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Registration No. 333-234538

PROSPECTUS SUPPLEMENT
(To the Prospectus dated November 6, 2019)

$50,000,000

Twist Bioscience Corporation

Common Stock

We have entered into a sales agreement with Cowen and Company, LLC, or Cowen, dated December 18, 2019, relating to the sale of shares of our common stock offered by this prospectus supplement. In accordance with the terms of the sales agreement, under this prospectus supplement we may offer and sell shares of our common stock, $0.00001 par value per share, having an aggregate offering price of up to $50.0 million from time to time through Cowen, acting as our agent.

Our common stock is traded on the Nasdaq Global Select Market under the symbol "TWST." On December 17, 2019, the last price of our shares as reported on the Nasdaq Global Select Market was $25.97 per share.

We are an "emerging growth company" under the federal securities laws and are subject to reduced public company disclosure standards. See "Prospectus Supplement Summary—Implications of Being an Emerging Growth Company."

Sales of our common stock, if any, under this prospectus supplement will be made by any method permitted that is deemed an "at the market offering" as defined in Rule 415(a)(4) under the Securities Act of 1933, as amended, or the Securities Act, including sales made directly on or through the Nasdaq Global Select Market or any other existing trading market for our common stock. Cowen is not required to sell any specific amount, but will act as our sales agent using commercially reasonable efforts consistent with its normal trading and sales practices on mutually agreed terms between Cowen and us. There is no arrangement for funds to be received in any escrow, trust or similar arrangement.

The aggregate compensation payable to Cowen as sales agent equals 3.0% of the gross proceeds of the shares of our common stock sold through it pursuant to the sales agreement. See "Plan of Distribution" beginning on page S-33 for additional information regarding the compensation to be paid to Cowen. In connection with the sale of the common stock on our behalf, Cowen will be deemed to be an "underwriter" within the meaning of the Securities Act and the compensation of Cowen will be deemed to be underwriting commissions or discounts. We have also agreed to provide indemnification and contribution to Cowen with respect to certain liabilities, including liabilities under the Securities Act or the Exchange Act of 1934, as amended.

OUR BUSINESS AND INVESTMENT IN OUR SECURITIES INVOLVES SIGNIFICANT RISKS. SEE THE SECTION TITLED "RISK FACTORS" ON PAGE S-17 OF THIS PROSPECTUS SUPPLEMENT AND IN THE DOCUMENTS INCORPORATED BY REFERENCE IN THIS PROSPECTUS SUPPLEMENT CONCERNING FACTORS YOU SHOULD CONSIDER BEFORE INVESTING IN OUR COMMON STOCK.

Neither the Securities and Exchange Commission nor any state securities commission has approved or disapproved of these securities or passed upon the adequacy or accuracy of this prospectus. Any representation to the contrary is a criminal offense.

Cowen

December 18, 2019

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Prospectus Supplement

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ABOUT THIS PROSPECTUS SUPPLEMENT

This sales agreement prospectus supplement is part of a registration statement that we have filed with the U.S. Securities and Exchange Commission, or the SEC, utilizing a "shelf" registration process. By using a shelf registration statement, we may offer shares of our common stock having an aggregate offering price of up to $50.0 million from time to time under this prospectus supplement at prices and on terms to be determined by market conditions at the time of offering.

We provide information to you about this offering of our common stock in two separate documents that are bound together: (1) this sales agreement prospectus supplement, which describes the specific details regarding this offering; and (2) the accompanying base prospectus, which provides general information, some of which may not apply to this offering. Generally, when we refer to this "prospectus supplement," we are referring to both documents combined. If information in this prospectus supplement is inconsistent with the accompanying base prospectus, you should rely on this prospectus supplement. To the extent there is a conflict between the information contained in this prospectus supplement, on the one hand, and the information contained in any document incorporated by reference in this prospectus supplement, on the other hand, you should rely on the information in this prospectus supplement. If any statement in one of these documents is inconsistent with a statement in another document having a later date—for example, a document incorporated by reference in this prospectus supplement—the statement in the document having the later date modifies or supersedes the earlier statement.

We have not, and Cowen has not, authorized anyone to provide you with information other than that contained in this prospectus, the accompanying base prospectus and any free writing prospectus. We are not, and Cowen is not, making an offer to sell or soliciting any offer to buy these securities in any jurisdiction where the offer or sale is not permitted or in which the person making that offer or solicitation is not qualified to do so or to anyone to whom it is unlawful to make an offer or solicitation. You should assume that the information appearing in this prospectus supplement, the accompanying base prospectus, the documents incorporated by reference herein and therein and any free writing prospectus that we have authorized for use in connection with this offering is accurate only as of the date of those respective documents. Our business, financial condition, results of operations and prospects may have changed since those dates. You should read this prospectus supplement, the accompanying base prospectus, the documents incorporated by reference herein and therein and any free writing prospectus that we have authorized for use in connection with this offering in their entirety before making an investment decision.

Before buying any of the common stock that we are offering, we urge you to carefully read this prospectus supplement, the accompanying base prospectus and all of the information incorporated by reference herein and therein, as well as the additional information described under the heading "Where You Can Find More Information; Incorporation by Reference." These documents contain important information that you should consider when making your investment decision.

We are offering to sell, and seeking offers to buy, shares of common stock only in jurisdictions where offers and sales are permitted. The distribution of this prospectus supplement and the offering of the common stock in certain jurisdictions may be restricted by law. Persons outside the United States who come into possession of this prospectus supplement must inform themselves about, and observe any restrictions relating to, the offering of the common stock and the distribution of this prospectus supplement outside the United States. This prospectus supplement does not constitute, and may not be used in connection with, an offer to sell, or a solicitation of an offer to buy, any securities offered by this prospectus supplement by any person in any jurisdiction in which it is unlawful for such person to make such an offer or solicitation.

When we refer to “Twist,” “we,” “our” and “us” in this prospectus supplement, we mean Twist Bioscience Corporation or its consolidated subsidiaries, unless otherwise specified. When we refer to “you,” we mean the holders of the applicable series of securities.

“Twist Bioscience,” and “Sequencespace” are registered trademarks in the United States and, in some cases, in certain other countries and our logo is an unregistered trademark of Twist Bioscience Corporation. All other brand names or trademarks appearing in this prospectus, and the information incorporated by reference herein, are the property of their respective holders. Solely for convenience, the trademarks and trade names in this prospectus, and the information incorporated by reference herein, are referred to without the ® and ™ symbols, but such references should not be construed as any indicator that their respective owners will not assert, to the fullest extent under applicable law, their rights thereto.

PROSPECTUS SUPPLEMENT SUMMARY

This summary highlights certain information about us, this offering and selected information contained elsewhere in or incorporated by reference into this prospectus supplement or the accompanying prospectus. This summary is not complete and does not contain all of the information that you should consider before deciding whether to invest in our common stock. For a more complete understanding of our company and this offering, we encourage you to read and consider carefully the more detailed information in this prospectus supplement and the accompanying prospectus, including the information incorporated by reference in this prospectus supplement and the accompanying prospectus, and the information included in any free writing prospectus that we have authorized for use in connection with this offering, including the information under the heading "Risk Factors" in this prospectus supplement on page S-17, the financial statements and related notes, and the other information that we incorporate by reference into this prospectus supplement, including the section "Risk Factors" in our Annual Report on Form 10-K for the fiscal year ended September 30, 2019.

Overview

At Twist Bioscience Corporation, we work in service of customers who are changing the world for the better. In fields such as health care, agriculture, industrial chemicals, academic research and data storage, by using our synthetic DNA tools, our customers are developing ways to better lives and improve the sustainability of the planet. We believe that the faster our customers succeed, the better for all of us, and we believe Twist Bioscience is uniquely positioned to help accelerate their efforts.

We have developed a disruptive DNA synthesis platform to industrialize the engineering of biology that provides DNA for a wide range of uses and markets. The core of our platform is a proprietary technology that pioneers a new method of manufacturing synthetic DNA by "writing" DNA on a silicon chip. We have miniaturized traditional chemical DNA synthesis reactions to write over one million short pieces of DNA on each silicon chip, approximately the size of a large mobile phone. We have combined our silicon-based DNA writing technology with proprietary software, scalable commercial infrastructure and an e-commerce platform to create an integrated technology platform that enables us to achieve high levels of quality, precision, automation, and manufacturing throughput at a significantly lower cost than our competitors.

We have applied our unique technology to manufacture a broad range of synthetic DNA-based products, including synthetic genes, tools for next generation sample preparation, and antibody libraries for drug discovery and development, all designed to enable our customers to conduct research more efficiently and effectively. Additionally, we are expanding our footprint by harnessing our proprietary platform to disrupt and innovate within larger market opportunities, such as discovery partnerships for biologic drugs, and new applications for synthetic DNA, such as digital data storage, to expand the overall reach and impact of DNA-based products. We sell our synthetic DNA and synthetic DNA-based products to a global customer base of 1,305 customers across a broad range of industries.

DNA is the fundamental building block of biology. The ability to design DNA and engineer biology, a field known as synthetic biology, is growing rapidly, and we believe this field represents one of the most exciting areas of growth and technological innovation in the 21st century. The ability to modify DNA to improve health and the sustainability of the planet is leading to a broad range of applications for synthetic DNA and synthetic DNA-based products across multiple industries, including:

- healthcare for the identification, prevention, diagnosis and treatment of disease (antibody discovery and optimization technology);

- industrial chemicals for cost-effective and sustainable production of new and existing specialty chemicals and materials, such as spider silk, nylon, rubber, fragrances, food flavors and food additives;
- agriculture for more effective and sustainable crop production;
- academic research for a broad range of applications; and
- technology for potential use as an alternative long-term data storage medium.

The synthetic biology market is growing rapidly and is being fueled by increased access to affordable and innovative tools that enable new applications. We believe this is analogous to the trends seen in the next generation sequencing, or NGS, market, where declining costs of sequencing drove adoption, new applications and market expansion. Similarly, tools that combine advanced production technology with modern digital technology and software capabilities, such as our DNA synthesis platform, are driving growth and market creation for synthetic DNA and synthetic DNA-based products. According to BCC Research, in calendar year 2017, the market for synthetic biology products was approximately $4.4 billion and is expected to grow to $13.9 billion by calendar year 2022. We believe this period of accelerated growth in the synthetic biology industry is in its early stages.

The applications of our DNA synthesis platform are broad. We currently generate revenue through two primary product lines: synthetic biology tools and next generation sequencing tools. In addition, we are leveraging the versatility of our platform to expand our portfolio to include other synthetic DNA-based products and address additional market opportunities, including vertical market opportunities in biological drug discovery and development and digital data storage.

In April 2016, we launched the first applications of our platform, synthetic genes and high diversity collections of oligonucleotides, or oligo pools, to disrupt the gene synthesis market and make legacy DNA synthesis methods obsolete. We believe that the traditional DNA synthesis methods used by our competitors are inherently limited in scalability and are not optimized to satisfy the rapidly growing demand for high-quality, low-cost synthetic DNA. Our silicon-based chip technology can increase DNA production by a factor of 9,600 on a footprint like that of traditional DNA synthesis methods. Also, it significantly lowers the volume of required reagents, specifically the most expensive reagent by a factor of 1,000,000, and improves the precision of the synthesis process relative to legacy methods. This enables us to produce high-quality synthetic DNA on a much larger scale and at lower cost than competitors. Importantly, it is this platform that can be applied to multiple market opportunities to harness the power of DNA—from next generation sequencing to drug discovery to data storage—to enable life-changing products and therapeutic medicines.

In February 2018, we launched an innovative and comprehensive sample preparation kit for next generation sequencing. Our kit leverages our platform to precisely synthesize short pieces of DNA called probes, and thus uniformly amplify the desired target DNA segments, considerably improving the accuracy of the downstream sequencing analysis, saving both time and sequencing costs. We have expanded our NGS offering to include both general and customized tools in addition to adding the mouse exome. In addition, we have formatted our NGS tools to work within an automated and advanced workflow.

Our currently marketed products target the synthetic DNA market, a sub-segment of the synthetic biology market, and NGS sample preparation, a large adjacent market opportunity. We estimate that the combined market opportunity was $1.8 billion in calendar year 2016. Based on market research, we believe that current estimates understate our market potential because they reflect the costly, time-consuming, and cumbersome nature of legacy DNA synthesis technologies. We believe our solution

has the potential to materially expand our initial market by providing end users access to high-quality and lower cost tools, encouraging adoption and facilitating new applications for our products.

As part of our synthetic biology offering, we have commercialized a custom DNA library solution which we believe can be leveraged to facilitate other proprietary tools to provide an end-to-end solution in biologics drug discovery and early development, from target to investigational new drug, or IND, application, adding value as a partner to biotechnology and pharmaceutical companies.

In fiscal year 2019 we served 1,305 customers and reported $54.4 million in revenue including $21.9 million to the industrial chemicals sector, $17.4 million to the healthcare sector, $13.8 million to the academic research sector and $1.2 million to the agricultural sector. The industrial chemicals segment includes sales of $9.2 million to Ginkgo Bioworks (which we believe is the largest purchaser of synthetic DNA).

We generated revenues of $54.4 million in fiscal 2019, $25.4 million in fiscal 2018 and $10.8 million in fiscal 2017, while incurring net losses of $107.7 million. $71.2 million and $59.3 million in fiscal years 2019, 2018 and 2017, respectively. Since our inception, we have incurred significant operating losses. Our ability to generate product revenue sufficient to achieve profitability will depend heavily on the success of our existing products and development and commercialization of additional products in the synthetic biology industry.

Our headquarters and manufacturing facilities are located in South San Francisco, California. As of September 30, 2019, we had 414 full-time employees worldwide, including three locations in the San Francisco Bay Area and an international location in Tel Aviv, Israel. We also utilize a team of 32 dedicated commercial consultants across the European Union and the United Kingdom and 18 dedicated commercial consultants across Asia. We expect to establish back-end, finishing production facilities to expand our commercial market for our Next Generation Sequencing (NGS) product line in China. We expect this site will be open by the end of December 2019. This site will be used to ensure Asian customers receive products in a timeframe similar to other parts of the world. Our advanced front-end manufacturing facilities that create our synthetic DNA products will remain in the United States and will remain subject to comprehensive patent protection in key jurisdictions. We will continue to use our best practice biosecurity screening program in servicing the China market, a part of the world that is dominated by foreign actors that we do not believe have rigorous biosecurity screening measures.

Through September 30, 2019, we have raised a total of $444.4 million in net proceeds from public and private funding. Specifically, we have raised $290.5 million in net proceeds from the sale of redeemable convertible preferred stock from January 2016 through July 2018, and a total of $153.9 million in net proceeds from the sale of stock, including $84.3 million in net proceeds from our public offering in May 2019 and $69.6 million in net proceeds from our initial public offering in October 2018.

The synthetic biology industry

Our initial suite of products serve the field of synthetic biology, which is undergoing an era of rapid innovation and transformation. Synthetic biology is the engineering of biology to build new biological systems or re-design existing biological systems. The ability to design DNA and engineer biology is creating advances and benefits for a broad and growing range of applications for synthetic DNA and synthetic DNA-based products across multiple industries, including:

- healthcare for the discovery and production of new therapeutics and molecular diagnostics;

- industrial chemicals for cost-effective and sustainable production of new and existing specialty chemicals and materials, such as spider silk, nylon, rubber, fragrances food flavors and food additives;
- agriculture for more effective and sustainable crop production;
- academic research for a broad range of applications; and
- technology for potential use as an alternative long-term data storage medium.

According to BCC Research, the overall market for synthetic biology products was approximately $4.4 billion in calendar year 2017 and is expected to grow to over $13.9 billion by calendar year 2022. This industry momentum creates a significant opportunity for us to grow within our existing markets as well as expand our product offering.

Synthetic DNA is the fundamental building block of synthetic biology. Users of synthetic biology can design synthetic DNA to regulate the production of these proteins and molecules to achieve a specific functional purpose. While synthetic DNA has been produced for more than 40 years, the complexities of biology and the production constraints inherent in legacy processes have historically limited the applications and market opportunities for DNA synthesis.

Limitations of existing solutions

Traditional methods of DNA synthesis consist of a two-step process that initially involves the synthesis of oligonucleotides, also referred to as oligos, which are short strands of DNA. These oligos are then combined to create longer strands of DNA. Currently, there are two primary methodologies used by others to create synthetic DNA, the 96-well plate method and the microarray method, each having production limitations that we believe make these technologies sub-optimal to satisfy the rapidly growing demand for synthetic DNA. In addition, because the synthesis of oligos can introduce errors in the sequence order, all DNA synthesis methods require a process called cloning to produce many identical copies of a strand of DNA, such as a clonal gene. Today, all of our competitors use one of these two primary methods of DNA synthesis and require cloning for clonal genes.

96-well plate method of DNA synthesis

Introduced as early as the 1950s, a 96-well plate is a flat plastic plate, roughly the size of two smartphones, with eight rows of 12 wells that are used as small test tubes. Instead of creating one sequence of DNA at a time in a single test tube, the 96-well plate allows researchers to create 96 oligos in parallel, one in each well. While this process successfully achieves DNA synthesis, it requires high volumes of phosphoramidites, an expensive raw material, as well as other ancillary reagents. It also produces excessive amounts of the final product, significantly more than is required for most subsequent processes, resulting in material that is discarded and an unnecessary expense. Additionally, this process is not scalable to produce high volumes, as approximately 100 oligos are needed to assemble one gene and therefore only one gene can be made from each 96-well plate.

Microarray method of DNA synthesis

Unlike a 96-well plate, a microarray is a flat surface made of plastic or glass on which DNA is synthesized directly in an array of discrete locations. Microarrays allow large numbers of oligos to be synthesized in parallel, increasing DNA production by up to four orders of magnitude when compared to the 96-well plate. However, while this method can make 100 genes in parallel, it remains difficult to scale, requires many steps, and results in significant waste of materials.

Cloning

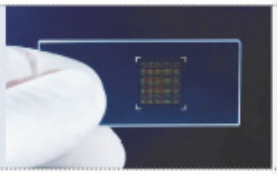
Cloning is a tedious process to filter out errors and produce many identical copies of a strand of DNA, such as a gene. While the cloning process results in a precise sequence, it is incredibly slow and

labor intensive and generally takes around 10 business days to complete. As a result, it is time consuming, expensive, and, in many cases, not an efficient use of researchers' time. In general, more accurate DNA synthesis technology results in fewer errors in the sequence order and reduces the time and costs required or allocated to the cloning process.

Our platform

We developed the Twist Bioscience DNA synthesis platform to address the limitations of throughput, scalability, and cost inherent in legacy DNA synthesis methods. Our platform stems from extensive analyses of, and improvements to, the existing gene synthesis and assembly workflows. Our core technologies combine expertise in silicon, software, fluidics, chemistry, and motion and vision control to miniaturize thousands of parallel chemical reactions on silicon and write thousands of strands of DNA in parallel. With a footprint that is similar to the size of a 96-well plate that produces one gene, we are able to produce 9,600 genes in parallel. Based on current production needs, we have intentionally designed our latest chip to make 6,144 genes in parallel, but we have the current capability to increase this to 9,600 genes, as needed. We have combined our DNA synthesis technology with propriety software and a scalable commercial infrastructure to create our vertically integrated DNA synthesis platform capable of delivering very large volumes of high-quality synthetic DNA at low cost.

Synthesis and Assembly Comparison

	96-well Plate	Microarray	TWIST BIOSCIENCE
			
Amount of DNA	Too much (waste) Nano-mol	Too little (amplification) <Femto-mol	Right amount (no amplification, no waste) Pico-mol
DNA processing	Pooling required	De-pooling required	No pooling No de-pooling
Genes per 96-well	1	96	9,600*

* Full scale capacity chip shown, current chip in production has the capacity to make 6,144 genes

Next Generation Sequencing Market

Our next generation sequencing (NGS) product line improves the work of our customers within large and growing markets. NGS has transformed many markets in recent years by changing the landscape of diagnosing disease and disorders to offer a path to prevention or treatment of disease. Some of the markets impacted by NGS include: oncology, reproductive health, agriculture, consumer genomics, infectious disease research and drug discovery. As NGS technology improved and the cost of sequencing declines, new emerging markets that were once considered impractical, such as population-scale sequencing and single cell sequencing, have become major areas of interest and investment.

Historically, a significant constraint in many NGS applications has been the high cost and long turnaround time of oligonucleotide production. Highly accurate and reproducible oligonucleotide production is required to produce high quality target enrichment data. Traditionally, the lack of options for oligonucleotide production forced researchers to choose between using less precise methods or to reduce the number of samples in their study.

The ability of the Twist DNA synthesis platform to precisely manufacture target enrichment probes at large scale has dramatically increased the types of projects that can now be addressed using NGS technologies. Our platform has unlocked new applications, improved data quality, and dramatically expanded the types of scientific questions that can be answered using NGS. In addition, the speed of our DNA synthesis platform enables customers to quickly deploy NGS technologies to applications where the time to answer is critical.

Our products

We have developed multiple products derived from synthetic DNA and our versatile DNA synthesis technology. Our current offering consists of two primary product lines that address different needs of our customers across a variety of applications: synthetic genes, oligo pools, next generation sequencing tools and DNA libraries.

Synthetic Biology Products

Synthetic genes

Synthetic genes are manufactured strands of DNA. Customers order our synthetic genes to conduct a wide range of research, including product development for the healthcare, agricultural, and industrial chemical industries as well as a multitude of applications within academic research. Virtually all research and development requires trial and error, and our customers require many variations of genes to find the DNA sequence that achieves their objectives.

We offer two primary categories of synthetic genes: genes of perfect quality, clonal genes, in a vehicle to carry the DNA, also called a vector, and genes of near-perfect quality, non-clonal genes or fragments, that customers can place in their own vector. Within these two categories, customers can order different lengths of DNA depending on their required final gene construct. Customers can order longer genes or shorter genes and can stitch genes together to create longer or shorter constructs if desired.

Clonal genes in a Twist Bioscience or customer vector

Our premier gene synthesis offering delivers clonally perfect genes. For our clonally perfect genes, we perform the cloning on behalf of our customers and deliver DNA in either a customer-supplied vector or a Twist Bioscience vector. Customer-supplied vectors greatly simplify downstream work for our customers, allowing them to take our genes and pass them directly into their workflows. We have also developed a catalog of our own specific vectors. Currently, we manufacture genes of up to 5,000 base pairs in length, yielding a clonally perfect piece of DNA that our customers can immediately use for their research. We offer turnaround times of approximately 11 – 17 business days for clonal genes. Our standard pricing for clonal DNA is $0.09 per base pair for genes between 300 and 1,800 bps in length.

Non-clonal genes

Non-clonal genes serve customers who prefer to conduct their own cloning protocols or that do not need, or want, to pay for perfect quality genes. We offer non-clonal genes of up to 1,800 base pairs in length, which we believe addresses the vast majority of demand for non-clonal genes. We offer turnaround times of six to nine business days for non-clonal genes, with what we believe is the lowest industry error rate of 1:3000 base pairs. Our standard pricing for non-clonal genes is $0.07 per base pair.

Oligonucleotide (Oligo) pools

Oligo pools, or high diversity collections of oligonucleotides, are utilized in many applications, including targeted next generation sequencing, or NGS, CRISPR gene editing, mutagenesis experiments, DNA origami (the nanoscale folding of DNA to create two- and three-dimensional shapes at the nanoscale), DNA computing and data storage in DNA, among others. Our oligo pools are also used for high-throughput reporter assays that are used to study cell signaling pathways, gene regulation, and the structure of cell regulatory elements. For these applications, we provide customers with accurate and uniform synthetic oligos to precisely match their required designs.

We sell a diverse, customizable set of oligo pools, ranging from a few hundred oligos to over one million and offer oligonucleotides of up to 300 nucleotides in length with an error rate of 1:2000 nucleotides and turnaround times beginning at five days. In the future, we expect to offer cloned pools, and a sub-pooling capability which will allow our customers to purchase lower complexity pools and arrayed pools.

Oligo pools for CRISPR gene editing

CRISPR is a recently discovered gene editing tool that has become an area of significant research focus, especially in drug development, and is a rapidly growing application that is contributing to growing demand for our oligo pools. In the CRISPR editing process, a short sequence of RNA called guide-RNA (gRNA) binds to its target DNA sequence in a host cell, indicating to an enzyme where to cut and edit the DNA. In order to conduct gene editing research, many single guide-RNA must be created. Researchers can use oligo pools for CRISPR gene editing to silence, through editing, DNA locations. This process creates an error at a particular location in the DNA of the cell, rendering that location unusable, in other words silenced. By studying the relationship between silenced regions and change in phenotype (did the disease get worse or better), researchers can find the genomic regions important to the disease and identify targets for therapeutics. Similar to our standard oligo pools, we offer oligo pools for CRISPR screening with a diverse and customizable set of specifications, including pool sizes ranging from a few hundred oligos to over one million. From oligo produced on a single silicon chip, researchers can edit up to 1,000,000 DNA locations. We currently offer oligo pools for CRISPR screening of up to 300 nucleotides in length, which in each oligo, allows for two guide-RNAs. As such, where previously researchers could study one region at a time, with the ability to create double guide-RNA pools, there is now the ability to study two regions simultaneously, which has the potential to expand the knowledge of a particular target or disease as well as the underlying biology.

Gene pools

The growth of the synthetic biology industry continues to see incredible innovation and new applications facilitated by unlimited access to the building blocks of research, including synthetic DNA at unprecedented scale. Where previously researchers worked in individual workflows with one gene in one tube, the explosion of biological information provides new opportunities to work in massively parallel workflows to exponentially accelerate the rate and scope of research. Gene pools are similar to

oligo pools, but provide multiple genes within one test tube. Designed with the flexibility to have up to 180,000 genes in a single tube at an affordable price, we introduced gene pools in October 2019 as part of our new Twist Innovation Lab that continues to drive toward products that enable customers to innovate at the pace of today's research and truly change the world for the better.

Next generation sequencing (NGS) tools

We recently expanded the application of our DNA synthesis technology to develop products targeted at the large next generation sequencing market, or NGS. In particular, we are focused on addressing the demand for better sample preparation products that improve sequencing workflow, increase sequencing accuracy, and lower sequencing costs. Using our silicon-based DNA synthesis platform, we are able to synthesize the exact sequences of interest. In the target enrichment process, our synthetic DNA probes "enrich" bind the sequence of interest within the sample in order to isolate and physically extract the targeted segment of DNA.

The ability of the probes to bind to the target segment of interest impacts the ability to capture the correct DNA from the sample, which is subsequently sequenced. Though many factors can influence the efficiency of such capture, a primary consideration is how well the DNA sequence of the probe matches the target (sequence complementarity), as this affects both the efficiency and selectivity of capture. Our target enrichment capture probes are unique in the enrichment market as they consist of double stranded DNA. During the melt step the probes unwind, becoming two independent probes of complementary sequence. When the genome fragments unwind, both strands are captured independently. Each genome fragment can be sequenced twice. Also, with some genomic fragments, one of the two strands may be difficult to capture due to unfavorable sequence composition, as in some cancer mutations. By using double stranded probes, capture efficiency can be maximized as there are multiple opportunities to capture a single fragment. Data shows that uniform synthesis of probes is important for downstream productivity. Because we synthesize each probe individually, our solution allows genome fragments to be captured uniformly.

The targeted segment of DNA can then be copied uniformly prior to NGS analysis by our customers, yielding a larger volume of targeted segments in the sample used for sequencing. Because we are able to precisely target, extract, and uniformly amplify the target DNA segments, our solution considerably improves the accuracy of the downstream sequencing analysis. This enables our customers to perform fewer sequencing runs per sample, without sacrificing accuracy, saving them time and money.

Our NGS products are primarily used for diagnostic testing, research for population genetics and biomarker discovery, translational research, microbiology and applied markets. Our customers are primarily diagnostic companies and hospitals, research institutions, agricultural biotechnology companies, and consumer genetics companies conducting diagnostic tests for a wide range of applications.

In addition to our DNA probes, we have created a comprehensive sample preparation kit that combines these probes for NGS target enrichment with all the reagents and consumables necessary to process a sample into sequencing-ready material. This improves the NGS library preparation workflow and is a cost-effective solution that reduces sequencing costs, improves time to results, enhances sequencing coverage, and provides quality control on every DNA probe. Each of our NGS tool products include our individually synthesized DNA probes.

ISO Certification

In January 2019, our quality management systems for manufacturing our NGS Target Enrichment Panels in our Mission Bay San Francisco offices received ISO 9001:2015 and 13485:2016

certifications, the latter for medical device applications. In addition to continuing to provide NGS tools to our current customer base, we now have the ability to support customers in more regulated markets that require ISO certification from their key reagent suppliers. We anticipate obtaining these certifications for our new facility in South San Francisco in the first quarter of the calendar year 2020.

Human Core Exome Kit

A human genome is incredibly complex. Genes (the parts of the genome that encode proteins) are fragmented, scattered across the genome and surrounded by other DNA. That other DNA is required for maintaining the genome's integrity, for controlling each gene's expression, and in some instances, its function still remains a mystery. A researcher's aim in an exome sequencing experiment is to isolate the DNA sequences from a genomic sample containing only the protein coding regions called the exome. Only 1% of a human genome contains gene encoding regions, yet around 85% of genetic mutations known to cause disease occur in the exome. By isolating just these regions, the amount of genomic DNA that needs to be sequenced to get meaningful data about a disease can be lowered. Exome sequencing provides an important "first pass" screen for mutations.

The Twist Human Core Exome Kit includes the library preparation and enrichment components of the NGS sample preparation process for the entire known coding region of the genome for known inherited disease. Compared to traditional capture methods, our kit allows researchers to increase sample throughput, and achieve a higher depth of coverage across target regions with uncompromising quality.

Library Prep Kits

In addition to the complete human exome, we offer kits to accommodate a wide range of DNA. Sometimes DNA samples are degraded and need special materials to enhance the extraction of the DNA, particularly when the input sample is low quality.

Fixed Panels

We offer a suite of products that have specific probes to address specific needs. We sell the Human RefSeq Panel to complement the Human Core Exome Kit. We sell the Pan-Viral Panel that contains over 1,000 viral human pathogens for rapid identification in various settings and the Mouse Exome Panel with the most current content in the industry.

FastHyb

A key step in the sample preparation process is hybridization. This is the process whereby the probes are mixed with the genomic sample and then the target DNA is extracted. This step often takes many hours and can even take days, and is an important rate-limiting step in the sample preparation process. With our FastHyb solution, customers can complete the hybridization step in as little as 15 minutes, enabling the sample to be moved through the workflow and onto the sequencing step in a single day.

In our FastHyb and Wash Kit, the probes are mixed with the genomic sample and then heated to above 95°C to melt the base pair interactions in the double-stranded genomic DNA, forming a pool of single stranded DNA. Bringing the temperature down allows the genomic DNA to start to form back into complementary double stranded molecules. As the probes are designed to be complementary with the exome, they will also form base pair interactions with the genomic DNA.

Drug and Target Discovery Solutions

DNA libraries

DNA libraries are collections of DNA fragments that are primarily used by pharmaceutical companies during antibody discovery and development. During the drug discovery phase, a pharmaceutical company typically has a biological target or function of interest. In order to find antibodies that best bind to that target in a specific region of a gene and deliver a therapeutic effect, it may be necessary to test many variants of an antibody. Synthetic DNA libraries become useful in this process, as they produce customized, controllable groups of antibodies from specific DNA sequences to run through assays that assess function, toxicity and binding affinity.

Traditionally, pharmaceutical companies have generated antibody libraries through a process called “random mutagenesis.” This uses a technique called polymerase chain reaction (PCR) mutagenesis, where PCR is used to introduce many sequence errors, or variations, within the copies of the antibody. While this generates many different antibody variants, the changes are entirely random and are unknown until the antibody DNA is sequenced. In addition, because of the random approach, there is no guarantee that the resulting antibodies will target the desired region of interest.

Our platform allows customers to customize every antibody variation and construct a precise library systematically to target the entire region of interest. We can create single site libraries in which we change one single amino acid (which is encoded by a group of three DNA nucleobases) within the sequence or single site saturation libraries in which we change every amino acid within the sequence for a more comprehensive approach. We can also generate combinatorial libraries in which we introduce changes to multiple sites within the same gene in specific ratios and combinations. These libraries can be used for antibody engineering, affinity maturation, and humanization, which simplifies downstream screening and identifies more lead molecules. Our libraries are explicitly developed for a specific area of the genome or tailored to a specific disease, with antibody compounds evenly represented across all areas of the genome desired.

To support our efforts to add further value for our customers and potential partners, we have developed a comprehensive antibody optimization solution to enable simultaneous optimization of multiple characteristics of a given antibody. We have developed custom software for the optimization of antibody hits, antibody compounds that meet pre-specified criteria for therapeutic development. We have added our high throughput and hyper-variant antibody library capabilities to create a comprehensive antibody optimization solution for potential partners. We are now using this solution to design, build and test hyper-variant, tightly controlled antibody libraries that follow the rules of the human repertoire and mitigate the pitfalls associated with traditional optimization methods. By following the rules of the human repertoire, which means including only DNA sequences known to occur in humans, these libraries will be natural in composition and are expected to generate better drug development candidates. The libraries also have a large degree of synthetic variation, enabling simultaneous optimization of several antibody characteristics and the discovery of antibodies with high affinity and specificity to drug targets.

Additionally, we are leveraging our ability to rapidly generate custom libraries to discover novel therapeutic antibodies against biological targets that have traditionally been difficult for biological drug development. We have developed a proprietary antibody library targeting a major class of proteins known as GPCRs. GPCRs are important receptors that control and drive the biology of nearly all disease classes, including inflammation, cancer, metabolism, respiratory, and pain. According to a recent publication in Molecular Pharmacology, approximately 700 approved therapeutics target GPCRs, representing approximately 35% of all approved drugs. However, they remain a difficult class

of targets for antibody development due to the lack of exposed protein surfaces to bind. We have created a series of single domain antibody libraries. Single domain antibody libraries are antibody fragments that are much smaller than a whole antibody. Where a whole antibody is composed of two heavy chains and two light chains, single domain antibodies are engineered from the heavy chain antibodies and are also called VHH fragments. These fragments are small and modular antibodies that are both stable and robust for potentially faster discovery and development.

Using our proprietary libraries, we have identified seven different functional antibodies to GPCR targets. We may partner with other technology providers to advance development of our antibody discovery efforts. We expect to continue to develop additional libraries for screening and selection of other biological therapeutic targets such as ion channels and membrane-based transporters.

We believe we have several avenues available to monetize our antibody discovery program. For example, we anticipate that successful discovery of a novel therapeutic antibody against any single GPCR target would attract significant partnership interest from academic institutions as well as biotechnology and pharmaceutical companies given the difficult nature of this class of antibody targets. These partnerships may include upfront, milestone and royalty payments to us for access to our GPCR library.

Collaboration with LakePharma

In April 2019, we announced a strategic collaboration with LakePharma to offer antibody discovery and development solutions to pharmaceutical and biotechnology customers. Under the terms of the agreement, LakePharma will have the ability to offer Twist's proprietary antibody discovery and optimization platforms to their existing and future biopharmaceutical customers as part of their service offerings. One such Twist platform that may be offered is for discovery of novel therapeutic antibodies against a major class of protein drug targets known as GPCRs, which traditionally have been difficult for biologics drug development. GPCRs have been heavily investigated due to their involvement in multiple disease classes, including inflammation, cancer, metabolism, respiratory, and pain. In return, we may offer our customers access to LakePharma's integrated discovery and development services. Each of we and LakePharma will share with each other a percentage of certain revenues generated from customers who purchase services as a result of the collaboration.

Antibody Optimization Service for Pandion

In April 2019, we announced a new collaboration with Pandion Therapeutics, to apply our antibody optimization platform to the targeting arm of a bispecific antibody. The first project required us to improve the affinity of an autoimmune bispecific antibody and harmonize species cross-reactivity for optimal preclinical testing. Based on that success, we are now working to optimize additional antibodies for Pandion Therapeutics.

Our target markets

Our currently marketed product offering addresses a market opportunity that was approximately $1.8 billion in calendar year 2016. We believe our solution has the potential to materially expand our initial market by providing end-users with access to high-quality and lower cost tools, encouraging adoption and facilitating new applications for our products, such as pharmaceutical biologics drug discovery and digital data storage in DNA.

Synthetic DNA market

We believe that our current market opportunity for synthetic DNA was approximately $1.3 billion in calendar year 2016. The market consists of those who buy DNA, or DNA Buyers, and those who make

their own DNA, or DNA Makers. Driven by access to more affordable and high-quality synthetic DNA, we believe that there is a strong trend of DNA Makers converting to DNA Buyers. According to BCC Research, the size of the DNA Buyer market in 2016 was approximately $300 million and is growing at a rate of approximately 20% annually as existing DNA Buyers develop new uses for synthetic DNA and existing DNA Makers convert to DNA Buyers. We estimate our market opportunity in the DNA Maker market to be approximately $950 million. Our market estimate is based on the market sizes for products used in manual DNA synthesis, including the cloning and restriction digestion enzyme market in 2016, according to a report on Molecular Biology by Markets and Markets.

NGS sample preparation market

Our NGS sample preparation kits address the demand for better sample preparation products that improve the sequencing workflow, increase sequencing accuracy and lower sequencing costs. We offer kits consisting of double-stranded DNA probes and a comprehensive target enrichment kit that are used for exome sequencing and custom targeted sequencing. Kalorama Information, a division of marketresearch.com, estimates the market for sample preparation for next generation sequencing was approximately $500 million in calendar year 2016 and growing at approximately 20% annually.

In addition, we believe we have an opportunity to convert customers using single nucleotide polymorphism arrays, or SNP arrays to a workflow that uses Twist products for library preparation and target capture with sequencing on the NovaSeq platform. We believe this workflow can be less expensive than running DNA microarrays for SNP analysis and we intend to continue to enable this conversion.

SNP arrays are used extensively in the consumer DNA testing space as well as the agricultural biotech market. In the agricultural market, SNP arrays are used to genotype chicken, beef, salmon and other food products. We believe that together, these SNP array market segments represent a total market opportunity of $500 million. We do expect it to take time to penetrate this area of the market as the shift in workflow is substantial, though it could result in richer genotyping data at an attractive price per point compared to SNP arrays.

Pharmaceutical biologics drug discovery

We believe we are uniquely positioned to capture a larger portion of the drug discovery value chain given that our synthetic DNA products are already used by our pharmaceutical partners throughout the drug development process. As part of our effort in this market, we recently launched our custom DNA library solution which facilitates biologic drug discovery and development. We are already in agreement with a top three pharmaceutical company by revenue to supply our custom DNA libraries instead of them producing their own. In addition to our custom DNA libraries, we are also developing other proprietary tools, such as a wholly-owned GPCR library and an antibody optimization solution, that we believe will enable us to provide an end-to-end solution in biologics drug discovery and early development, from target to investigational new drug, or IND, application, and adding value as a partner to biotechnology and pharmaceutical companies. These partnerships may include upfront, milestone and royalty payments.

Digital data storage in DNA

Due to the explosion of data across many industries, finding efficient means of storage has become more important. Through the Semiconductor Research Corporation, many leading semiconductor companies, including Microsoft Corporation, IBM Corporation, Micron Technology, Inc., Autodesk Inc., Mentor Graphics Corporation and GlobalFoundries Inc., are exploring DNA as a data storage medium. We have strategic relationships with Microsoft Corporation and the University of Washington through which we have demonstrated the feasibility of storing data on DNA and the unique

benefits of longevity, density, and universality of this format. We believe that in three to five years, new DNA technologies and cost efficiencies could surpass mature information technology hardware solutions to allow data storage in DNA to become cost competitive with traditional storage media and enable us to target several large markets within data storage. The market for digital data storage is more than $35 billion and we believe DNA can address several segments within this market.

Our growth strategy

Our objective is to be the leading provider of synthetic DNA and DNA-based products worldwide and to leverage the versatility of our platform to build a leadership position in other synthetic DNA-based product markets in which we have a competitive advantage. We intend to accomplish this objective by executing on the following:

- Maintain and expand our position as the provider of choice for high-quality, affordable synthetic genes and DNA to customers across multiple industries;
- Become a leading supplier of NGS sample preparation products;
- Conduct antibody therapeutic discovery and optimization for our current customers and future partners;
- Continue to explore development of DNA as a digital data storage medium via internal research and government and industry partnerships; and
- Expand our global presence.

Beyond these opportunities, we are working with industry partners to create new markets for our products by leveraging the versatility of our platform.

Corporate information

We were incorporated in Delaware on February 4, 2013. Our principal executive offices are located at 681 Gateway Blvd., South San Francisco, CA 94080. Our telephone number at that location is (800) 719-0671. References in the prospectus, and the information incorporate by reference herein, to “we,” “our,” “us,” “Twist Bioscience” and the “company” refer to Twist Bioscience Corporation and, where appropriate, its wholly-owned subsidiaries unless the context requires otherwise. Our corporate website address is www.twistbioscience.com. The information contained on our website is not incorporated by reference into this prospectus, and you should not consider any information contained on, or that can be accessed through, our website to be part of this prospectus. We have included our website address only as an inactive textual reference and do not intend it to be an active link to our website.

Implications of being an emerging growth company

We qualify as an “emerging growth company,” as defined in Section 2(a) of the Securities Act of 1933, as amended, or the Securities Act, as modified by the Jumpstart Our Business Startups Act of 2012, or the JOBS Act. As such, we are eligible to take advantage of certain exemptions from various reporting requirements that are applicable to other public companies that are not “emerging growth companies” including, but not limited to:

- an exemption from complying with the auditor attestation requirements of Section 404 of the Sarbanes Oxley Act of 2002, as amended, or Section 404;
- reduced disclosure obligations regarding executive compensation in our periodic reports and proxy statements; and
- an exemption from the requirement to seek non-binding advisory votes on executive compensation.

We have elected to take advantage of certain of the reduced disclosure obligations in the registration statement of which this prospectus supplement and the accompanying prospectus is a part and the documents incorporated herein by reference and may elect to take advantage of other reduced reporting requirements in future filings. As a result, the information that we provide to our stockholders may be different than you might receive from other public reporting companies in which you hold equity interests.

In addition, Section 107 of the JOBS Act provides that an “emerging growth company” can take advantage of the extended transition period provided in Section 7(a)(2)(B) of the Securities Act for complying with new or revised accounting standards. In other words, an “emerging growth company” can delay the adoption of certain accounting standards until those standards would otherwise apply to private companies. We have irrevocably opted out of the extended transition period for complying with new or revised accounting standards pursuant to Section 107(b) of the JOBS Act.

We could remain an “emerging growth company” for up to five years, or until the earliest of (a) the last day of the first fiscal year in which our annual gross revenues exceed $1.07 billion, (b) the date that we become a “large accelerated filer” as defined in Rule 12b-2 under the Securities Exchange Act of 1934, as amended, or the Exchange Act, which would occur if the market value of our common stock that is held by non-affiliates exceeds $700 million as of the last business day of our most recently completed second fiscal quarter and (c) the date on which we have issued more than $1 billion in non-convertible debt during the preceding three-year period.

THE OFFERING

Common stock offered by us	Shares of our common stock having an aggregate offering price of up to $50.0 million.
Common stock outstanding after this offering	Up to 1,925,298 shares, assuming sales at a price of $25.97 per share, which was the closing price of our common stock on the Nasdaq Global Select Market on December 17, 2019. The actual number of shares issued will vary depending on the sales price under this offering.
Manner of offering	“At the market offering” that may be made from time to time on the Nasdaq Global Select Market or other existing trading market for our common stock through our agent, Cowen. See the section entitled “Plan of Distribution” on page S-33 of this prospectus supplement.
Use of proceeds	We intend to use the net proceeds from this offering for working capital, general corporate purposes and to fund our growth. See the section titled “Use of Proceeds” on page S-20 for additional information.
Risk factors	See the section titled “Risk Factors” beginning on page S-17 of this prospectus supplement and the other information included in, or incorporated by reference into, this prospectus supplement for a discussion of certain factors you should carefully consider before deciding to invest in shares of our common stock.
Nasdaq Global Select Market symbol	“TWST”

Except as otherwise indicated, all information in this prospectus is based upon 32,872,675 shares of our common stock (including 38,157 unvested shares of restricted common stock subject to our repurchase right) outstanding as of September 30, 2019, and excludes:

- 3,550,445 shares of our common stock issuable upon exercise of stock options outstanding as of September 30, 2019, having a weighted-average exercise price of $15.99 per share;
- 462,370 shares of our common stock issuable upon the settlement of outstanding restricted stock units as of September 30, 2019;
- 1,520,875 shares of common stock reserved for future grant or issuance under our 2018 Equity Incentive Plan, or the 2018 Plan;
- 56,081 shares of common stock reserved for future grant or issuance under our 2018 Employee Stock Purchase Plan, or the 2018 ESPP;

- 18,854 shares of our common stock, issuable upon the exercise of outstanding warrants to purchase common stock outstanding as of September 30, 2019, having an exercise price of $14.85 per share; and
- 7,531 shares of our common stock issuable upon the exercise of outstanding warrants to purchase common stock outstanding as of September 30, 2019, having an exercise price of $21.24 per share.

RISK FACTORS

Investing in our common stock involves risk. Before deciding whether to invest in our common stock, you should consider carefully the risks and uncertainties described below. You should also consider the risks, uncertainties and assumptions discussed under the heading "Risk Factors" included in our most recent annual report on Form 10-K for the year ended September 30, 2019, which is on file with the SEC and is incorporated herein by reference, and which may be amended, supplemented or superseded from time to time by other reports we file with the SEC in the future. There may be other unknown or unpredictable economic, business, competitive, regulatory or other factors that could have material adverse effects on our future results. If any of these risks actually occurs, our business, business prospects, financial condition or results of operations could be seriously harmed. This could cause the trading price of our common stock to decline, resulting in a loss of all or part of your investment. Please also read carefully the section below titled "Cautionary Statement Regarding Forward-Looking Statements."

Risks Related to Our Common Stock and this Offering

Purchasers of shares of our common stock in this offering will experience immediate and substantial dilution in the book value of their investment.

The price per share of our common stock being offered may be higher than the net tangible book value per share of our outstanding common stock prior to this offering. Assuming that an aggregate of 1,925,298 shares of our common stock are sold at a price of $25.97 per share, the last reported sale price of our common stock on the Nasdaq Global Select Market on December 17, 2019, for aggregate gross proceeds of approximately $50.0 million, and after deducting commissions and estimated offering expenses payable by us, new investors in this offering will incur immediate dilution of $20.26 per share. For a more detailed discussion of the foregoing, see the section titled "Dilution" below. To the extent outstanding stock options or warrants are exercised, there will be further dilution to new investors. To the extent outstanding stock options or warrants are exercised, there will be further dilution to new investors. In addition, to the extent we need to raise additional capital in the future and we issue additional shares of common stock or securities convertible or exchangeable for our common stock, our then existing stockholders may experience dilution and the new securities may have rights senior to those of our common stock offered in this offering.

We have broad discretion in the use of the net proceeds from this offering and our existing cash and may not use them effectively.

Our management will have broad discretion in the application of the net proceeds from this offering, including for any of the purposes described in the section titled "Use of Proceeds," as well as our existing cash and cash equivalents, and you will be relying on the judgment of our management regarding such application. You will not have the opportunity, as part of your investment decision, to assess whether the net proceeds are being used appropriately. Because of the number and variability of factors that will determine our use of the net proceeds from this offering, their ultimate use may vary substantially from their currently intended use. Our management might not apply the net proceeds or our existing cash in ways that ultimately increase the value of your investment. If we do not invest or apply the net proceeds from this offering or our existing cash and cash equivalents in ways that enhance stockholder value, we may fail to achieve expected business and financial results, which could cause our stock price to decline. Pending their use, we may invest the net proceeds from this offering in short-term, investment-grade, interest-bearing securities. These investments may not yield a favorable return to our stockholders.

Future sales of our common stock in the public market, or the perception that such sales could occur, could cause our stock price to fall.

The sale of a substantial number of shares of our common stock or other equity-related securities in the public markets, or the perception that such sales could occur, could depress the market price of our common stock and impair our ability to raise capital through the sale of additional equity securities. We may sell large quantities of our common stock at any time pursuant to this prospectus supplement or in one or more separate offerings. We cannot predict the effect that future sales of common stock or other equity-related securities would have on the market price of our common stock.

The actual number of shares we will issue under the sales agreement, at any one time or in total, is uncertain.

Subject to certain limitations in the sales agreement and compliance with applicable law, we have the discretion to deliver a placement notice to Cowen at any time throughout the term of the sales agreement. The number of shares that are sold by Cowen after delivering a placement notice will fluctuate based on the market price of our common stock during the sales period and limits we set with Cowen. Because the price per share of each share sold will fluctuate based on the market price of our common stock during the sales period, it is not possible at this stage to predict the number of shares that will be ultimately issued.

The common stock offered hereby will be sold in "at the market offerings," and investors who buy shares at different times will likely pay different prices.

Investors who purchase shares in this offering at different times will likely pay different prices, and so may experience different outcomes in their investment results. We will have discretion, subject to market demand, to vary the timing, prices, and numbers of shares sold, and there is no minimum or maximum sales price. Investors may experience a decline in the value of their shares as a result of share sales made at prices lower than the prices they paid.

CAUTIONARY STATEMENT REGARDING FORWARD-LOOKING STATEMENTS

This prospectus supplement and the accompanying prospectus, including the documents that we incorporate by reference, contains forward-looking statements within the meaning of Section 27A of the Securities Act of 1933, as amended, or the Securities Act, and Section 21E of the Securities Exchange Act of 1934, as amended, or the Exchange Act. The words “believe,” “will,” “may,” “estimate,” “continue,” “anticipate,” “intend,” “should,” “plan,” “expect,” “predict,” “could,” “potentially” and variations of such words and similar expressions are intended to identify such forward-looking statements, which may include, but are not limited to, statements concerning the following:

- our ability to increase our revenue and our revenue growth rate;
- estimates of our expenses, future revenues, capital requirements and our needs for additional financing; our estimates of the size of our market opportunities;
- our expectations regarding our ability to increase DNA production, reduce turnaround times and drive cost reductions for our customers;
- our ability to effectively manage our growth;
- our ability to successfully enter new markets and manage our international expansion;
- our ability to protect our intellectual property, including our proprietary DNA synthesis platform;
- costs associated with defending intellectual property infringement and other claims;
- the effects of increased competition in our business;
- our ability to keep pace with changes in technology and our competitors;
- our ability to successfully identify, evaluate and manage any future acquisitions of businesses, solutions or technologies;
- the success of our marketing efforts;
- the potential purchases of common stock by certain of our existing stockholders and their affiliated entities, including stockholders who are associated with certain of our directors;
- significant disruption in, or breach in security of our information technology systems and resultant interruptions in service and any related impact on our reputation;
- the attraction and retention of qualified employees and key personnel;
- the effects of natural or man-made catastrophic events;
- the effectiveness of our internal controls;
- changes in government regulation affecting our business;
- the impact of adverse economic conditions; and
- other risk factors included under the section titled “Risk Factors.”

You should not rely upon forward-looking statements as predictions of future events. Such statements are based on management’s expectations as of the date of this filing and involve many risks and uncertainties that could cause our actual results, events or circumstances to differ materially from those expressed or implied in our forward-looking statements. Such risks and uncertainties include those described throughout this report and particularly in the section titled “Risk factors” and elsewhere in this prospectus supplement. Given these risks and uncertainties, readers are cautioned not to place undue reliance on such forward-looking statements. Readers are urged to carefully review and consider all of the information in this prospectus supplement, the base prospectus, and any free writing prospectus that we have authorized for use in connection with this offering. We undertake no obligation to update any forward-looking statements made in this prospectus supplement to reflect events or circumstances after the date of this filing or to reflect new information or the occurrence of unanticipated events, except as required by law. We may not actually achieve the plans, intentions or expectations disclosed in our forward-looking statements. Our forward-looking statements do not reflect the potential impact of any future acquisitions, mergers, dispositions, joint ventures or investments we may make.

USE OF PROCEEDS

We may issue and sell shares of our common stock having aggregate sales proceeds of up to $50.0 million from time to time. Because there is no minimum offering amount required as a condition to close this offering, the actual total public offering amount, commissions and proceeds to us, if any, are not determinable at this time.

We currently intend to use the net proceeds of this offering for working capital, general corporate purposes and to fund our growth. We may also use a portion of the net proceeds from this offering to acquire or invest in complementary businesses, assets or technologies, although we have no present commitments or agreements to do so. Accordingly, we will retain broad discretion over the use of these proceeds.

The amounts and timing of our actual expenditures will depend on numerous factors, including the progress of our clinical trials and other development efforts and other factors described in the section titled “Risk Factors” in this prospectus supplement, the accompanying prospectus and the documents incorporated by reference herein and therein, as well as the amount of cash used in our operations. We may find it necessary or advisable to use the net proceeds for other purposes, and we will have broad discretion in the application of the net proceeds. Pending the use of the net proceeds described above, we plan to invest the net proceeds from this offering in a variety of capital preservation investments, including short- and intermediate-term, interest-bearing obligations, investment-grade instruments, certificates of deposit or direct or guaranteed obligations of the U.S. government.

DIVIDEND POLICY

We have never declared or paid, and do not anticipate declaring or paying in the foreseeable future, any cash dividends on our capital stock. Any future determination to declare cash dividends will be made at the discretion of our board of directors, subject to applicable laws, and will depend on our financial condition, results of operations, capital requirements, general business conditions and other factors that our board of directors may deem relevant.

DILUTION

If you invest in our common stock, your interest will be diluted to the extent of the difference between the price per share you pay in this offering and the net tangible book value per share of our common stock immediately after this offering. Our net tangible book value of our common stock as of September 30, 2019 was $150.4 million, or $4.58 per share of common stock based upon 32,872,675 shares outstanding. Net tangible book value per share is equal to our total tangible assets, less our total liabilities, divided by the total number of shares outstanding as of September 30, 2019.

After giving effect to the sale of our common stock in the aggregate amount of $50.0 million at an assumed offering price of $25.97 per share, the last reported sale price of our common stock on the Nasdaq Global Select Market on December 17, 2019, and after deducting commissions and estimated offering expenses payable by us, our as adjusted net tangible book value as of September 30, 2019 would have been $198.6 million, or $5.71 per share of common stock. This represents an immediate increase in net tangible book value of $1.13 per share to our existing stockholders and an immediate dilution in net tangible book value of $20.26 per share to new investors in this offering.

The following table illustrates this calculation on a per share basis. The as adjusted information is illustrative only and will adjust based on the actual price to the public, the actual number of shares sold and other terms of the offering determined at the time shares of our common stock are sold pursuant to this prospectus supplement. The as adjusted information assumes that all of our common stock in the aggregate amount of $50.0 million is sold at the assumed offering price of $25.97 per share, the last reported sale price of our common stock on the Nasdaq Global Select Market on December 17, 2019. The shares sold in this offering, if any, will be sold from time to time at various prices.

The following table illustrates the dilution:

Assumed public offering price per share		$25.97
Net tangible book value per share as of September 30, 2019	$4.58	
Increase in net tangible book value per share attributable to this offering	$1.13	
As-adjusted net tangible book value per share after giving effect to this offering		$ 5.71
Dilution per share to new investors participating in this offering		$20.26

The above table and discussion are based on 32,872,675 shares of our common stock outstanding as of September 30, 2019, which included 38,157 shares of unvested restricted stock subject to repurchase. The number of shares outstanding as of September 30, 2019 does not include:

- 3,550,445 shares of common stock issuable upon exercise of stock options outstanding as of September 30, 2019, a weighted-average exercise price of $15.99 per share;
- 462,370 shares of our common stock issuable upon the settlement of outstanding restricted stock units as of September 30, 2019;
- 1,520,875 shares of common stock reserved for future grant or issuance under the 2018 Plan;
- 56,081 shares of common stock reserved for future grant or issuance under the 2018 ESPP;

- 18,854 shares of our common stock issuable upon the exercise of outstanding warrants to purchase common stock outstanding as of September 30, 2019, having an exercise price of $14.85 per share; and
- 7,531 shares of common stock issuable upon the exercise of outstanding warrants to purchase our common stock outstanding as of September 30, 2019, having an exercise price of $21.24 per share.

To the extent that any options are exercised, new options are issued or we otherwise issue additional shares of common stock in the future at a price less than the public offering price, there may be further dilution to purchasers of our common stock in this offering.

DESCRIPTION OF CAPITAL STOCK

General

The following is a summary of the rights of our common stock and preferred stock and certain provisions of our amended and restated certificate of incorporation and amended and restated bylaws as they are currently in effect, which we refer to in this section as our certificate of incorporation and bylaws, respectively. This summary does not purport to be complete and is qualified in its entirety by the provisions of our certificate of incorporation and bylaws, copies of which have been filed with the SEC.

As of the date of this prospectus supplement, our authorized capital stock consists of 110,000,000 shares, of which 100,000,000 shares, par value $0.00001 per share, are designated as common stock, and 10,000,000 shares, par value $0.00001 per share, are designated as preferred stock. As of September 30, 2019, there were 32,872,675 shares of common stock outstanding. No shares of preferred stock are currently outstanding.

Common Stock

The holders of our common stock are entitled to one vote per share on all matters to be voted on by our stockholders. Holders of common stock are entitled to receive such dividends as may be declared by the board of directors out of funds legally available therefor. In the event of our liquidation, dissolution or winding up, holders of common stock are entitled to share ratably in all assets remaining after payment of liabilities and distribution of the liquidation preferences of any then outstanding shares of preferred stock. There are no redemption or sinking fund provisions applicable to the common stock.

Stock Exchange Listing

Our common stock is listed on the Nasdaq Global Select Market. The trading symbol for our common stock is “TWST.”

Transfer Agent and Registrar

The transfer agent and registrar for our common stock is American Stock Transfer & Trust Company, LLC. The transfer agent and registrar’s address is 6201 15th Avenue, Brooklyn, NY 11219, and its telephone number is (718) 921-8124.

Preferred Stock

Our board of directors has the authority, without further action by our stockholders, to designate and issue up to the total number of authorized shares of preferred stock in one or more series and to fix the rights, preferences, privileges and restrictions granted to or imposed upon each such series of preferred stock, including dividend rights, dividend rate, conversion rights, voting rights, rights and terms of redemption, redemption prices, liquidation preference and sinking fund terms, any or all of which may be greater than or senior to the rights of the common stock. The issuance of preferred stock could adversely affect the voting power of holders of common stock and reduce the likelihood that such holders will receive dividend payments or payments upon liquidation. Such issuance could have the effect of decreasing the market price of the common stock. The issuance of preferred stock or even the ability to issue preferred stock could also have the effect of delaying, deterring or preventing a change of control or other corporate action.

Anti-Takeover Effects of Delaware Law and Our Certificate of Incorporation and Bylaws

Our amended and restated certificate of incorporation and our amended and restated bylaws contain certain provisions that could have the effect of delaying, deterring or preventing another party from acquiring control of us. These provisions and certain provisions of Delaware law, which are summarized below, are expected to discourage coercive takeover practices and inadequate takeover bids. These provisions are also designed, in part, to encourage persons seeking to acquire control of

us to negotiate first with our board of directors. We believe that the benefits of increased protection of our potential ability to negotiate more favorable terms with an unfriendly or unsolicited acquirer outweigh the disadvantages of discouraging a proposal to acquire us.

Undesignated preferred stock

As discussed above, our board of directors has the ability to issue preferred stock with voting or other rights or preferences that could impede the success of any attempt to change control of us. These and other provisions may have the effect of deterring hostile takeovers or delaying changes in control or management of our company.

Limits on ability of stockholders to act by written consent or call a special meeting

Our amended and restated certificate of incorporation provides that our stockholders may not act by written consent, which may lengthen the amount of time required to take stockholder actions. As a result, a holder controlling a majority of our capital stock would not be able to amend our bylaws or remove directors without holding a meeting of our stockholders called in accordance with our bylaws.

In addition, our amended and restated bylaws provide that special meetings of the stockholders may be called only by the majority of our board of directors. Stockholders may not call a special meeting, which may delay the ability of our stockholders to force consideration of a proposal or for holders controlling a majority of our capital stock to take any action, including the removal of directors.

Requirements for advance notification of stockholder nominations and proposals

Our amended and restated bylaws establish advance notice procedures with respect to stockholder proposals and the nomination of candidates for election as directors, other than nominations made by or at the direction of our board of directors or a committee of our board of directors. These provisions may have the effect of precluding the conduct of certain business at a meeting if the proper procedures are not followed. These provisions may also discourage or deter a potential acquirer from conducting a solicitation of proxies to elect the acquirer's own slate of directors or otherwise attempting to obtain control of our company.

Board classification

Our board of directors is divided into three classes, one class of which is elected each year by our stockholders. The directors in each class serve three-year terms. For more information on the classified board, see "Directors, executive officers and corporate governance" in our Annual Report on Form 10-K for the fiscal year ended September 30, 2019. A third party may be discouraged from making a tender offer or otherwise attempting to obtain control of us as it is it more difficult and time-consuming for stockholders to replace a majority of the directors on a classified board.

No cumulative voting

Our amended and restated certificate of incorporation and amended and restated bylaws do not provide for cumulative voting in the election of directors. Cumulative voting allows a stockholder to vote a portion or all of its shares for one or more candidates for seats on the board of directors. Without cumulative voting, a minority stockholder may not be able to gain as many seats on our board of directors as the stockholder would be able to gain if cumulative voting were permitted. The absence of cumulative voting makes it more difficult for a minority stockholder to gain a seat on our board of directors to influence our board's decision regarding a takeover.

Amendment of charter and bylaws provisions

The amendment of the above provisions of our amended and restated certificate of incorporation requires approval by holders of at least two thirds of our outstanding capital stock entitled to vote

generally in the election of directors. The amendment of certain provisions of our bylaws also requires approval by the holders of at least two thirds of our outstanding capital stock entitled to vote generally in the election of directors.

Delaware anti-takeover statute

We are subject to the provisions of Section 203 of the DGCL regulating corporate takeovers. In general, Section 203 prohibits a publicly held Delaware corporation from engaging, under certain circumstances, in a business combination with an interested stockholder for a period of three years following the date the person became an interested stockholder unless:

- prior to the date of the transaction, our board of directors approved either the business combination or the transaction which resulted in the stockholder becoming an interested stockholder;
- upon completion of the transaction that resulted in the stockholder becoming an interested stockholder, the interested stockholder owned at least 85% of the voting stock of the corporation outstanding at the time the transaction commenced, calculated as provided under Section 203; or
- at or subsequent to the date of the transaction, the business combination is approved by our board of directors and authorized at an annual or special meeting of stockholders, and not by written consent, by the affirmative vote of at least two-thirds of the outstanding voting stock which is not owned by the interested stockholder.

Generally, a business combination includes a merger, asset or stock sale, or other transaction resulting in a financial benefit to the interested stockholder. An interested stockholder is a person who, together with affiliates and associates, owns or, within three years prior to the determination of interested stockholder status, did own 15% or more of a corporation's outstanding voting stock. We expect the existence of this provision to have an anti-takeover effect with respect to transactions our board of directors does not approve in advance. We anticipate that Section 203 may also discourage attempts that might result in a premium over the market price for the shares of common stock held by stockholders.

The provisions of Delaware law and the provisions of our amended and restated certificate of incorporation and amended and restated bylaws, as amended upon the completion of this offering, could have the effect of discouraging others from attempting hostile takeovers and, as a consequence, they might also inhibit temporary fluctuations in the market price of our common stock that often result from actual or rumored hostile takeover attempts. These provisions might also have the effect of preventing changes in our management. It is possible that these provisions could make it more difficult to accomplish transactions that stockholders might otherwise deem to be in their best interests.

Our amended and restated certificate of incorporation provides that the Court of Chancery of the State of Delaware is the sole and exclusive forum for any derivative action or proceeding brought on our behalf, any action asserting a breach of fiduciary duty owed by any of our directors, officers or other employees to us or our stockholders, any action asserting a claim against us arising pursuant to any provisions of the DGCL, our amended and restated certificate of incorporation or our amended and restated bylaws, any action or proceeding asserting a claim as to which the Delaware General Corporation Law confers jurisdiction upon the Court of Chancery of the State of Delaware or any action asserting a claim against us that is governed by the internal affairs doctrine, subject in each case to the Court of Chancery having personal jurisdiction over the parties named as defendants therein. The exclusive forum provision will not apply to suits brought to enforce any liability or duty created by the Exchange Act or any other claim for which the federal courts have exclusive jurisdiction.

In addition, our amended and restated certificate of incorporation provides that the U.S. federal district courts are the exclusive forum for the resolution of any complaint asserting a cause of action arising under the Securities Act. Our exclusive forum provision will not relieve us of our duties to comply with the federal securities laws and the rules and regulations thereunder, and our stockholders will not be deemed to have waived our compliance with these laws, rules and regulations.

The enforceability of similar federal court choice of forum provisions in other companies' certificates of incorporation has been challenged in legal proceedings, and it is possible that a court could find our federal court choice of forum provision to be inapplicable or unenforceable. If a court were to find either of the choice of forum provisions contained in our amended and restated certificate of incorporation to be inapplicable or unenforceable in an action, we may incur additional costs associated with resolving such action in other jurisdictions.

For example, on December 19, 2018, the Court of Chancery of the State of Delaware issued an opinion in *Sciabacucchi v. Salzberg*, C.A. No. 2017-0931-JTL, invalidating provisions in the certificates of incorporation of Delaware companies that purport to designate federal district courts as the exclusive forum in which a stockholder could bring a claim under the Securities Act. The Court of Chancery held that a Delaware corporation can only use its constitutive documents to bind a plaintiff to a particular forum where the claim involves rights or relationships established by or under Delaware's corporate law. In light of the *Sciabacucchi* decision, we do not currently intend to enforce our federal forum selection provision unless the *Sciabacucchi* decision is appealed and the Supreme Court for the State of Delaware reverses the decision. If the Supreme Court for the State of Delaware affirms the Delaware Chancery Court's decision, we intend to seek approval by our stockholders to amend the amended and restated certificate of incorporation at our next regularly-scheduled annual meeting of stockholders to remove the invalid provision.

MATERIAL U.S. FEDERAL INCOME TAX CONSIDERATIONS FOR NON-U.S. HOLDERS

This section discusses the material U.S. federal income tax consequences of the ownership and sale, exchange or other taxable disposition of our common stock sold pursuant to this offering to a "non-U.S. holder" (as defined below). This discussion does not provide a complete analysis of all potential tax considerations. The information provided below is based upon provisions of the Internal Revenue Code of 1986, as amended, or Code, Treasury regulations promulgated thereunder, administrative rulings and judicial decisions currently in effect. These authorities may change at any time, possibly on a retroactive basis, or the Internal Revenue Service, or IRS, might interpret the existing authorities differently. In either case, the U.S. federal income tax considerations of owning or disposing of our common stock could differ from those described below. As a result, we cannot assure you that the U.S. federal income tax considerations described in this discussion will not be challenged by the IRS or will be sustained by a court if challenged by the IRS.

This discussion does not address the tax considerations arising under the alternative minimum tax, the net investment income tax, the laws of any state, local or non-U.S. jurisdiction, or under U.S. federal gift and estate tax laws. In addition, this discussion does not address tax considerations applicable to an investor's particular circumstances or to investors that may be subject to special tax rules, including, without limitation:

- banks, insurance companies or other financial institutions;
- partnerships or entities or arrangements treated as partnerships or other pass-through entities for U.S. federal income tax purposes (or investors in such entities);
- corporations that accumulate earnings to avoid U.S. federal income tax;
- tax-exempt or governmental organizations or tax-qualified retirement plans;
- real estate investment trusts or regulated investment companies;
- controlled foreign corporations or passive foreign investment companies;
- persons who acquired our common stock pursuant to the exercise of an employee stock option or otherwise as compensation for services;
- brokers or dealers in securities or currencies;
- traders in securities that elect to use a mark-to-market method of accounting for their securities holdings;
- persons that own, or are deemed to own, more than 5% of our capital stock (except to the extent specifically set forth below);
- certain former citizens or long-term residents of the United States;
- persons who hold our common stock as a position in a hedging transaction, "straddle," "conversion transaction" or other risk reduction transaction;
- persons who do not hold our common stock as a capital asset within the meaning of Section 1221 of the Code (generally, for investment purposes); or
- persons deemed to sell our common stock under the constructive sale provisions of the Code.

In addition, if a partnership or entity classified as a partnership for U.S. federal income tax purposes is a beneficial owner of our common stock, the tax treatment of a partner in the partnership or an owner of the entity will depend upon the status of the partner or owner and the activities of the partnership or entity.

Accordingly, this discussion does not address U.S. federal income tax considerations applicable to partnerships that hold our common stock, and partners in such partnerships should consult their tax advisors.

Investors considering the purchase of our common stock should consult their own tax advisors regarding the application of the U.S. federal income, gift and estate tax laws to their particular situations and the consequences of non-U.S., state or local laws, and tax treaties.

Non-U.S. holder defined

For purposes of this section, a "non-U.S. holder" is any holder of our common stock, other than an entity taxable as a partnership for U.S. federal income tax purposes, that is not:

- an individual who is a citizen or resident of the United States for U.S. federal income tax purposes;
- a corporation, or other entity taxable as a corporation for U.S. federal income tax purposes, created or organized under the laws of the United States, any state therein or the District of Columbia or otherwise treated as such for U.S. federal income tax purposes;
- a trust that (1) is subject to the primary supervision of a U.S. court and one or more U.S. persons have authority to control all substantial decisions of the trust or (2) has a valid election in effect under applicable Treasury regulations to be treated as a U.S. person; or
- an estate whose income is subject to U.S. federal income tax regardless of source.

If you are a non-U.S. citizen who is an individual, you may, in many cases, be deemed to be a resident alien, as opposed to a nonresident alien, by virtue of being present in the United States for at least 31 days in the calendar year and for an aggregate of at least 183 days during a three-year period ending in the current calendar year. For these purposes, all the days present in the current year, one-third of the days present in the immediately preceding year, and one-sixth of the days present in the second preceding year are counted. Resident aliens are subject to U.S. federal income tax as if they were U.S. citizens. Such an individual is urged to consult his or her own tax advisor regarding the U.S. federal income tax consequences of the ownership and sale, exchange or other taxable disposition of our common stock.

Distributions

In the future, if we make any distributions on shares of our common stock, such distributions will constitute dividends for U.S. federal income tax purposes to the extent paid from our current or accumulated earnings and profits, as determined under U.S. federal income tax principles. Distributions in excess of our current and accumulated earnings and profits will constitute a return of capital that is applied against and reduces, but not below zero, a non-U.S. holder's adjusted tax basis in shares of our common stock. Any remaining excess will be treated as gain realized on the sale, exchange or other taxable disposition of our common stock. See "—Sale of common stock."

Subject to the discussion below regarding the Foreign Account Tax Compliance Act, or FATCA, and backup withholding, any distribution made to a non-U.S. holder on our common stock that is not effectively connected with a non-U.S. holder's conduct of a trade or business in the United States will generally be subject to U.S. withholding tax at a 30% rate. The withholding tax might not apply, however, or might apply at a reduced rate, under the terms of an applicable income tax treaty between the United States and the non-U.S. holder's country of residence. You should consult your tax advisors regarding your entitlement to benefits under a relevant income tax treaty. Generally, in order for us or our paying agent to withhold tax at a lower treaty rate, a non-U.S. holder must certify its entitlement to treaty benefits. A non-U.S. holder generally can meet this certification requirement by providing an IRS Form W-8BEN, W-8BEN-E (or any successor form to the IRS Form W-8BEN or W-8BEN-E) to us or our paying agent. If the non-U.S. holder holds the stock through a financial institution or other agent acting on the non-U.S. holder's behalf, the non-U.S. holder will be required to provide appropriate documentation to the agent. The non-U.S. holder's agent will then be required to provide certification to us or our paying agent, either directly or through other intermediaries. If you are eligible for a reduced

rate of U.S. federal withholding tax under an income tax treaty, you may obtain a refund or credit from the IRS of any excess amounts withheld by filing an appropriate claim for a refund with the IRS in a timely manner.

Distributions received by a non-U.S. holder that are effectively connected with a U.S. trade or business conducted by the non-U.S. holder, and, if required by an applicable income tax treaty between the United States and the non-U.S. holder's country of residence, are attributable to a permanent establishment maintained by the non-U.S. holder in the United States, are not subject to the 30% withholding tax. To obtain this exemption, a non-U.S. holder must provide us with an IRS Form W-8ECI properly certifying such exemption. Such effectively connected distributions, although not subject to U.S. withholding tax, are generally taxed at the same graduated rates applicable to U.S. persons, net of certain deductions and credits. In addition to the graduated tax described above, distributions received by corporate non-U.S. holders that are effectively connected with a U.S. trade or business of the corporate non-U.S. holder may also be subject to a branch profits tax equal to 30% of its effectively connected earnings and profits for the taxable year, as adjusted for certain items, although an applicable income tax treaty between the United States and the non-U.S. holder's country of residence might provide for a lower rate.

Sale of common stock

Subject to the discussion below regarding FATCA and backup withholding, non-U.S. holders will generally not be subject to U.S. federal income tax on any gains realized on the sale, exchange or other taxable disposition of our common stock unless:

- the gain (1) is effectively connected with the conduct by the non-U.S. holder of a U.S. trade or business and (2) if required by an applicable income tax treaty between the United States and the non-U.S. holder's country of residence, is attributable to a permanent establishment (or, in the case of an individual, a fixed base) maintained by the non-U.S. holder in the United States (in which case the special rules described below apply);
- the non-U.S. holder is an individual who is present in the United States for 183 days or more in the taxable year of the sale, exchange or other taxable disposition of our common stock, and certain other requirements are met (in which case the gain would be subject to a flat 30% tax, or such reduced rate as may be specified by an applicable income tax treaty, which may be offset by certain U.S.-source capital losses, even though the individual is not considered a resident of the United States, provided that the non-U.S. holder has timely filed U.S. federal income tax returns with respect to such losses); or
- the rules of the Foreign Investment in Real Property Tax Act, or FIRPTA, treat the gain as effectively connected with a U.S. trade or business.

The FIRPTA rules may apply to a sale, exchange or other taxable disposition of our common stock if we are at the time of the sale, exchange, or other taxable disposition, or were within the shorter of the five-year period preceding the disposition and the non-U.S. holder's holding period, a "United States real property holding corporation," or USRPHC. In general, we would be a USRPHC if the fair market value of our "U.S. real property interests" comprised at least half of the fair market value of our business assets and our U.S. and non-U.S. real property interests. If we are or become a USRPHC, as long as our common stock is regularly traded on an established securities market, such common stock will be treated as "U.S. real property interests" subject to the FIRPTA rules only if a non-U.S. holder actually owns or constructively holds more than 5% of our outstanding common stock at any time within the shorter of the five-year period preceding the disposition and the non-U.S. holder's holding period. Currently, we believe we are not, and do not anticipate becoming, a USRPHC.

If any gain from the sale, exchange or other taxable disposition of our common stock (1) is effectively connected with a U.S. trade or business conducted by a non-U.S. holder and (2) if required

by an applicable income tax treaty between the United States and the non-U.S. holder's country of residence, is attributable to a permanent establishment (or, in the case of an individual, a fixed base) maintained by such non-U.S. holder in the United States, then the gain generally will be subject to U.S. federal income tax at the same graduated rates applicable to U.S. persons, net of certain deductions and credits. If the non-U.S. holder is a corporation, under certain circumstances, that portion of its earnings and profits that is effectively connected with its U.S. trade or business, subject to certain adjustments, generally would be subject to a "branch profits tax." The branch profits tax rate is equal to 30% of its effectively connected earnings and profits for the taxable year, as adjusted for certain items, although an applicable income tax treaty between the United States and the non-U.S. holder's country of residence might provide for a lower rate.

Backup withholding and information reporting

Payments of dividends on our common stock will not be subject to backup withholding, provided the non-U.S. holder certifies its non-U.S. status, such as by furnishing a valid IRS Form W-8BEN, W-8BEN-E or W-8ECI (and we or our paying agent do not have actual knowledge or reason to know the holder is a U.S. person or that the conditions of any other exemption are not, in fact, satisfied), or otherwise establishes an exemption. However, information returns are required to be filed with the IRS in connection with any dividends on our common stock paid to the non-U.S. holder, regardless of whether any tax was actually withheld. Copies of these reports may be made available to tax authorities in the country where the non-U.S. holder resides. In addition, proceeds of the sale or other taxable disposition of our common stock within the United States or conducted through certain U.S.-related brokers generally will not be subject to backup withholding or information reporting if the applicable withholding agent receives the certification described above or the non-U.S. holder otherwise establishes an exemption. Proceeds of a disposition of our common stock conducted through a non-U.S. office of a non-U.S. broker that does not have certain enumerated relationships with the United States generally will not be subject to backup withholding or information reporting. The backup withholding rate is currently 24%.

Backup withholding is not an additional tax. Any amounts withheld from a payment to a holder of our common stock under the backup withholding rules can be credited against any U.S. federal income tax liability of the holder and may entitle the holder to a refund from the IRS, provided that the required information is furnished to the IRS in a timely manner.

Foreign account tax compliance act, or FATCA

FATCA imposes U.S. federal withholding tax of 30% on certain types of U.S. source "withholdable payments" (including dividends and the gross proceeds from the sale, exchange or other taxable disposition of U.S. stock) to "foreign financial institutions," which are broadly defined for this purpose, and other non-U.S. entities in connection with the failure to comply with certain certification and information reporting requirements regarding U.S. account holders or owners of such institutions or entities. The obligation to withhold under FATCA applies to any dividends on our common stock. While withholding under FATCA would have applied also, to gross proceeds from the sale, exchange or other taxable disposition of our common stock paid after December 31, 2018 and to certain "pass-thru" payments received with respect to instruments held through foreign financial institutions after the later of December 31, 2018 and the date on which applicable final Treasury regulations are issued, recently proposed Treasury regulations eliminate FATCA withholding on payments of gross proceeds entirely and limit FATCA withholding on these "pass-thru" payments to those payments made two years after the date on which applicable final Treasury regulations are issued. Taxpayers generally may rely on these proposed Treasury regulations until final Treasury regulations are issued. An intergovernmental agreement between the United States and an applicable foreign country may modify the requirements described in this paragraph. Non-U.S. holders should consult their own tax advisors regarding the possible implications of FATCA on their investment in our common stock.

The preceding discussion of U.S. federal income tax considerations is for general information only. It is not tax advice. Each prospective investor should consult its own tax advisor regarding the particular U.S. federal, state, local and non-U.S. tax consequences of the sale, exchange or other taxable disposition of our common stock, including the consequences of any proposed change in applicable laws.

PLAN OF DISTRIBUTION

We have entered into a sales agreement with Cowen, under which we may issue and sell from time to time up to $50.0 million of our common stock through Cowen as our sales agent. Sales of our common stock, if any, will be made at market prices by any method that is deemed to be an “at the market” offering as defined in Rule 415 under the Securities Act, including sales made directly on the Nasdaq Global Select Market or any other trading market for our common stock. If authorized by us in writing, Cowen may purchase shares of our common stock as principal.

Cowen will offer our common stock subject to the terms and conditions of the sales agreement on a daily basis or as otherwise agreed upon by us and Cowen. We will designate the maximum amount of common stock to be sold through Cowen on a daily basis or otherwise determine such maximum amount together with Cowen. Subject to the terms and conditions of the sales agreement, Cowen will use its commercially reasonable efforts to sell on our behalf all of the shares of common stock requested to be sold by us. We may instruct Cowen not to sell common stock if the sales cannot be effected at or above the price designated by us in any such instruction. Cowen or we may suspend the offering of our common stock being made through Cowen under the sales agreement upon proper notice to the other party. Cowen and we each have the right, by giving written notice as specified in the sales agreement, to terminate the sales agreement in each party’s sole discretion at any time.

The aggregate compensation payable to Cowen as sales agent equals 3.0% of the gross sales price of the shares sold through it pursuant to the sales agreement. We have also agreed to reimburse Cowen up to $60,000 of Cowen’s expenses, including actual outside legal expenses incurred by Cowen in connection with this offering (inclusive of up to $10,000 for associated legal expenses of Cowen’s outside counsel for filings with FINRA). We estimate that the total expenses of the offering payable by us, excluding commissions payable to Cowen under the sales agreement, will be approximately $360,000.

The remaining sales proceeds, after deducting any expenses payable by us and any transaction fees imposed by any governmental, regulatory, or self-regulatory organization in connection with the sales, will equal our net proceeds for the sale of such common stock.

Cowen will provide written confirmation to us following the close of trading on the Nasdaq Global Select Market on each day in which common stock is sold through it as sales agent under the sales agreement. Each confirmation will include the number of shares of common stock sold through it as sales agent on that day, the volume weighted average price of the shares sold, the percentage of the daily trading volume and the net proceeds to us.

We will report at least quarterly the number of shares of common stock sold through Cowen under the sales agreement, the net proceeds to us and the compensation paid by us to Cowen in connection with the sales of common stock.

Settlement for sales of common stock will occur, unless the parties agree otherwise, on the second business day that is also a trading day following the date on which any sales were made in return for payment of the net proceeds to us. There is no arrangement for funds to be received in an escrow, trust or similar arrangement.

In connection with the sales of our common stock on our behalf, Cowen will be deemed to be an “underwriter” within the meaning of the Securities Act, and the compensation paid to Cowen will be deemed to be underwriting commissions or discounts. We have agreed in the sales agreement to provide indemnification and contribution to Cowen against certain liabilities, including liabilities under the Securities Act. As sales agent, Cowen will not engage in any transactions that stabilizes our common stock.

Our common stock is listed on the Nasdaq Global Select Market and trades under the symbol “TWST.” The transfer agent of our common stock is American Stock Transfer Trust Company, LLC.

Cowen and/or its affiliates have provided, and may in the future provide, various investment banking and other financial services for us for which services they have received and, may in the future receive, customary fees.

LEGAL MATTERS

The validity of the issuance of our common stock offered in this prospectus supplement and the accompanying prospectus will be passed upon for us by Orrick, Herrington & Sutcliffe LLP, 1000 Marsh Road, Menlo Park, California 94025. Latham & Watkins LLP, 140 Scott Drive, Menlo Park, California 94025, is acting as counsel for the sales agent in connection with this offering.

EXPERTS

The financial statements incorporated in this prospectus supplement and the accompanying prospectus by reference to the Annual Report on Form 10-K for the year ended September 30, 2019 have been so incorporated in reliance on the report of PricewaterhouseCoopers LLP, an independent registered public accounting firm, given on the authority of said firm as experts in auditing and accounting.

WHERE YOU CAN FIND MORE INFORMATION; INCORPORATION BY REFERENCE

Available Information

We filed with the SEC a registration statement on Form S-3 under the Securities Act with respect to the shares of common stock offered hereby. This prospectus supplement and the accompanying prospectus, which constitutes a part of the registration statement, does not contain all of the information set forth in the registration statement or the exhibits filed with the registration statement. For further information about us and the common stock offered hereby, we refer you to the registration statement and the exhibits filed with the registration statement. Statements contained in this prospectus supplement and the accompanying prospectus regarding the contents of any contract or any other document that is filed as an exhibit to the registration statement are not necessarily complete, and each such statement is qualified in all respects by reference to the full text of such contract or other document filed as an exhibit to the registration statement.

We are subject to the information and reporting requirements of the Exchange Act and, in accordance with this law, are required to file periodic reports, proxy statements and other information with the SEC. We file annual, quarterly and current reports, proxy statements and other information with the SEC. Our SEC filings are available to the public at the SEC's website at http://www.sec.gov.

Incorporation by Reference

The SEC allows us to "incorporate by reference" information that we file with them. Incorporation by reference allows us to disclose important information to you by referring you to those other documents. The information incorporated by reference is an important part of this prospectus supplement and the accompanying prospectus, and information that we file later with the SEC will automatically update and supersede this information. We filed a registration statement on Form S-3 under the Securities Act, with the SEC with respect to the securities being offered pursuant to this prospectus supplement and the accompanying prospectus. This prospectus supplement and the accompanying prospectus omit certain information contained in the registration statement, as permitted by the SEC. You should refer to the registration statement, including the exhibits, for further information about us and the securities being offered pursuant to this prospectus supplement and the accompanying prospectus. Statements in this prospectus supplement and the accompanying prospectus regarding the provisions of certain documents filed with, or incorporated by reference in, the registration statement are not necessarily complete and each statement is qualified in all respects by that reference. Copies of all or any part of the registration statement, including the documents incorporated by reference or the exhibits, may be obtained upon payment of the prescribed rates at the offices of the SEC listed above in "Where You Can Find More Information." The documents we are incorporating by reference are (other than those documents or the portions of those documents not deemed to be filed):

- Annual Report on Form 10-K for the year ended September 30, 2019, as filed with the SEC on December 13, 2019;
- Our Current Report on Form 8-K filed with the SEC on October 25, 2019 (in each case, except for information contained therein which is furnished rather than filed);
- The description of our common stock contained in our registration statement on Form 8-A, which was filed with the SEC on October 25, 2018, including any amendment or report filed for the purpose of updating such description; and
- All documents filed by Twist Bioscience Corporation under Sections 13(a), 13(c), 14 or 15(d) of the Exchange Act, that are filed (excluding, however, information we furnish to the SEC) (i) by us after the date of the initial registration statement and prior to its effectiveness and (ii) by us after the date of this prospectus and prior to the termination of any offering under this registration statement.

Any statement contained in this prospectus supplement and the accompanying prospectus, or in a document all or a portion of which is incorporated by reference, shall be modified or superseded for purposes of this prospectus supplement to the extent that a statement contained in this prospectus supplement and the accompanying prospectus, any applicable prospectus supplement and any related free writing prospectus or any document incorporated by reference modifies or supersedes such statement. Any such statement so modified or superseded shall not, except as so modified or superseded, constitute a part of this prospectus supplement and the accompanying prospectus.

Upon request, we will provide, without charge, to each person, including any beneficial owner, to whom a copy of this prospectus supplement and the accompanying prospectus is delivered a copy of the documents incorporated by reference into this prospectus supplement. You may request a copy of these filings, and any exhibits we have specifically incorporated by reference as an exhibit in this prospectus supplement and the accompanying prospectus, at no cost by writing or telephoning us at the following:

Twist Bioscience Corporation
681 Gateway Blvd.
South San Francisco, CA 94080
Telephone: (800) 719-0671

You may also access these documents, free of charge on the SEC's website at www.sec.gov or on the "Investors" page of our website at www.twistbioscience.com. Information contained on our website is not incorporated by reference into this prospectus supplement and the accompanying prospectus, and you should not consider any information on, or that can be accessed from, our website as part of this prospectus supplement or the accompanying prospectus.

This prospectus supplement and the accompanying prospectus is part of a registration statement we filed with the SEC. We have incorporated exhibits into this registration statement. You should read the exhibits carefully for provisions that may be important to you.

We have not authorized anyone to provide you with information other than what is incorporated by reference or provided in this prospectus supplement and the accompanying prospectus. We are not making an offer of these securities in any state where such offer is not permitted. You should not assume that the information in this prospectus supplement and the accompanying prospectus or in the documents incorporated by reference is accurate as of any date other than the date on the front of this prospectus supplement and the accompanying prospectus or those documents.

PROSPECTUS

$200,000,000
Common Stock
Preferred Stock
Debt Securities
Warrants
Units

From time to time, we may offer, issue and sell up to $200,000,000 of any combination of the securities described in this prospectus in one or more offerings. We may also offer securities as may be issuable upon conversion, redemption, repurchase, exchange or exercise of any securities registered hereunder, including any applicable antidilution provisions.

This prospectus provides a general description of the securities we may offer. Each time we offer securities, we will provide specific terms of the securities offered in a supplement to this prospectus. We may also authorize one or more free writing prospectuses to be provided to you in connection with these offerings. The prospectus supplement and any related free writing prospectus may also add, update or change information contained in this prospectus. You should carefully read this prospectus, the applicable prospectus supplement and any related free writing prospectus, as well as any documents incorporated by reference, before you invest in any of the securities being offered.

This prospectus may not be used to sell our securities unless accompanied by a prospectus supplement. The prospectus supplement or any related free writing prospectus may also add to, update, supplement or clarify information contained in this prospectus.

Our common stock is traded on the Nasdaq Global Select Market under the symbol “TWST”. The last reported sales price of our common stock on the Nasdaq Global Select Market on November 5, 2019 was $22.98 per share.

We may offer and sell our securities to or through one or more agents, underwriters, dealers or other third parties or directly to one or more purchasers on a continuous or delayed basis. If agents, underwriters or dealers are used to sell our securities, we will name them and describe their compensation in a prospectus supplement. The price to the public of our securities and the net proceeds we expect to receive from the sale of such securities will also be set forth in a prospectus supplement.

Investing in our securities involves a high degree of risk. You should review carefully the risks and uncertainties referenced under the heading “Risk Factors” on page 5 of this prospectus as well as those contained in the applicable prospectus supplement and any related free writing prospectus, and in the other documents that are incorporated by reference into this prospectus or the applicable prospectus supplement.

NEITHER THE SECURITIES AND EXCHANGE COMMISSION NOR ANY STATE SECURITIES COMMISSION HAS APPROVED OR DISAPPROVED OF THESE SECURITIES OR DETERMINED IF THIS PROSPECTUS IS TRUTHFUL OR COMPLETE. ANY REPRESENTATION TO THE CONTRARY IS A CRIMINAL OFFENSE.

The date of this prospectus is , 2019.

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We are responsible for the information contained and incorporated by reference in this prospectus, in any accompanying prospectus supplement, and in any related free writing prospectus we prepare or authorize. We have not authorized anyone to give you any other information, and we take no responsibility for any other information that others may give you. If you are in a jurisdiction where offers to sell, or solicitations of offers to purchase, the securities offered by this documentation are unlawful, or if you are a person to whom it is unlawful to direct these types of activities, then the offer presented in this document does not extend to you. The information contained in this document speaks only as of the date of this document, unless the information specifically indicates that another date applies. Neither the delivery of this prospectus or any accompanying prospectus supplement, nor any sale of securities made under these documents, will, under any circumstances, create any implication that there has been no change in our affairs since the date of this prospectus, any accompanying prospectus supplement or any free writing prospectus we may provide you in connection with an offering or that the information contained or incorporated by reference is correct as of any time subsequent to the date of such information. You should assume that the information in this prospectus or any accompanying prospectus supplement, as well as the information incorporated by reference in this prospectus or any accompanying prospectus supplement, is accurate only as of the date of the documents containing the information, unless the information specifically indicates that another date applies. Our business, financial condition, results of operations and prospects may have changed since those date

ABOUT THIS PROSPECTUS

This prospectus provides you with a general description of our securities being offered. You should read this prospectus together with the additional information described under the heading “Where You Can Find Additional Information” and “Incorporation of Certain Information by Reference.”

Under this shelf registration, we may offer shares of our common stock and preferred stock, various series of warrants to purchase common stock or preferred stock, debt securities or any combination thereof, from time to time in one or more offerings. This prospectus only provides you with a general description of the securities we may offer. Each time we offer a type or series of securities under this prospectus, we will provide a prospectus supplement that will contain more specific information about the specific terms of the offering. We may also authorize one or more free writing prospectuses to be provided to you that may contain material information relating to these offerings. This prospectus may not be used to sell our securities unless accompanied by a prospectus supplement. Each such prospectus supplement and any free writing prospectus that we may authorize to be provided to you may also add, update or change information contained in this prospectus or in documents incorporated by reference into this prospectus. We urge you to carefully read this prospectus, any applicable prospectus supplement and any related free writing prospectus, together with the information incorporated herein by reference as described under the headings “Where You Can Find Additional Information” and “Incorporation of Certain Information by Reference” before you invest in our securities.

We have not authorized anyone to provide you with information in addition to or different from that contained in this prospectus, any applicable prospectus supplement and any related free writing prospectus. We take no responsibility for, and can provide no assurances as to the reliability of, any information not contained in this prospectus, any applicable prospectus supplement or any related free writing prospectus that we may authorize to be provided to you. This prospectus is an offer to sell only the securities offered hereby, but only under circumstances and in jurisdictions where it is lawful to do so. You should assume that the information in this prospectus, any applicable prospectus supplement or any related free writing prospectus is accurate only as of the date on the front of the document and that any information incorporated by reference is accurate only as of the date of the document incorporated by reference, regardless of the time of delivery of this prospectus, any applicable prospectus supplement or any related free writing prospectus, or any sale of a security.

This prospectus contains summaries of certain provisions contained in some of the documents described herein, but reference is made to the actual documents for complete information. All of the summaries are qualified in their entirety by the actual documents. Copies of some of the documents referred to herein have been filed, will be filed or will be incorporated by reference as exhibits to the registration statement of which this prospectus is a part, and you may obtain copies of those documents as described below under the heading “Where You Can Find Additional Information”.

Unless otherwise mentioned or unless the context requires otherwise, throughout this prospectus, any applicable prospectus supplement and any related free writing prospectus, the words “Twist”, “we”, “us”, “our”, the “company” or similar references refer to Twist Bioscience Corporation and its subsidiaries; and the term “securities” refers collectively to our common stock, preferred stock, warrants to purchase common stock or preferred stock, debt securities, or any combination of the foregoing securities.

We own various U.S. federal trademark registrations and applications and unregistered trademarks, including our corporate logo. This prospectus and the information incorporated herein by reference contains references to trademarks, service marks and trade names owned by us or other

companies. Solely for convenience, trademarks, service marks and trade names referred to in this prospectus and the information incorporated herein, including logos, artwork, and other visual displays, may appear without the ® or TM symbols, but such references are not intended to indicate, in any way, that we will not assert, to the fullest extent under applicable law, our rights or the rights of the applicable licensor to these trademarks, service marks and trade names. We do not intend our use or display of other companies' trade names, service marks or trademarks to imply a relationship with, or endorsement or sponsorship of us by, any other companies. All trademarks, service marks and trade names included or incorporated by reference into this prospectus, any applicable prospectus supplement or any related free writing prospectus are the property of their respective owners.

COMPANY OVERVIEW

We are a leading and rapidly growing synthetic biology company that has developed a disruptive DNA synthesis platform to industrialize the engineering of biology. The core of our platform is a proprietary technology that pioneers a new method of manufacturing synthetic DNA by “writing” DNA on a silicon chip. We have combined this technology with proprietary software, scalable commercial infrastructure, and an e-commerce platform to create an integrated technology platform that enables us to achieve high levels of quality, precision, automation, and manufacturing throughput at a significantly lower cost than our competitors. We are leveraging our unique technology to manufacture a broad range of synthetic DNA-based products, including synthetic genes, tools for next-generation sample preparation, and antibody libraries for drug discovery and development.

Additionally, we believe our platform will enable new value-add opportunities, such as discovery partnerships for biologic drugs, and will enable new applications for synthetic DNA, such as digital data storage. We sell our synthetic DNA and synthetic DNA-based products to a customer base of over 1,000 customers across a broad range of industries. We launched the first application of our platform, synthetic genes and oligo pools, in April 2016 to disrupt the gene synthesis market and make legacy DNA synthesis methods obsolete.

We have also leveraged the versatility of our platform to expand our product portfolio into other markets in which we believe we have a competitive advantage. In February 2018, we launched an innovative and comprehensive preparation kit for next-generation sequencing at the Advances in Genome Biology and Technology conference. In February 2019, we announced an expansion of next generation sequencing product offerings including Twist Fast Hybridization and wash kits. Our kit leverages our platform to precisely synthesize oligo pools and uniformly amplify the desired target DNA segments, accelerating the hybridization process and considerably improving the accuracy of the downstream sequencing analysis. We have also commercialized a custom DNA library solution which enables more effective biologic drug discovery and development for our customers. We believe we can further leverage our platform to develop other proprietary tools, such as our GPCR library and antibody optimization solution, to provide services in biologics drug discovery and early development, from target to Investigational New Drug (IND) application, adding value as a partner to biotech and pharmaceutical companies. We also aim to explore the development of DNA as a digital data storage medium via internal research and industry partnerships.

We have built a scalable commercial platform that enables us to reach a diverse customer base that we believe includes over 100,000 synthetic DNA users today. To address this diverse customer base, we have employed a multi-channel strategy comprised of a direct sales force targeting synthetic DNA customers, a direct sales force focusing on the NGS market, international distributors, and an e-commerce platform. We launched our proprietary, innovative, and easy-to-use e-commerce platform in October 2017 to existing customers and expanded access to the general public in January 2018. Our platform allows customers to design, validate and place on-demand orders of customized DNA online. This is a key component of our strategy to address and support our diverse and growing customer base, as well as support commercial productivity, enhance the customer experience, and promote loyalty.

CORPORATE INFORMATION

We were incorporated in Delaware on February 4, 2013. Our principal executive offices are located at 681 Gateway Blvd., South San Francisco, CA 94080. Our telephone number at that location is (800) 719-0671. References in the prospectus, and the information incorporate by reference herein, to “we,” “our,” “us,” “Twist Bioscience” and the “company” refer to Twist Bioscience Corporation and, where appropriate, its wholly-owned subsidiaries unless the context requires otherwise. Our corporate website address is www.twistbioscience.com. The information contained on our website is not incorporated by reference into this prospectus, and you should not consider any information contained on, or that can be accessed through, our website to be part of this prospectus. We have included our website address only as an inactive textual reference and do not intend it to be an active link to our website.

We will remain an emerging growth company until the earliest of (i) the last day of the fiscal year in which we have total annual gross revenue of $1.07 billion or more; (ii) the last day of our fiscal year following the fifth anniversary of the date of the closing of our initial public offering; (iii) the date on which we have issued more than $1.0 billion in nonconvertible debt during the previous three years; or (iv) the date on which we are deemed to be a large accelerated filer under the rules of the SEC.

We are also a “smaller reporting company,” meaning that the market value of our stock held by non-affiliates plus the proposed aggregate amount of gross proceeds to us as a result of this offering is less than $700 million and our annual revenue is less than $100 million during the most recently completed fiscal year. We may continue to be a smaller reporting company if either (i) the market value of our stock held by non-affiliates is less than $250 million or (ii) our annual revenue is less than $100 million during the most recently completed fiscal year and the market value of our stock held by non-affiliates is less than $700 million. If we are a smaller reporting company at the time we cease to be an emerging growth company, we may continue to rely on exemptions from certain disclosure requirements that are available to smaller reporting companies. Specifically, as a smaller reporting company we may choose to present only the two most recent fiscal years of audited financial statements in our Annual Report on Form 10-K and, similar to emerging growth companies, smaller reporting companies have reduced disclosure obligations regarding executive compensation.

RISK FACTORS

Investing in our securities involves a high degree of risk. You should carefully consider the risks and uncertainties described in the documents incorporated by reference in this prospectus and any prospectus supplement, as well as other information we include or incorporate by reference into this prospectus and any applicable prospectus supplement, before making an investment decision. Our business, financial condition or results of operations could be materially adversely affected by the materialization of any of these risks. The trading price of our securities could decline due to the materialization of any of these risks, and you may lose all or part of your investment. This prospectus and the documents incorporated herein by reference also contain forward-looking statements that involve risks and uncertainties. Actual results could differ materially from those anticipated in these forward-looking statements as a result of certain factors, including the risks described under the headings “Risk Factors” in the documents incorporated herein by reference, including in our Annual Report on Form 10-K for the year ended September 30, 2018, in any applicable prospectus supplement and any risk factors set forth in our other filings with the SEC pursuant to Sections 13(a), 13(c), 14 or 15(d) of the Exchange Act, including our Quarterly Reports on Form 10-Q and our Current Reports on Form 8-K, before making an investment decision.

CAUTIONARY STATEMENT REGARDING FORWARD-LOOKING STATEMENTS

This prospectus, including the documents that we incorporate by reference, contains forward-looking statements within the meaning of Section 27A of the Securities Act of 1933, as amended, or the Securities Act, and Section 21E of the Securities Exchange Act of 1934, as amended, or the Exchange Act. Any statements about our expectations, beliefs, plans, objectives, assumptions or future events or performance are not historical facts and may be forward-looking. These statements are often, but are not always, made through the use of words or phrases such as “anticipate,” “believe,” “contemplate,” “continue,” “could,” “estimate,” “expect,” “intend,” “may,” “plan,” “potential,” “predict,” “project,” “seek,” “should,” “target,” “will,” “would,” or the negative of these words or other comparable terminology. Accordingly, these statements involve estimates, assumptions and uncertainties which could cause actual results to differ materially from those expressed in them. Any forward-looking statements are qualified in their entirety by reference to the factors discussed throughout this prospectus, and in particular those factors referenced in the section “Risk Factors.”

This prospectus, including the sections entitled “About this Prospectus” and “Risk Factors,” contains forward-looking statements that are based on our management’s belief and assumptions and on information currently available to our management. These statements relate to future events or our future financial performance, and involve known and unknown risks, uncertainties and other factors that may cause our actual results, levels of activity, performance or achievements to be materially different from any future results, levels of activity, performance or achievements expressed or implied by these forward-looking statements. Forward-looking statements include, but are not limited to, statements about:

- our ability to increase our revenue and our revenue growth rate;
- estimates of our expenses, future revenues, capital requirements and our needs for additional financing; our estimates of the size of our market opportunities;
- our expectations regarding our ability to increase DNA production, reduce turnaround times and drive cost reductions for our customers;
- our expectations regarding our ability to effectively produce and deliver our sample preparation kits for next generation sequencing, and the kits’ ability to leverage our platform to improve the accuracy of the downstream sequencing analysis;
- our ability to obtain relevant ISO certifications for our South San Francisco manufacturing facility on a timely basis;
- our ability to effectively manage our growth;
- our ability to successfully enter new markets and manage the expansion of our next generation sequencing kits in the Chinese market;
- our ability to protect our intellectual property, including our proprietary DNA synthesis platform and technology related to our next generation sample preparation kits;
- costs associated with defending intellectual property infringement and other claims;
- the effects of increased competition in our business;
- our ability to keep pace with changes in technology and our competitors;
- our ability to successfully identify, evaluate and manage any future acquisitions of businesses, solutions or technologies;
- the success of our marketing efforts;
- the potential purchases of common stock by certain of our existing stockholders and their affiliated entities, including stockholders who are associated with certain of our directors;
- a significant disruption in, or breach in security of our information technology systems and resultant interruptions in service and any related impact on our reputation;

- the attraction and retention of qualified employees and key personnel;
- the effects of natural or man-made catastrophic events;
- the effectiveness of our internal controls;
- changes in government regulation affecting our business;
- the impact of adverse economic conditions; and
- other risk factors included under the section titled “Risk Factors.”

You should not rely upon forward-looking statements as predictions of future events. Such statements are based on management’s expectations as of the date of this filing and involve many risks and uncertainties that could cause our actual results, events or circumstances to differ materially from those expressed or implied in our forward-looking statements. Such risks and uncertainties include those risks more fully discussed in the “Risk Factors” section in this prospectus, the section of any accompanying prospectus supplement entitled “Risk Factors” and the risk factors and cautionary statements described in other documents that we file from time to time with the SEC, specifically under “Item 1A: Risk Factors” and elsewhere in our most recent Annual Report on Form 10-K for the period ended December 31, 2018, and our Current Reports on Form 8-K.

Given these uncertainties, readers should not place undue reliance on our forward-looking statements. These forward-looking statements speak only as of the date on which the statements were made and are not guarantees of future performance. Except as may be required by applicable law, we do not undertake to update any forward-looking statements after the date of this prospectus or the respective dates of documents incorporated by reference herein or therein that include forward-looking statements.

USE OF PROCEEDS

We intend to use the net proceeds from the sale of the securities as set forth in the applicable prospectus supplement.

DESCRIPTION OF OUR CAPITAL STOCK

General

The following is a summary of the rights of our common stock and preferred stock and certain provisions of our amended and restated certificate of incorporation and amended and restated bylaws as they are currently in effect, which we refer to in this section as our certificate of incorporation and bylaws, respectively. This summary does not purport to be complete and is qualified in its entirety by the provisions of our certificate of incorporation and bylaws, copies of which have been filed with the SEC.

As of the date of this prospectus, our authorized capital stock consists of 110,000,000 shares, of which 100,000,000 shares, par value $0.00001 per share, are designated as common stock, and 10,000,000 shares, par value $0.00001 per share, are designated as preferred stock. As of September 30, 2019, there were 32,872,675 shares of common stock outstanding. No shares of preferred stock are currently outstanding.

Common Stock

The holders of our common stock are entitled to one vote per share on all matters to be voted on by our stockholders. Holders of common stock are entitled to receive such dividends as may be declared by the board of directors out of funds legally available therefor. In the event of our liquidation, dissolution or winding up, holders of common stock are entitled to share ratably in all assets remaining after payment of liabilities and distribution of the liquidation preferences of any then outstanding shares of preferred stock. There are no redemption or sinking fund provisions applicable to the common stock.

The prospectus supplement relating to any common stock being offered will include specific terms relating to the offering.

Stock Exchange Listing

Our common stock is listed on The Nasdaq Global Select Market. The trading symbol for our common stock is “TWST.”

Transfer Agent and Registrar

The transfer agent and registrar for our common stock is American Stock Transfer & Trust Company, LLC. The transfer agent and registrar’s address is 6201 15th Avenue, Brooklyn, NY 11219, and its telephone number is (718) 921-8124.

Preferred Stock

Our board of directors has the authority, without further action by our stockholders, to designate and issue up to the total number of authorized shares of preferred stock in one or more series and to fix the rights, preferences, privileges and restrictions granted to or imposed upon each such series of preferred stock, including dividend rights, dividend rate, conversion rights, voting rights, rights and terms of redemption, redemption prices, liquidation preference and sinking fund terms, any or all of which may be greater than or senior to the rights of the common stock. The issuance of preferred stock could adversely affect the voting power of holders of common stock and reduce the likelihood that such holders will receive dividend payments or payments upon liquidation. Such issuance could have the effect of decreasing the market price of the common stock. The issuance of preferred stock or even the ability to issue preferred stock could also have the effect of delaying, deterring or preventing a change of control or other corporate action.

Anti-Takeover Effects of Delaware Law and Our Certificate of Incorporation and Bylaws

Our amended and restated certificate of incorporation and our amended and restated bylaws contain certain provisions that could have the effect of delaying, deterring or preventing another party

from acquiring control of us. These provisions and certain provisions of Delaware law, which are summarized below, are expected to discourage coercive takeover practices and inadequate takeover bids. These provisions are also designed, in part, to encourage persons seeking to acquire control of us to negotiate first with our board of directors. We believe that the benefits of increased protection of our potential ability to negotiate more favorable terms with an unfriendly or unsolicited acquirer outweigh the disadvantages of discouraging a proposal to acquire us.

Undesignated preferred stock

As discussed above, our board of directors has the ability to issue preferred stock with voting or other rights or preferences that could impede the success of any attempt to change control of us. These and other provisions may have the effect of deterring hostile takeovers or delaying changes in control or management of our company.

Limits on ability of stockholders to act by written consent or call a special meeting

Our amended and restated certificate of incorporation provides that our stockholders may not act by written consent, which may lengthen the amount of time required to take stockholder actions. As a result, a holder controlling a majority of our capital stock would not be able to amend our bylaws or remove directors without holding a meeting of our stockholders called in accordance with our bylaws.

In addition, our amended and restated bylaws provide that special meetings of the stockholders may be called only by the majority of our board of directors. Stockholders may not call a special meeting, which may delay the ability of our stockholders to force consideration of a proposal or for holders controlling a majority of our capital stock to take any action, including the removal of directors.

Requirements for advance notification of stockholder nominations and proposals

Our amended and restated bylaws establish advance notice procedures with respect to stockholder proposals and the nomination of candidates for election as directors, other than nominations made by or at the direction of our board of directors or a committee of our board of directors. These provisions may have the effect of precluding the conduct of certain business at a meeting if the proper procedures are not followed. These provisions may also discourage or deter a potential acquirer from conducting a solicitation of proxies to elect the acquirer’s own slate of directors or otherwise attempting to obtain control of our company.

Board classification

Our board of directors is divided into three classes, one class of which is elected each year by our stockholders. The directors in each class serve three-year terms. For more information on the classified board, see “Directors, executive officers and corporate governance” in our Annual Report on Form 10-K for the fiscal year ended September 30, 2018. A third party may be discouraged from making a tender offer or otherwise attempting to obtain control of us as it is it more difficult and time-consuming for stockholders to replace a majority of the directors on a classified board.

No cumulative voting

Our amended and restated certificate of incorporation and amended and restated bylaws do not provide for cumulative voting in the election of directors. Cumulative voting allows a stockholder to vote a portion or all of its shares for one or more candidates for seats on the board of directors. Without cumulative voting, a minority stockholder may not be able to gain as many seats on our board of directors as the stockholder would be able to gain if cumulative voting were permitted. The absence of cumulative voting makes it more difficult for a minority stockholder to gain a seat on our board of directors to influence our board’s decision regarding a takeover.

Amendment of charter and bylaws provisions

The amendment of the above provisions of our amended and restated certificate of incorporation requires approval by holders of at least two thirds of our outstanding capital stock entitled to vote generally in the election of directors. The amendment of certain provisions of our bylaws also requires approval by the holders of at least two thirds of our outstanding capital stock entitled to vote generally in the election of directors.

Delaware anti-takeover statute

We are subject to the provisions of Section 203 of the DGCL regulating corporate takeovers. In general, Section 203 prohibits a publicly held Delaware corporation from engaging, under certain circumstances, in a business combination with an interested stockholder for a period of three years following the date the person became an interested stockholder unless:

- prior to the date of the transaction, our board of directors approved either the business combination or the transaction which resulted in the stockholder becoming an interested stockholder;
- upon completion of the transaction that resulted in the stockholder becoming an interested stockholder, the interested stockholder owned at least 85% of the voting stock of the corporation outstanding at the time the transaction commenced, calculated as provided under Section 203; or
- at or subsequent to the date of the transaction, the business combination is approved by our board of directors and authorized at an annual or special meeting of stockholders, and not by written consent, by the affirmative vote of at least two-thirds of the outstanding voting stock which is not owned by the interested stockholder.

Generally, a business combination includes a merger, asset or stock sale, or other transaction resulting in a financial benefit to the interested stockholder. An interested stockholder is a person who, together with affiliates and associates, owns or, within three years prior to the determination of interested stockholder status, did own 15% or more of a corporation's outstanding voting stock. We expect the existence of this provision to have an anti-takeover effect with respect to transactions our board of directors does not approve in advance. We anticipate that Section 203 may also discourage attempts that might result in a premium over the market price for the shares of common stock held by stockholders.

The provisions of Delaware law and the provisions of our amended and restated certificate of incorporation and amended and restated bylaws, as amended upon the completion of this offering, could have the effect of discouraging others from attempting hostile takeovers and, as a consequence, they might also inhibit temporary fluctuations in the market price of our common stock that often result from actual or rumored hostile takeover attempts. These provisions might also have the effect of preventing changes in our management. It is possible that these provisions could make it more difficult to accomplish transactions that stockholders might otherwise deem to be in their best interests.

Our amended and restated certificate of incorporation provides that the Court of Chancery of the State of Delaware is the sole and exclusive forum for any derivative action or proceeding brought on our behalf, any action asserting a breach of fiduciary duty owed by any of our directors, officers or other employees to us or our stockholders, any action asserting a claim against us arising pursuant to any provisions of the DGCL, our amended and restated certificate of incorporation or our amended and restated bylaws, any action or proceeding asserting a claim as to which the Delaware General Corporation Law confers jurisdiction upon the Court of Chancery of the State of Delaware or any action asserting a claim against us that is governed by the internal affairs doctrine, subject in each case to the Court of Chancery having personal jurisdiction over the parties named as defendants therein. Our

amended and restated certificate of incorporation further provides that the federal district courts of the United States will be the exclusive forum for resolving any complaint asserting a cause of action arising under the Securities Act. Although our amended and restated certificate of incorporation contains the choice of forum provision described above, it is possible that a court could find that such a provision is inapplicable for a particular claim or action or that such provision is unenforceable.

DESCRIPTION OF OUR DEBT SECURITIES

The debt securities will constitute either senior or subordinated debt of Twist Bioscience Corporation. The debt securities that are sold may be exchangeable for and/or convertible into shares of common stock or any of the other securities that may be sold under this prospectus. The debt securities will be issued under one or more separate indentures between us and a designated trustee. We will include in a prospectus supplement the specific terms of each series of senior or subordinated debt securities being offered, including the terms, if any, on which a series of senior or subordinated debt securities may be convertible into or exchangeable for other securities. In addition, the material terms of any indenture, which will govern the rights of the holders of our senior or subordinated debt securities will be set forth in the applicable prospectus supplement.

DESCRIPTION OF OUR WARRANTS

We may issue warrants to purchase our debt or equity securities or securities of third parties or other rights, including rights to receive payment in cash or securities based on the value, rate or price of one or more specified commodities, currencies, securities or indices, or any combination of the foregoing. Warrants may be issued independently or together with any other securities and may be attached to, or separate from, such securities. Each series of warrants will be issued under a separate warrant agreement to be entered into between us and a warrant agent. The terms of any warrants to be issued and a description of the material provisions of the applicable warrant agreement will be set forth in the applicable prospectus supplement.

DESCRIPTION OF OUR UNITS

As specified in the applicable prospectus supplement, we may issue units consisting of one or more shares of common stock, shares of preferred stock, debt securities or warrants or any combination of such securities.

PLAN OF DISTRIBUTION

We may sell our securities from time to time in one or more transactions. We may sell our securities to or through agents, underwriters, dealers, remarketing firms or other third parties or directly to one or more purchasers or through a combination of any of these methods. In some cases, we or dealers acting with us or on behalf of us may also purchase our securities and reoffer them to the public. We may also offer and sell, or agree to deliver, our securities pursuant to, or in connection with, any option agreement or other contractual arrangement.

Agents whom we designate may solicit offers to purchase our securities.

- We will name any agent involved in offering or selling our securities, and disclose any commissions that we will pay to the agent, in the applicable prospectus supplement.
- Unless we indicate otherwise in the applicable prospectus supplement, agents will act on a best efforts basis for the period of their appointment.
- Agents may be deemed to be underwriters under the Securities Act, of any of our securities that they offer or sell.

We may use an underwriter or underwriters in the offer or sale of our securities.

- If we use an underwriter or underwriters, we will execute an underwriting agreement with the underwriter or underwriters at the time that we reach an agreement for the sale of our securities.
- We will include the names of the specific managing underwriter or underwriters, as well as the names of any other underwriters, and the terms of the transactions, including the compensation the underwriters and dealers will receive, in the applicable prospectus supplement.
- The underwriters will use the applicable prospectus supplement, together with the prospectus, to sell our securities.

We may use a dealer to sell our securities.

- If we use a dealer, we will sell our securities to the dealer, as principal.
- The dealer will then sell our securities to the public at varying prices that the dealer will determine at the time it sells our securities.
- We will include the name of the dealer and the terms of the transactions with the dealer in the applicable prospectus supplement.

We may solicit directly offers to purchase our securities, and we may directly sell our securities to institutional or other investors. We will describe the terms of direct sales in the applicable prospectus supplement.

We may engage in at-the-market offerings into an existing trading market in accordance with Rule 415(a)(4) of the Securities Act.

We may indemnify agents, underwriters and dealers against certain liabilities, including liabilities under the Securities Act. Agents, underwriters and dealers, or their affiliates, may be customers of, engage in transactions with or perform services for us or our respective affiliates, in the ordinary course of business.

We may authorize agents and underwriters to solicit offers by certain institutions to purchase our securities at the public offering price under delayed delivery contracts.

- If we use delayed delivery contracts, we will disclose that we are using them in the prospectus supplement and will tell you when we will demand payment and when delivery of our securities will be made under the delayed delivery contracts.
- These delayed delivery contracts will be subject only to the conditions that we describe in the prospectus supplement.
- We will describe in the applicable prospectus supplement the commission that underwriters and agents soliciting purchases of our securities under delayed delivery contracts will be entitled to receive.

Unless otherwise specified in connection with a particular underwritten offering of our securities, the underwriters will not be obligated to purchase offered securities unless specified conditions are satisfied, and if the underwriters do purchase any offered securities, they will purchase all offered securities.

In connection with underwritten offerings of the offered securities and in accordance with applicable law and industry practice, the underwriters in certain circumstances are permitted to engage in certain transactions that stabilize the price of our securities. Such transactions consist of bids or purchases for the purpose of pegging, fixing or maintaining the price of our securities. If the underwriters create a short position in our securities in connection with the offering (i.e., if they sell more securities than are set forth on the cover page of the applicable prospectus supplement), the underwriters may reduce that short position by purchasing our securities in the open market or as otherwise provided in the applicable prospectus supplement. The underwriters may also impose a penalty bid, whereby selling concessions allowed to dealers participating in the offering may be reclaimed if the securities sold by them are repurchased in connection with stabilization transactions. In general, purchases of a security for the purpose of stabilization or to reduce a short position could cause the price of the security to be higher than it might be in the absence of such purchases. The imposition of a penalty bid might also have an effect on the price of our securities to the extent that it were to discourage resales of our securities. The underwriters are not required to engage in these activities and may end any of these activities at any time.

We may effect sales of securities in connection with forward sale, option or other types of agreements with third parties. Any distribution of securities pursuant to any forward sale agreement may be effected from time to time in one or more transactions that may take place through a stock exchange, including block trades or ordinary broker’s transactions, or through broker-dealers acting either as principal or agent, or through privately-negotiated transactions, or through an underwritten public offering, or through a combination of any such methods of sale, at market prices prevailing at the time of sale, prices relating to such prevailing market prices or at negotiated or fixed prices.

The specific terms of the lock-up provisions, if any, in respect of any given offering will be described in the applicable prospectus supplement.

LEGAL MATTERS

The validity of the securities being offered by this prospectus will be passed upon by Orrick, Herrington & Sutcliffe LLP, San Francisco, California. Additional legal matters may be passed upon for us or any underwriters, dealers or agents, by counsel that we will name in the applicable prospectus supplement.

EXPERTS

The financial statements incorporated in this Prospectus by reference to the Annual Report on Form 10-K for the year ended September 30, 2018 have been so incorporated in reliance on the report of PricewaterhouseCoopers LLP, an independent registered public accounting firm, given on the authority of said firm as experts in auditing and accounting.

WHERE YOU CAN FIND ADDITIONAL INFORMATION

This prospectus is part of a registration statement we filed with the SEC. This prospectus does not contain all the information set forth in the registration statement and the exhibits to the registration statement. For further information with respect to us and the securities we are offering under this prospectus, we refer you to the registration statement and the exhibits and schedules filed as a part of the registration statement. You should rely only on information contained in this prospectus or incorporated by reference into this prospectus. We have not authorized any person to provide you with different information. We are not making an offer of these securities in any state where the offer is not permitted. You should not assume that the information in this prospectus is accurate as of any date other than the date on the front page of this prospectus, regardless of the time of delivery of this prospectus or any sale of the securities offered by this prospectus.

We file annual, quarterly and current reports, proxy statements and other information with the SEC. Our SEC filings are available to the public at the SEC's website at http://www.sec.gov.

INCORPORATION OF CERTAIN INFORMATION BY REFERENCE

The SEC allows us to "incorporate by reference" the information from other documents we file with the SEC, which means that we can disclose important information to you by referring you to those documents instead of having to repeat the information in this prospectus. The information incorporated by reference is considered to be part of this prospectus, and later information that we file with the SEC will automatically update and supersede this information. We incorporate by reference the documents listed below and any future filings (including those made after the date of the initial filing of the registration statement of which this prospectus is a part and prior to the effectiveness of such registration statement) we will make with the SEC under Sections 13(a), 13(c), 14, or 15(d) of the Exchange Act until the termination of the offering of the shares covered by this prospectus (other than information furnished under Item 2.02 or Item 7.01 of Form 8-K):

- Annual Report on Form 10-K for the year ended September 30, 2018, as filed with the SEC on December 20, 2018;
- Our Quarterly Reports on Form 10-Q for the quarters ended December 31, 2018, March 31, 2019 and June 30, 2019, filed on February 11, 2019, May 2, 2019 and August 9, 2019, respectively;
- Our Current Reports on Form 8-K filed with the SEC on November 7, 2018, November 21, 2018, February 7, 2019, May 23, 2019, July 24, 2019, and October 25, 2019 (in each case, except for information contained therein which is furnished rather than filed);
- The description of our common stock contained in our registration statement on Form 8-A, which was filed with the SEC on October 25, 2018, including any amendment or report filed for the purpose of updating such description; and
- All documents filed by Twist Bioscience Corporation under Sections 13(a), 13(c), 14 or 15(d) of the Exchange Act, that are filed (excluding, however, information we furnish to the SEC) (i) by us after the date of the initial registration statement and prior to its effectiveness and (ii) by us after the date of this prospectus and prior to the termination of any offering under this registration statement.

Any statement contained in this prospectus, or in a document all or a portion of which is incorporated by reference, shall be modified or superseded for purposes of this prospectus to the extent that a statement contained in this prospectus, any applicable prospectus supplement and any related free writing prospectus or any document incorporated by reference modifies or supersedes such statement. Any such statement so modified or superseded shall not, except as so modified or superseded, constitute a part of this prospectus.

Upon request, we will provide, without charge, to each person, including any beneficial owner, to whom a copy of this prospectus is delivered a copy of the documents incorporated by reference into this prospectus. You may request a copy of these filings, and any exhibits we have specifically incorporated by reference as an exhibit in this prospectus, at no cost by writing or telephoning us at the following:

Twist Bioscience Corporation
681 Gateway Blvd.
South San Francisco, CA 94080
Telephone: (844) 362-8978

You may also access these documents, free of charge on the SEC's website at www.sec.gov or on the "Investors" page of our website at www.twistbioscience.com. Information contained on our website is not incorporated by reference into this prospectus, and you should not consider any information on, or that can be accessed from, our website as part of this prospectus or any accompanying prospectus supplement.

This prospectus is part of a registration statement we filed with the SEC. We have incorporated exhibits into this registration statement. You should read the exhibits carefully for provisions that may be important to you.

We have not authorized anyone to provide you with information other than what is incorporated by reference or provided in this prospectus or any prospectus supplement. We are not making an offer of these securities in any state where such offer is not permitted. You should not assume that the information in this prospectus or in the documents incorporated by reference is accurate as of any date other than the date on the front of this prospectus or those documents.

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Twist Bioscience Corporation

Common Stock

PROSPECTUS SUPPLEMENT

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December 18, 2019