10.15	<u>Second Amendment to Credit Agreement and Amendment to Pledge and Security Agreement, dated November 8, 2022, among Harvard Bioscience, Inc., Citizens Bank, N.A., as the administrative agent, and the lenders party thereto.</u>	Exhibit to the Form 10-Q filed November 9, 2022, and incorporated by reference thereto.
10.16	<u>Guarantee Agreement dated as of December 22, 2020 among Harvard Bioscience, Inc., certain of Harvard Bioscience's direct and indirect subsidiaries and Citizens Bank, N.A., as administrative agent.</u>	Exhibit to the Current Report on Form 8-K filed December 23, 2020, and incorporated by reference thereto.
10.17	<u>Third Amendment to Credit Agreement dated March 28, 2024, among Harvard Bioscience, Inc., Citizen Bank, N. A., as the administrative agent, and the lenders party thereto.</u>	Exhibit to the Current Report on Form 8-K on April 3, 2024, and incorporated by reference thereto.
10.18	<u>Fourth Amendment to Credit Agreement dated August 6, 2024, among Harvard Bioscience, Inc., Citizen Bank, N. A., as the administrative agent, and the lenders party thereto.</u>	Exhibit to the Form 10-Q filed August 8, 2024, and incorporated by reference thereto.
10.19	<u>Fifth Amendment to Credit Agreement dated March 10, 2025, among Harvard Bioscience, Inc., Citizen Bank, N. A., as the administrative agent, and the lenders party thereto.</u>	Exhibit to the Current Report on Form 8-K filed March 12, 2025, and incorporated by reference thereto.
10.20#	<u>Harvard Bioscience, Inc. 2021 Incentive Plan.</u>	Exhibit to the Current Report on Form 8-K filed May 19, 2021, and incorporated by reference thereto.
10.21#	<u>Form of Performance RSU Award Agreement - 2021 Incentive Plan.</u>	Exhibit to the Annual Report on Form 10-K filed March 11, 2022, and incorporated by reference thereto.

10.22#	Form of Time-Based RSU Awards Agreement – 2021 Incentive Plan.	Exhibit to the Annual Report on Form 10-K filed March 11, 2022, and incorporated by reference thereto.
10.23#	Form of RSU Award for Directors – 2021 Incentive Plan.	Exhibit to the Annual Report on Form 10-K filed March 11, 2022, and incorporated by reference thereto.
10.24#	Form of Time-Based Restricted Stock Unit Award Agreement -2021 Incentive Plan (for awards granted on or after March 5, 2024)	Exhibit to the Form 10-Q filed August 8, 2024, and incorporated by reference thereto.
10.25#	Form of Performance-Based Restricted Stock Unit Award Agreement -2021 Incentive Plan (for awards granted on or after March 5, 2024)	Exhibit to the Form 10-Q filed August 8, 2024, and incorporated by reference thereto.
10.26#	Form of Director and Officer Indemnification Agreement	Exhibit to the Form 10-Q filed August 8, 2024, and incorporated by reference thereto.
19	Insider Trading Policy	Filed with this report
21.1	Subsidiaries of the Registrant	Filed with this report
23.1	Consent of Grant Thornton LLP	Filed with this report
31.1	Certification of Chief Financial Officer of Harvard Bioscience, Inc., pursuant to Rules 13a-15(e) and 15d-15(e), as adopted pursuant to Section 302 of the Sarbanes-Oxley Act of 2002	Filed with this report
31.2	Certification of Chief Executive Officer of Harvard Bioscience, Inc., pursuant to Rules 13a-15(e) and 15d-15(e), as adopted pursuant to Section 302 of the Sarbanes-Oxley Act of 2002	Filed with this report
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	*
97	Harvard Bioscience Inc., Dodd-Frank Clawback Policy	Exhibit to the Annual Report on Form 10-K filed March 7, 2024, and incorporated by reference thereto.
101.INS	Inline XBRL Instance Document	Filed with this report
101.SCH	Inline XBRL Taxonomy Extension Schema Document	Filed with this report
101.CAL	Inline XBRL Taxonomy Extension Calculation Linkbase Document	Filed with this report
101.DEF	Inline XBRL Taxonomy Extension Definition Linkbase Document	Filed with this report
101.LAB	Inline XBRL Taxonomy Extension Label Linkbase Document	Filed with this report
101.PRE	Inline XBRL Taxonomy Extension Presentation Linkbase Document	Filed with this report
104	Cover Page Interactive Data File (formatted as Inline XBRL with applicable taxonomy extension information contained in Exhibits 101)	
+	Portions of this exhibit have been redacted in compliance with Item 601(b)(10) of Regulation S-K.	
*	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	
#	Management contract or compensatory plan or arrangement.	
§	The schedules and exhibits have been omitted. A copy of any omitted schedule or exhibit will be furnished to the SEC supplementally upon request.	
	The Company will furnish to stockholders a copy of any exhibit without charge upon written request.	

SIGNATURES

Pursuant to the requirements of Section 13 or 15(d) of the Securities Exchange Act of 1934, the registrant has duly caused this report to be signed on its behalf by the undersigned thereunto duly authorized.

HARVARD BIOSCIENCE, INC.

Date: March 13, 2025

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

Pursuant to the requirements of Section 13 or 15(d) of the Securities Exchange Act of 1934, this report has been signed below by the following persons on behalf of the registrant and in the capacities and on the dates indicated.

<u>Signature</u>	<u>Title</u>	<u>Date</u>
<u>/s/ JAMES GREEN</u> James Green	Chief Executive Officer and Director (Principal Executive Officer)	March 13, 2025
<u>/s/ JENNIFER COTE</u> Jennifer Cote	Chief Financial Officer (Principal Financial Officer and Principal Accounting Officer)	March 13, 2025
<u>/s/ KATHERINE A. EADE</u> Katherine A. Eade	Director	March 13, 2025
<u>/s/ ALAN EDRICK</u> Alan Edrick	Director	March 13, 2025
<u>/s/ THOMAS W. LOEWALD</u> Thomas W. Loewald	Director	March 13, 2025
<u>/s/ BERTRAND LOY</u> Bertrand Loy	Director	March 13, 2025



INSIDER TRADING POLICY

Revised March 2025

Harvard Bioscience, Inc. and its subsidiaries (collectively, the "Company") are committed to complying with applicable securities regulations and maintaining the highest ethical standards. We prohibit the trading in Company securities while in possession of material non-public information about the Company.

Summary of Key Points

- Trading in Company securities while in possession of material non-public information ("Inside Information") is a violation of this Policy as well as federal and state laws regulating securities ("Securities Laws"), and is known as "insider trading".
- Individuals who engage in insider trading may be subject to consequences that include, among other things, imprisonment, fines, and termination of their relationship with the Company.
- You are prohibited from trading in derivatives relating to the Company's stock (for example, buying or selling puts or calls) or otherwise hedging the Company's stock (for example, short selling).
- The Company imposes Blackout Periods (explained below), both scheduled and unscheduled, during which you may not trade in Company securities. However, even outside of Blackout Periods, you must comply with all requirements under applicable Securities Laws and this Policy.
- Designated Insiders (defined below) must obtain the Compliance Officer's written permission prior to trading in Company securities, regardless of whether there is a Blackout Period in effect.
- The Company's Chief Financial Officer is the Compliance Officer, except that with respect to proposed transactions by the Compliance Officer, all such transactions must be approved by the Company's Chief Executive Officer.
- While this Policy is designed to assist you in avoiding violation of Securities Laws, it is your personal responsibility to comply with Securities Laws while trading in Company securities. If you are unsure whether any planned trading in Company securities is in compliance with this Policy and applicable Securities Laws, you should consult with the Chief Financial Officer, who serves as the Compliance Officer for this Policy.

Trading While in Possession of Material Non-Public Information Is Prohibited

While in possession of material non-public information, you may not offer to buy, sell, or otherwise transact in Company securities, including common stock, options and any other securities that the Company may issue, such as preferred stock, notes, bonds and convertible securities, as well as derivative securities. It is also a violation of this Policy and applicable Securities Laws to disclose Inside Information to another individual for the purpose of enabling that person to trade in Company securities on the basis of that Inside Information.

You are required to comply with all Securities Laws and are prohibited from misusing corporate information.

In the ordinary course of business, you may learn highly sensitive information regarding the Company and our activities. This information may not be adequately disclosed to the general public at the time you become aware of it, but nonetheless may be considered "material" to an investor's decision about whether to trade in the Company's securities.

It may be difficult to determine whether particular information is material or not. Although you may be entrusted with this information due to your relationship with the Company, the Inside Information is the property of the Company. Consequently, pursuant to this Policy as well as applicable Securities Laws, you may not use Inside Information for personal gain, either by trading in securities yourself, or through an agent, or by passing the information on to others to enable them to profit through trading.

This Policy was developed to provide you with an overview of the most significant aspects of insider trading. It also was developed generally to advise you of your legal responsibilities in handling Inside Information and the severe repercussions that may be imposed for any misuse of such information, including, among other things, imprisonment, fines, and termination of your relationship with the Company. However, it is your responsibility to comply with all Securities Laws when you trade in Company securities.

Other Prohibited Transactions

In order to avoid even the appearance of impropriety, you are prohibited from engaging in the following activities related to Company securities *whether or not you are in possession of material non-public information*:

- Hedging Company Securities. This prohibition includes effecting any transaction designed to hedge or offset economic risks of owning Company securities. Hedging is highly speculative and may also create the appearance of a lack of confidence in the Company's future prospects. Prohibited hedging activities include short sales of Company securities and selling security futures related to Company securities.
- Trading in Options or Derivatives Related to Company Securities. These activities are highly speculative and prohibited by this Policy.
- Purchases of Company Securities on Margin. You may not purchase Company securities on margin (i.e., borrowing money to fund the stock purchase). This prohibition does not apply to cashless exercises of employee stock options.

Non-Public Information

Non-public information is typically information that members of the investing public may not generally be able to access. It is important to note that even after information is disclosed to the general public or the market, such information still may be considered non-public until it has been widely disseminated (such as through a press release or a filing with the Securities and Exchange Commission) and the market has had sufficient time to absorb and respond to such information. For this reason, trading may not resume until at least two full trading days have passed after such disclosures have been made.

Material Information

In general, information is considered material if typical investors would likely consider it to be significant in arriving at a decision to buy, sell, or hold the stock of a company or would view its disclosure as significantly altering the “total mix” of information available to such investors. Information also is material if it would likely cause a change in the price of a company’s securities if such information became public.

While it is not possible to outline all types of material information, the following matters should be considered prior to trading in Company securities:

- ✓ Financial results and reporting (including earnings guidance, revenues, expenses, earnings, earnings estimates, and new sales or investment returns)
- ✓ Actual or anticipated signing of, or cancellation of, major contracts
- ✓ Potential mergers, acquisitions, divestitures, and restructuring activities
- ✓ Cybersecurity risks and incidents
- ✓ Changes in senior management
- ✓ Actual or threatened litigation, investigations, or related activities
- ✓ Information related to product releases, audits, regulatory certifications, defects, or recalls
- ✓ Offerings of Company securities

Material information is not limited to historical facts but may also include projections and forecasts. With respect to a future event, the point at which negotiations or product development are determined to be material is determined by balancing the probability that the event will occur against the magnitude of the effect the event would have on operations or stock price should it occur.

If you are in doubt about whether information you possess is considered material or non-public, you should consult the Company’s Compliance Officer.

Blackout Periods

To support compliance with Securities Laws and this Policy, you may not buy, sell, transfer, or otherwise trade in Company securities during a Blackout Period. Blackout Periods are imposed during times when individuals within the Company are likely to have Inside Information.

However, even during times when there is no Blackout Period, you may possess Inside Information, and are therefore prohibited from trading in Company securities at those times.

- **Scheduled Blackout Periods.** The Company has designated four Scheduled Blackout Periods associated with the Company’s fiscal quarters and subsequent financial reporting and disclosures.

Blackout Beginning	Blackout Expiration
On the 16th calendar day of the final month in each fiscal quarter (currently March, June, September, and December).	After the completion of two full trading days following public release of the Company’s earnings.

If the Company’s financial reporting and disclosures are made after the start of any trading day, the Scheduled Blackout Period will not end until two full trading days have elapsed (beginning on the next trading day).

- **Special Blackout Periods.** From time to time, the Company may institute additional Blackout Periods for all or a subset of directors or employees (a “Special Blackout Period”). The Compliance Officer, or his/her designee, will communicate the imposition or extension of a Special Blackout Period to all affected parties. Individuals subject to a Special Blackout Period may not disclose to anyone the fact that trading has been suspended, including other employees (who may themselves not be subject to the blackout), friends, or brokers. The imposition of a Special Blackout Period is to be treated as material non-public information.

Scheduled Blackout Period Exceptions

You must seek authorization from the Company's Compliance Officer in writing in order to trade in Company securities during a Scheduled Blackout Period.

In particular, if you are not in possession of material non-public information, you may request an exception in the following circumstances:

- Gifts and Related Transactions. This includes acquisitions, dispositions, and sales of Company securities for no consideration, including genuine gifts, inheritances, or transfers to family members or trusts.

Additional Restrictions for Designated Insiders

To support compliance with applicable Securities Laws and this Policy, the Company has identified specific individuals (collectively "Designated Insiders") who must follow additional pre-clearance procedures and comply with additional trading restrictions. Designated Insiders include:

- Members of the Company's Board of Directors;
- Section 16 Officers (those Company employees designated as Section 16 officers in writing by the Board of Directors); and
- Any other person designated by the Compliance Officer in writing.

Pre-clearance Requirements:

Designated Insiders are required to obtain written pre-clearance from the Company's Compliance Officer prior to issuing instructions to trade in Company securities *at any time* – even during an open trading window. In addition, Designated Insiders must obtain written pre-clearance from the Company's Compliance Officer prior to authorizing any change in beneficial ownership in Company securities, including ownership changes through a gift to a charity or a transfer to a family trust.

Pre-clearance Conditions:

Designated Insiders may not provide instructions to engage in any transactions related to Company securities until and unless they receive written pre-clearance from the Company's Compliance Officer. If the Designated Insider receives pre-clearance, the Designated Insider will have until the end of the fifth trading day following the date pre-clearance is received to provide instructions to take investment actions, unless otherwise noted by the Compliance Officer.

Transaction Completion Notification:

Designated Insiders must provide the Compliance Officer with written notice of the completion of any cleared transaction within two business days of the completion of any investment action.

Securities Filing Obligations:

Certain Designated Insiders, including directors and Section 16 Officers, may have individual reporting requirements under the Securities Exchange Act of 1934. The Company, in its sole discretion, may provide administrative and other support services for completing and/or filing applicable regulatory filings.

Exceptions:

The trading restrictions of this policy do not apply to the following:

- Investing 401(k) plan contributions in a Company stock fund in accordance with the Company's 401(k) plan. However, any changes in your investment election regarding the Company's stock are subject to trading restrictions under this policy.
- Purchasing Company stock through periodic, automatic payroll contributions to the Company's Employee Stock Purchase Plan ("ESPP"). However, electing to enroll in the ESPP, making any changes in your elections under the ESPP and selling any Company stock acquired under the ESPP are subject to trading restrictions under this policy.
- Exercising stock options granted under the Company's stock option and equity incentive plans for cash or the delivery of previously owned Company stock. However, the sale of any shares issued on the exercise of Company-granted stock options and any cashless exercise of Company-granted stock options are subject to trading restrictions under this policy.
- The vesting of restricted stock or restricted stock units, or the exercise of a tax withholding right pursuant to which you elect to have the Company withhold shares of stock to satisfy tax withholding requirements upon the vesting of any restricted stock or restricted stock units. This policy does apply, however, to any market sale of restricted stock and restricted stock units.

10b5-1 Trading Plans

Eligible directors and employees may wish to establish a 10b5-1 Trading Plan under which transactions in Company securities may take place during a Blackout Period. However, the 10b5-1 Trading Plan may only be established during a non-Blackout Period and when the individual is not in possession of any material non-public information about the Company. All newly adopted or amended 10b5-1 Trading Plans must have a "cooling off period" during which period trades cannot occur under the 10b5-1 Trading Plan. For directors and executive officers, the applicable "cooling off period" begins upon adoption or amendment of the 10b5-1 Trading Plan and ends on the later of (x) ninety (90) days after adoption or amendment and (y) three (3) business days following the disclosure of the Company's financial results in a Form 10-Q or Form 10-K filed with the Securities and Exchange Commission for the fiscal quarter in which the 10b5-1 Trading Plan was adopted, subject to a maximum of 120 days. For all other employees, the applicable "cooling off period" is the 30-day period after adoption or amendment of the 10b5-1 Trading Plan. Each 10b5-1 Trading Plan must be reviewed and approved by the Compliance Officer in advance of its adoption. In addition, all modifications to a 10b5-1 Trading Plan, including termination before its natural expiration, are trading decisions subject to the pre-clearance procedures outlined above for Designated Insiders. If the 10b5-1 Trading Plan is for the benefit of the Chief Financial Officer or Chief Executive Officer of the Company, such approvals shall require the pre-approval by the Chair of the Compensation Committee of the Board of Directors. Plan transactions that comply with a pre-approved trading plan will not require further pre-clearance at the time of the transaction. If you wish to establish a 10b5-1 Trading Plan, contact the Compliance Officer for approval. The Compliance Officer shall promptly notify the Chair of the Compensation Committee of the approval of any 10b5-1 Trading Plan.

Discussion and Disclosure of Company Information

Employees other than those expressly designated by the Company shall not discuss information about the Company, any subsidiary, affiliate, or business partner with the press, analysts, or other persons outside of the Company. This includes social media interactions and online content contributions.

Announcements of information regarding the Company, our subsidiaries, affiliates, and business partners may only be made by persons specifically authorized by the Company to make such announcements.

Securities Laws govern the nature and timing of such announcements to outsiders or the public, and unauthorized disclosure could result in substantial liability for you, the Company, our management, and others. Inquiries by any third party about such information should be directed to our Compliance Officer.

Your Responsibilities

The ultimate responsibility for complying with Securities Laws and this Policy rests with you. It can sometimes be difficult to know whether a potential transaction complies with the law or this Policy. When any doubt exists, you should assume that you possess material non-public information and refrain from trading in Company securities until you have consulted with the Compliance Officer.

Material Non-Public Information Related to Other Companies

In the course of normal business, you may obtain material non-public information about *other* companies, such as vendors, customers, competitors, and potential acquisition targets. You must keep this information confidential and are prohibited from trading in related securities while in possession of this information.

Household Members

You are responsible for ensuring that members of your household understand the rules regarding insider trading and comply with this Policy, including Scheduled Blackout Periods and Special Blackout Periods.

Questions and Assistance

In some cases, you may have questions about whether the information you possess may be considered material or if it has been made public. In these instances, you should seek assistance from the Compliance Officer.

Policy Violations

Failure to abide by applicable Securities Laws and this Policy may result in civil and criminal liabilities, as well as Company disciplinary action, up to and including termination of employment or other relationship with the Company.

Policy Enforcement

This Policy is enforced by the Compliance Officer with authority from the Board of Directors. The Compliance Officer may consult with the Company's other officers and/or outside legal counsel. The Compliance Officer may designate one or more individuals who may perform the Compliance Officer's duties in the event that the Compliance Officer is unable or unavailable to perform such duties.

The Compliance Officer is responsible for ensuring that:

- this Policy is reviewed and updated, as appropriate;
- pre-clearance requests are reviewed in a timely manner and documented in accordance with a pre-established procedure;
- directors, employees, and contractors have been trained on this Policy; and
- allegations of non-compliance or violation of this Policy are investigated.

Policy Application

This Policy applies to all our directors, employees, contractors, and part-time and temporary workers globally. This Policy also applies to those who share a household with someone otherwise subject to this Policy.

In addition, individuals who have recently departed from the Company or otherwise terminated a relationship with the Company will be expected to comply with the terms of this Policy for a minimum of 30 days after the date of departure or termination of the relationship or for the period of time during which such individuals are in possession of Inside Information until its public release and absorption by the securities market, whichever period is longer.

ACKNOWLEDGMENT AND CERTIFICATION

The undersigned does hereby acknowledge receipt of the Company's Insider Trading Policy. The undersigned has read and understands (or has had explained) such policy and agrees to be governed by such policy at all times in connection with the purchase and sale of securities and the confidentiality of nonpublic information.

(Signature)

(Please print name)

Date: _____

Subsidiaries Of Harvard Bioscience, Inc.

<u>Name</u>	<u>Jurisdiction</u>
Biochrom Limited	United Kingdom
CMA Microdialysis Ab	Sweden
Data Sciences (UK) Mn, Ltd.	United Kingdom
Data Sciences Eurl	France
Data Sciences GmbH	Germany
DSI (Shanghai) Trading Co Ltd.	China
Harvard Bioscience (Shanghai) Co. Ltd.	China
Hugo Sachs Elektronik - Harvard Apparatus GmbH	Germany
Multichannel Systems MCS GmbH	Germany
Panlab S.L.	Spain

CONSENT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

We have issued our reports dated March 13, 2025, with respect to the consolidated financial statements and internal control over financial reporting included in the Annual Report of Harvard Bioscience, Inc. on Form 10-K for the year ended December 31, 2024. We consent to the incorporation by reference of said reports in the Registration Statements of Harvard Bioscience, Inc. on Forms S-8 (File No. 333-174476, File No. 333-204760, File No. 333-225365, File No. 333-249943, File No. 333-256295 and File No. 333-265487) and Form S-3 (File No. 333-283637).

/s/ GRANT THORNTON LLP

Hartford, Connecticut
March 13, 2025

Certification

I, Jennifer Cote, certify that:

1. I have reviewed this annual report on Form 10-K 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: March 13, 2025

/s/ JENNIFER COTE

Jennifer Cote
Chief Financial Officer

Certification

I, James Green, certify that:

1. I have reviewed this annual report on Form 10-K 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: March 13, 2025

/s/ JAMES GREEN
James Green
Chief Executive Officer

**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 her knowledge that the Company’s annual report on Form 10-K for the year ended December 31, 2024 to which this certification is being furnished as an exhibit (the “Report”), 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: March 13, 2025

/s/ JENNIFER COTE

Name: Jennifer Cote

Title: Chief Financial Officer

**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 annual report on Form 10-K for the year ended December 31, 2024 to which this certification is being furnished as an exhibit (the “Report”), 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: March 13, 2025

/s/ JAMES GREEN

Name: James Green

Title: Chief Executive Officer