



Powering the Synthetic Biology and Genomics Revolutions

May 2019

@TwistBioscience #WeMakeDNA

Legal Disclaimers

This presentation contains forward-looking statements. In particular, statements regarding future economic performance, finances, and expectations and objectives of management constitute forward-looking statements. Forward-looking statements can be identified by the fact that they do not relate strictly to historical facts and generally contain words such as "believes," "expects," "may," "will," "should," "seeks," "approximately," "intends," "plans," "estimates," "anticipates," and other expressions that are predictions of or indicate future events and trends and that do not relate to historical matters. Although the forward-looking statements contained in this presentation are based upon information available at the time the statements are made and reflect management's good faith beliefs, forward-looking statements inherently involve known and unknown risks, uncertainties and other factors, which may cause the actual results, performance or achievements to differ materially from anticipated future results. Important factors that could cause actual results to differ materially from expectations include, among others: our estimates of the size of our market opportunity; our expectations regarding our ability to increase gene production, reduce turnaround times and drive cost reductions for our customers; and our ability to enter new markets. You should not place undue reliance on these forward-looking statements, which speak only as of the date hereof. We do not undertake to update or revise any forward-looking statements after they are made, whether as a result of new information, future events, or otherwise, except as required by applicable law.

This presentation also contains estimates and other statistical data made by independent parties and by us relating to market size and growth and other data about our industry. This data involves a number of assumptions and limitations, and you are cautioned not to give undue weight to such estimates. Neither we nor any other person makes any representation as to the accuracy or completeness of such data or undertakes any obligation to update such data after the date of this presentation. In addition, projections, assumptions and estimates of our future performance and the future performance of the markets in which we operate are necessarily subject to a high degree of uncertainty and risk.

By attending or receiving this presentation you acknowledge that you will be solely responsible for your own assessment of the market and our market position and that you will conduct your own analysis and be solely responsible for forming your own view of the potential future performance of our business.

Writing Synthetic DNA on Silicon Platform



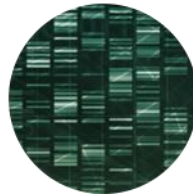
-
**Fueling the Industrialization
of Synthetic Biology**

KEY ADVANTAGES OF WRITING DNA ON SILICON



MINIATURIZATION

10^{3-6} less volume of required reagents



THROUGHPUT

20M oligos/month



LOW COST

Driving adoption and new applications



VERSATILE PLATFORM

Broad applications

Our Versatile DNA Synthesis Platform Has Broad Applications



Twist's versatile DNA synthesis platform has broad application across many enabling synthetic biology products, and **we are just beginning...**

Our Strategy



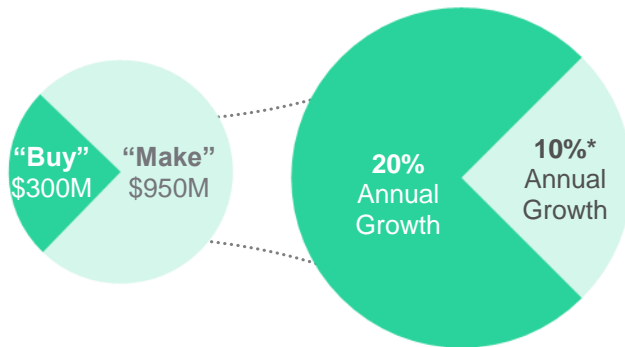
SYNTHETIC BIOLOGY: GENE SYNTHESIS

GENOMICS: TARGETED NGS

OPEN NEW MARKETS

Near-term strategic priorities

- Lead the Buyer market
- Convert Makers into Buyers



*Source: Markets and Market Molecular Biology (2014) / BCC Research (2017)

Twist's advantages in...

Exome

- Performance
- Customization
- Full kit

Custom

- Turnaround time
- Affordable pilot and scaling
- NGS QC on all probes

Long-term initiatives

- Augment our product offering to meet the growing needs of our existing and potential new customers
- Expand into adjacent addressable markets
- Leverage our platform and industry partnerships to create new market opportunities for our products



DRUG DISCOVERY



DATA STORAGE

Twist Bioscience Pipeline & Milestones



MARKET OPPORTUNITIES	EXPLORATION	PROOF OF CONCEPT	BETA	COMMERCIAL	NEXT STEPS
Synthetic Biology: Synthetic Genes, DNA Libraries and Oligo Pools ¹					<ul style="list-style-type: none"> • Continue to drive growth, add market share • NPI roadmap
Genomics: Targeted NGS ²					<ul style="list-style-type: none"> • Convert NGS pilot accounts to production • Launch NGS e-commerce platform • Launch back-end production in China
Biological Drug Discovery and Development ³					<ul style="list-style-type: none"> • Expand proof-of-concept data package • Longer-term: Establish partnerships
Digital Data Storage in DNA					<ul style="list-style-type: none"> • Execute roadmap to increase synthesis density • Continue to develop partnerships to explore digital data storage in DNA

¹ Products addressing this market include clonal, non-clonal genes (gene fragments), oligo pools and DNA libraries

² Products addressing this market include NGS exome capture and NGS custom capture

³ Products addressing this market include custom DNA libraries, our proprietary GPCR-targeting antibody library and our antibody optimization solution

Multiple Large Market Opportunities

TWIST'S PLATFORM TECHNOLOGY ADDRESSES



\$1.3B
SYNTHETIC
BIOLOGY

- Competitive Turnaround Time
- Lower Cost
- High Throughput
- High Quality

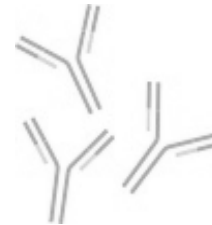
\$0.5B
GENOMICS:
TARGETED NGS

- Fast Customization
- Performance
- Full Kit
- High Quality

SHORT TERM GOAL
Grow Revenue

Source: BCC Report (2017), Markets and Markets (2014) DeciBio (2015)

LARGE MARKET OPPORTUNITIES



LARGE MARKET
DRUG DISCOVERY/ DEVELOPMENT

- High Quality Diversity Hits / Leads
- Shorter Time and Cost from Target to IND

MID TERM GOAL
Develop novel therapeutics



\$35B+
DATA STORAGE

- Permanence
- Density
- Ease of Copying
- Universal Format

LONG TERM GOAL
Enter technology market

Source: LDC Market Analysis, LTO Program Technology Provider Companies

Synthetic Biology is a Rapidly Growing \$4B Opportunity



NEEDS

NEW APPLICATIONS FOR SYNTHETIC DNA



Healthcare

- Better drug development tools to lessen time and lower costs
- More effective diagnostic tools for DNA extraction to lower costs (i.e. NGS)

- Antibodies / TCR
- Vaccines
- Immuno and Cancer Therapies
- Small Molecule Drug Manufacture



Industrial

- Increased population growth impacting the sustainability of finite resources
- Industrial production to address the needs of civilization

- Specialty Chemicals
- Advanced Property Materials



Agriculture

- Global population growing with decrease in per capita arable land
- Food security and increased nutrition

- Self-fertilizing crops
- Oil-Free Fertilizers
- Drought Solutions
- New Disease Protection

Source: BCC Research

**We need a new
type of DNA
supplier to
meet demand**

Gene Synthesis Market: Buyers and Makers

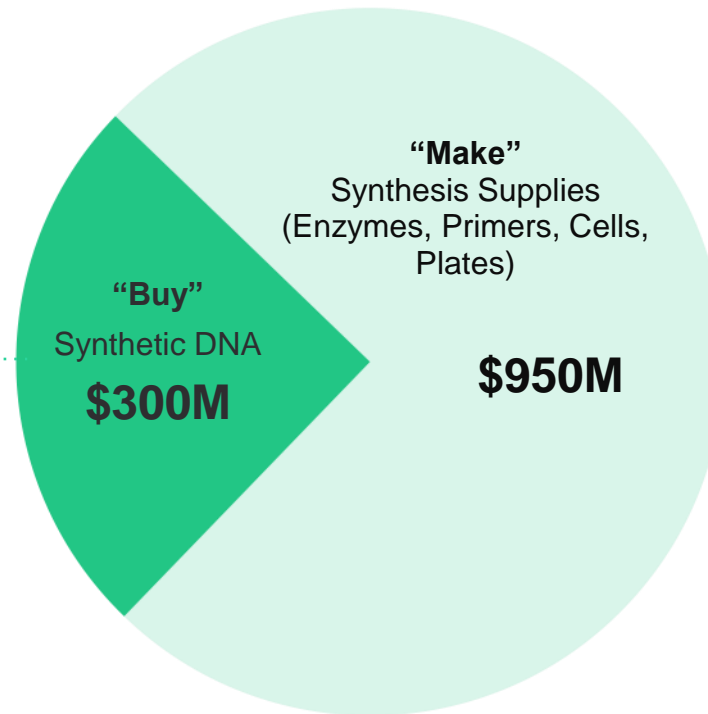


\$1.3B / Year

Large Scale, Commercial Users

Value: Speed, Throughput
and Quality

“Can’t get
what I need”

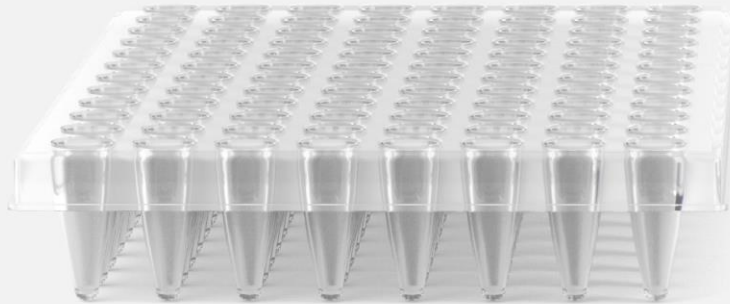


Small Scale,
Academic Users
Price-Sensitive

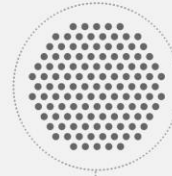
“I Hate
Cloning”

Source: BCC Report (2017), Markets and Markets Molecular Biology (2014)

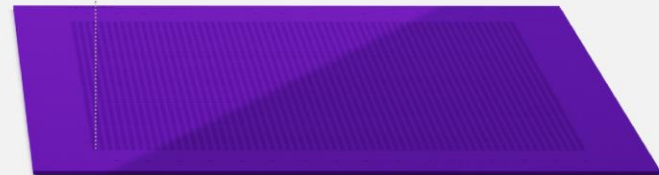
Rewriting DNA with the Power of Silicon



96 WELL PLATE
makes 1 gene



121 devices per cluster



TWIST SILICON PLATFORM
can make 9,600 gene

**Developing Game-Changing Throughput and Cost through
Quality and Speed at Scale**



HIGH QUALITY

UNIQUE CUSTOMER EXPERIENCE

LOWER COST



UNPRECEDENTED THROUGHPUT / SCALE

CONSISTENT RELIABILITY

COMPETITIVE TURNAROUND TIME

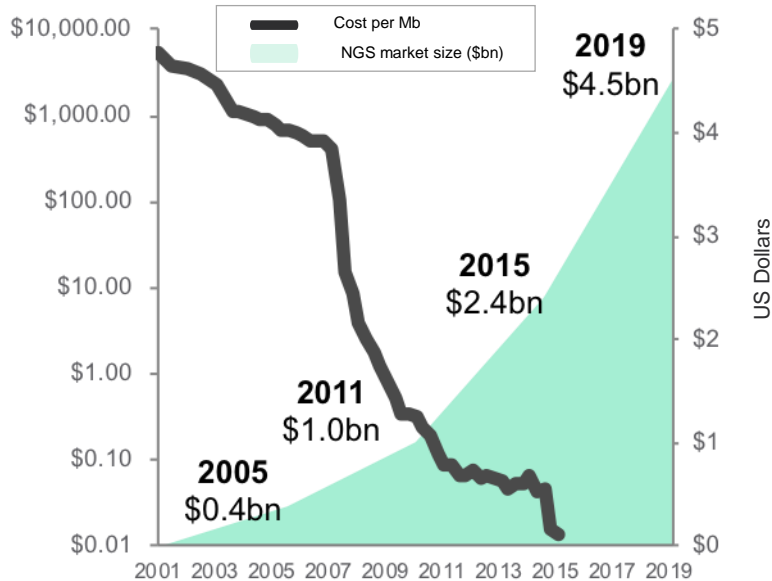


COMPREHENSIVE PRODUCT OFFERING

Our Disruptive Technology is Enabling New Markets and Applications

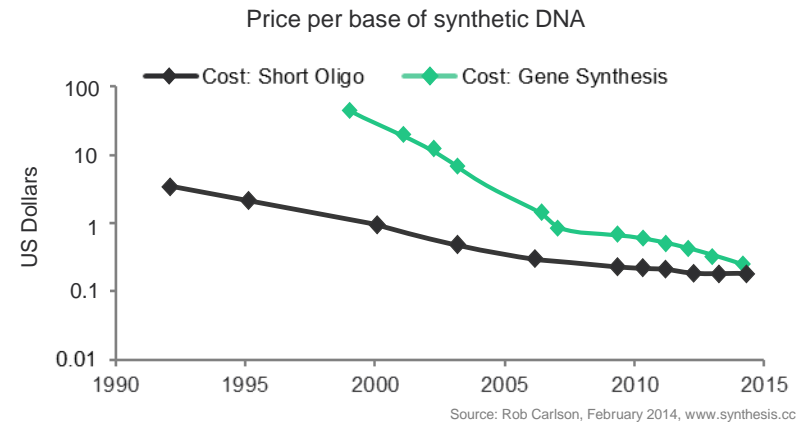


COST PER BASE PAIR VS NGS MARKET SIZE

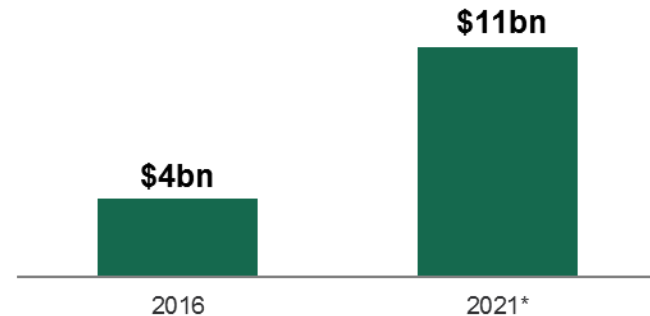


Source: Equity research, company filings Note: NGS market data taken from U.S. DNA Sequencing Technology Markets - 2006 from Cowen and Next generation Sequencing market size, growth and trends (2011–2019) report from DeciBio

SYNTHESIS COST PER GENE VS SYNTHETIC BIOLOGY MARKET



GLOBAL VALUE OF SYNTHETIC BIOLOGY MARKET



Source: BCC Research *Expected growth

A Market Leader in Gene Synthesis



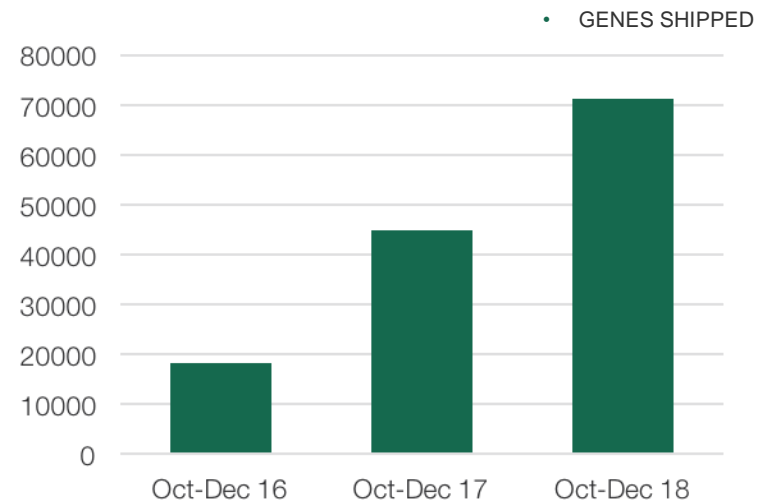
Over 700 Customers Served in FY 2018

INCLUDING:

- Seven of the top 20 pharma companies by revenue
- Ginkgo Bioworks - Contract for up to 1.3B base pairs over four years
- Three of the largest agricultural biotechnology companies that use synthetic biology
- >100 academic research institutions worldwide
- Microsoft - For use of DNA as a digital data storage medium



>240,000 genes shipped in FY 2018



MONTHLY AVERAGE IN

2016 Oct-Dec	6,070 genes shipped
2017 Oct-Dec	14,928 genes shipped
2018 Oct-Dec	23,748 genes shipped

A Unique Way to Order your DNA Online ...



T

M

CLONAL GENES

My Genes Project

OVERVIEW > GENE IMPORT > PRICING & SCORE

Change Vector ▾

+ Flanks

Optimize

+ Genes

+ Custom Vector

Q

#	<input type="checkbox"/>	NAME ▾	SEQUENCE	BP	VECTOR	SCORE ⓘ	PRICE
1	<input type="checkbox"/>	gene-001	ACTCGACTGACTAGC...	1264	Select Vector ▾	●	\$113.76
2	<input type="checkbox"/>	gene-002	ACTCGACTGACTAGC...	1014	Select Vector ▾	●	\$91.26
3	<input type="checkbox"/>	gene-003	ACTCGACTGACTAGC...	978	Select Vector ▾	●	\$88.02
4	<input type="checkbox"/>	gene-004	ACTCGACTGACTAGC...	848	Select Vector ▾	●	Fix it
5	<input type="checkbox"/>	gene-005	ACTCGACTGACTAGC...	1200	Select Vector ▾	●	\$108.00
6	<input type="checkbox"/>	gene-006	ACTCGACTGACTAGC...	1124	Select Vector ▾	●	\$101.16
7	<input type="checkbox"/>	gene-007	ACTCGACTGACTAGC...	1200	Select Vector ▾	●	Fix it
8	<input type="checkbox"/>	gene-008	ACTCGACTGACTAGC...	1087	Select Vector ▾	●	\$97.83
9	<input type="checkbox"/>	gene-009	ACTCGACTGACTAGC...	1200	Select Vector ▾	●	\$108.00

32 GENES • 26,400 BP

All (240)

● Easy (24)

● Difficult (4)

● Error (2)

● Not Possible (2)

PRICING SUMMARY ⓘ

NAME	QTY	COST
Easy Genes	24	\$2,376.00
Cloning Fee	24	\$1,300.00

DELIVERY FORMAT

☒ Plate: 96 Well, Horizontal

☐ Tube [Edit](#)

Total\$3,676

Checkout

E-Commerce is Enabling Capture of Long Tail

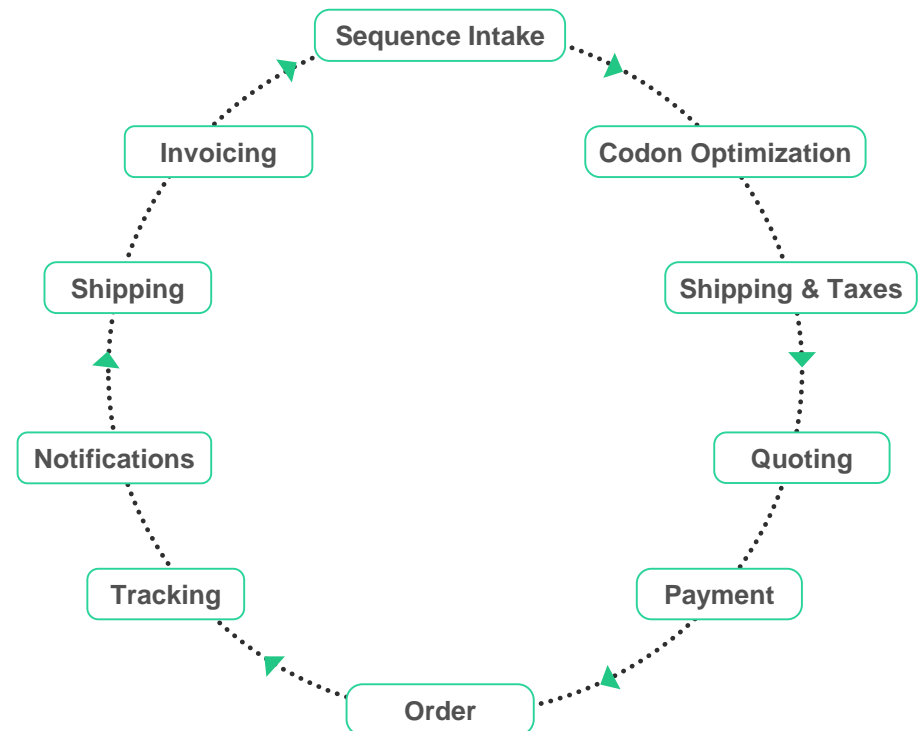


E-COMMERCE IMPACT Q2-18 VS. Q2-19*

Less than 50% lower PO size as we reach long tail

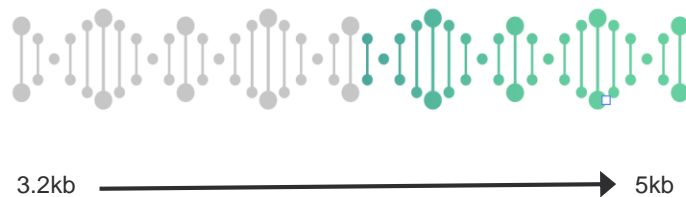
3.8x more orders

*unaudited, ex-Ginkgo, synbio



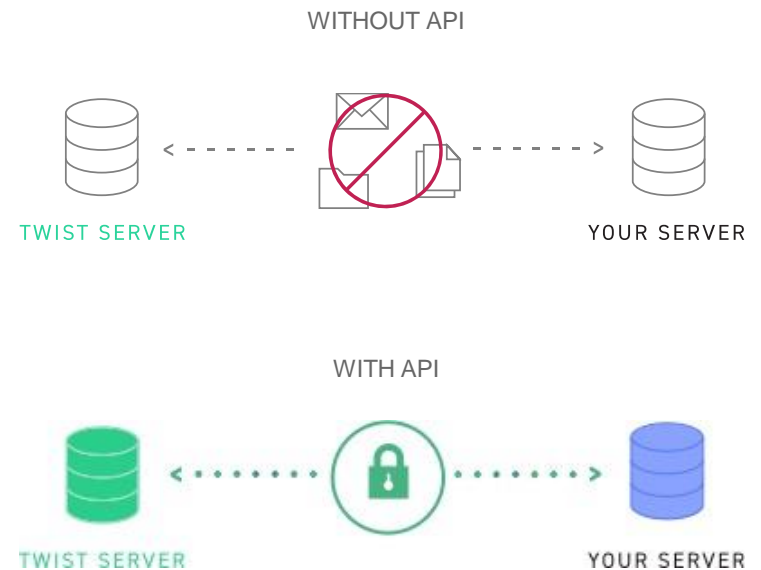
5kb Genes at disruptive price

- Increase serviceable market
- Enable maker to buyer conversion



API

- Seamless integration
- Increase service stickiness



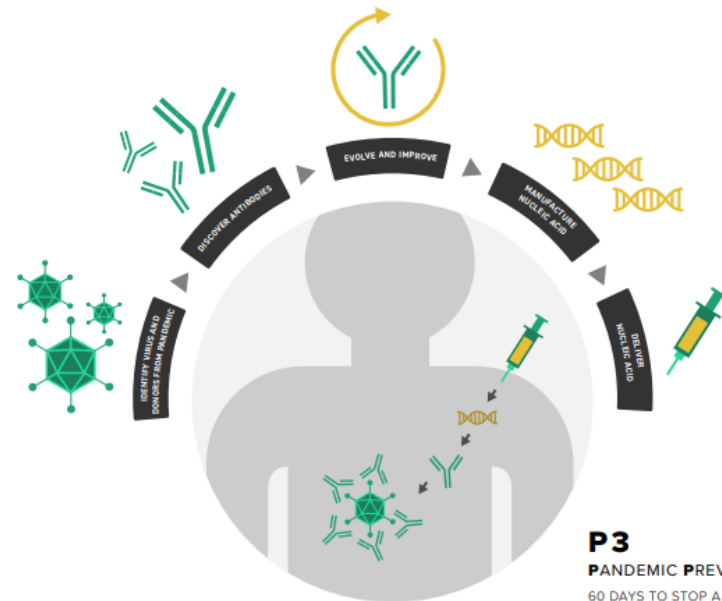


VANDERBILT
UNIVERSITY
MEDICAL
CENTER

“Twist’s very high-throughput platform allowed us to quickly and efficiently examine thousands of possible antibodies in order to select the best results faster than ever before.”

Tasked with an ambitious goal from DARPA to develop a rapid response to help medical workers fight viral diseases in the field, Vanderbilt University Medical Center has already reduced the time to develop antibodies significantly. High-throughput, synthetic genes from Twist Bioscience have allowed the lab to expedite this process.

- Scale to high quantities with Twist’s gene synthesis platform
- Affordable synthetic DNA
- High-throughput platform allowed VUMC to accelerate the antibody identification process
- Twist delivered hundreds of genes in **9 business days** for first DARPA sprint



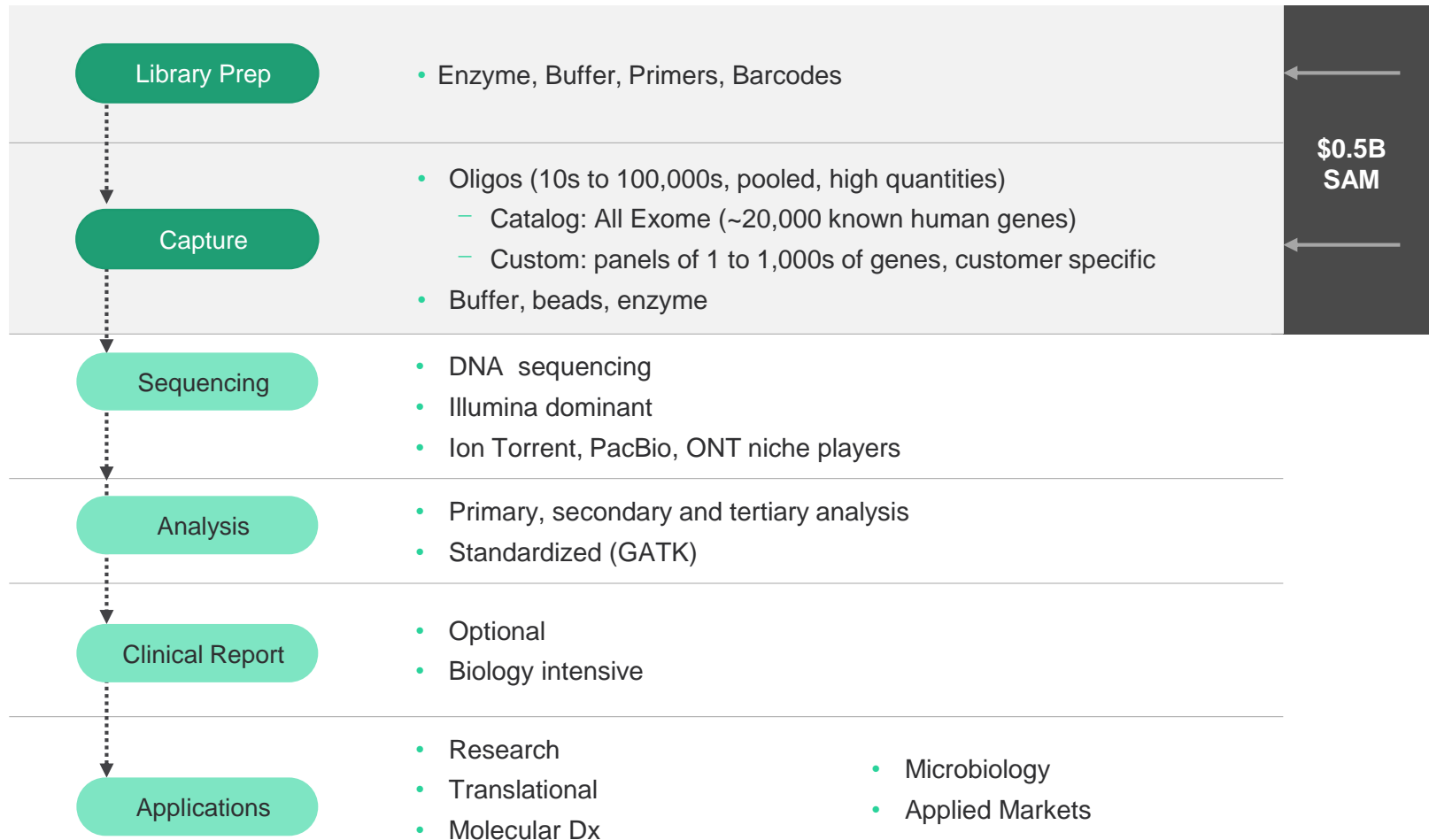
CASE STUDY

Targeted NGS is enabling reading of patient's and/or pathogen's DNA to inform precision or personalized medical treatment

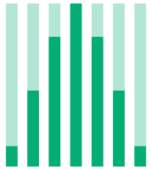
- Reduced sequencing cost per sample
- Faster time to results
- Increased sensitivity / complete coverage of difficult regions



Targeted NGS Value Chain

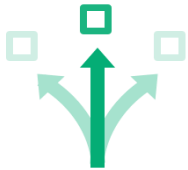


Targeted NGS – Strong Value Proposition



PERFORMANCE / COST

- High Uniformity
- Low Sequencing Costs



CUSTOMIZATION

- 2-3 Weeks Design to Production
- On Custom and Exome Panels



FULL KIT

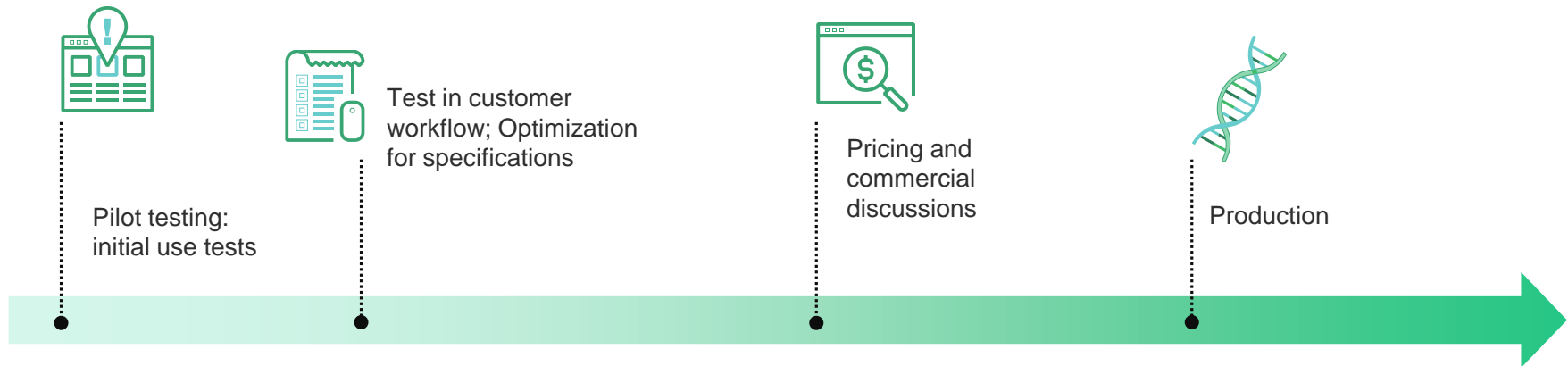
- All Consumables From One Provider



QUALITY MANAGEMENT SYSTEMS

- ISO 13485:2016 Design/manufacture of NGS target enrichment panels for medical device applications
- ISO 9001:2015 Design/manufacture of NGS target enrichment panels

NGS Conversion – Pilot to Production Pipeline



- Pilot to production cycle typically requires 9 to 18 months
- First Twist customers moved to production Q4 2018
- Capturing more orders and increasing average order size as customer scale-up:

**Shipped to over 100 customers in
Q2-FY19***

**Out of 74 major potential customers:
24 have adopted Twist in their production**

*unaudited

New NGS Products

(available to Early Access customers), providing dramatic time savings and lowering sequencing costs

- Twist Fast Hybridization and Wash Kit
- Twist Universal Blockers (to allow flexible blocking and improved on-target capture)
- Twist Universal Adapter System (to maximize performance for library preparation)
- Twist Mechanical Fragmentation Library Prep Kit (to amplify highly-degraded samples)

NGS Customer Presentations

Demonstrating the power of using the Twist NGS Target Enrichment Solutions to identify neurological and inherited diseases, quickly scale consumer DNA testing, and the development of liquid (blood) biopsies.





“We do the majority of our research in whole exomes, but at the end of the day the technology is still based on short reads in sequencing and panels are still very powerful and focused.”

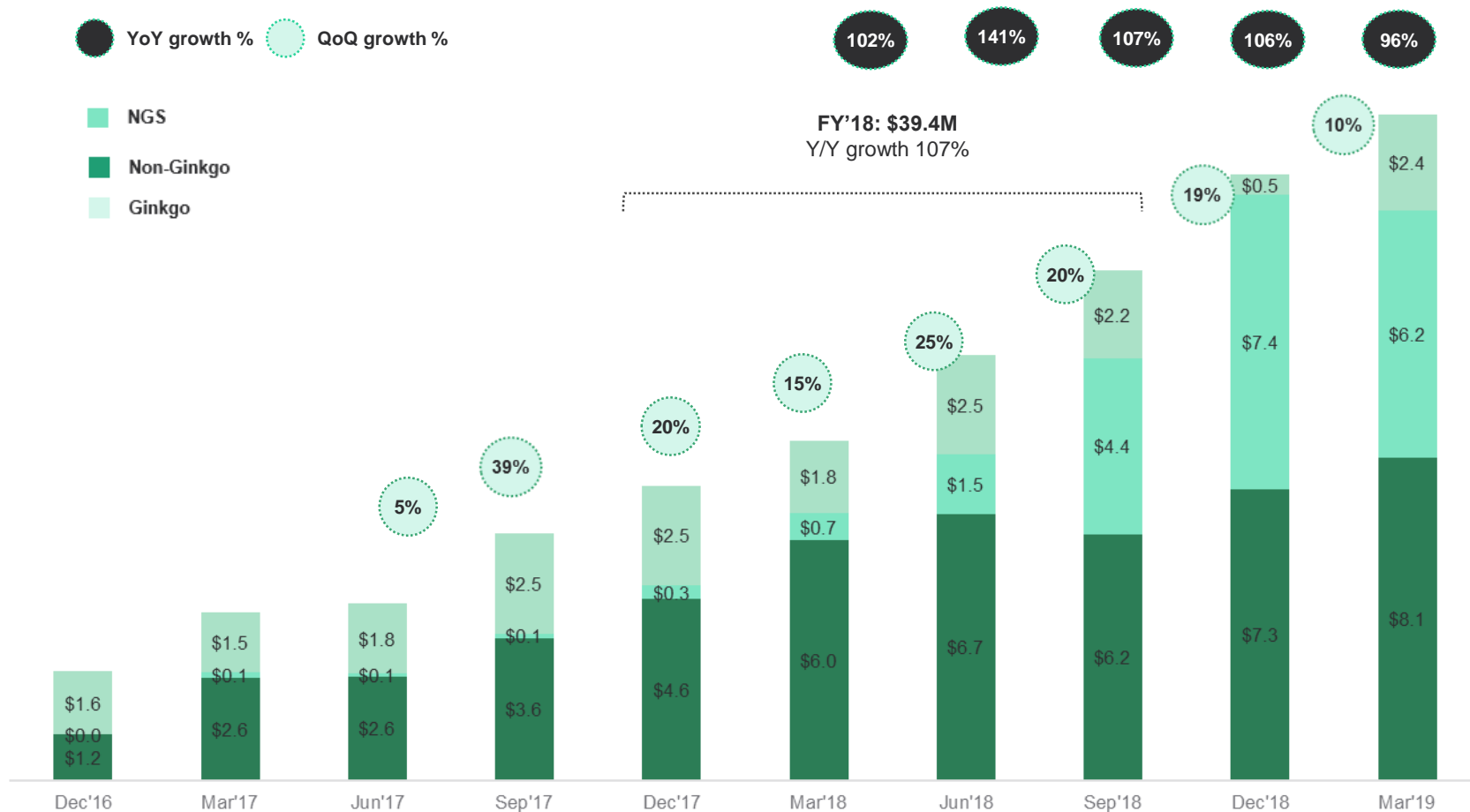
Because the dry blood samples used in the lab are often very poor in quality, this current work presents significant challenges to genetic identification. In order to combat these challenges, the Center asked Twist Bioscience to provide custom target enrichment panels rather than seeking to sequence a whole genome or whole exomes, as target enrichment procedures isolate specific genomic regions of interest before next-generation sequencing.

- Twist Custom Panels allowed the team to focus on important, medically relevant genes instead of working with a whole genome
- Concise panel with a simple protocol
- Reasonable cost
- Very good candidate variants already curated by the literature

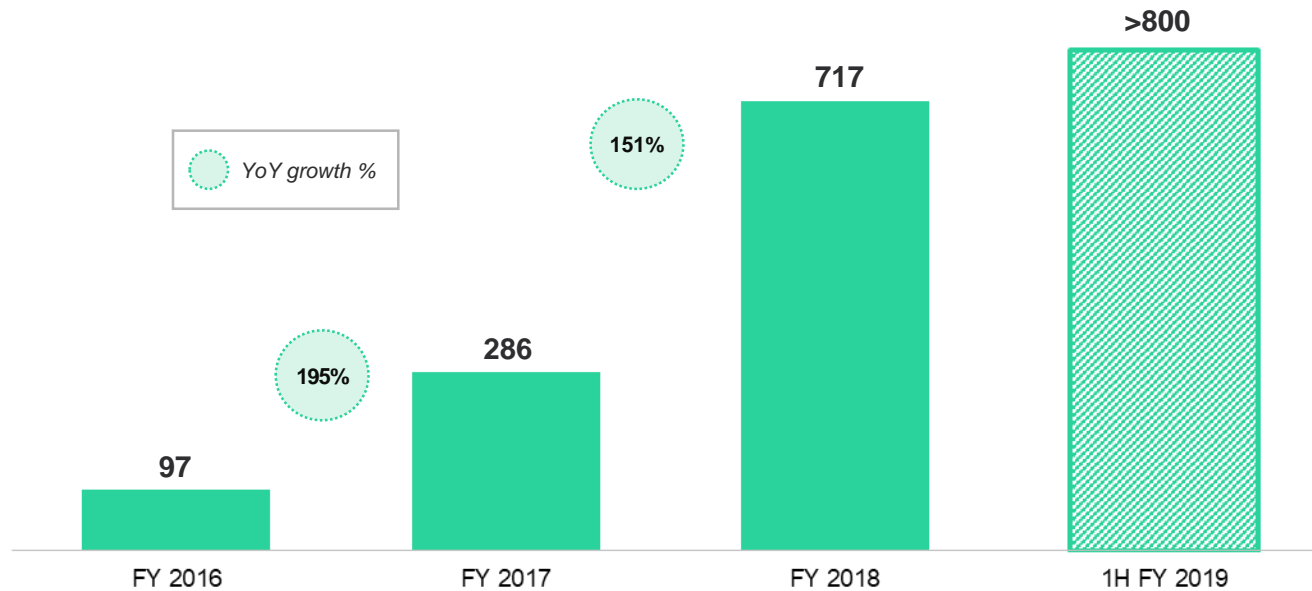
Genetic tests for epilepsy in children from remote reaches of South America conducted by the Center for Applied Genomics at the Children's Hospital of Philadelphia lead to faster, effective treatment.



Strong Orders Growth



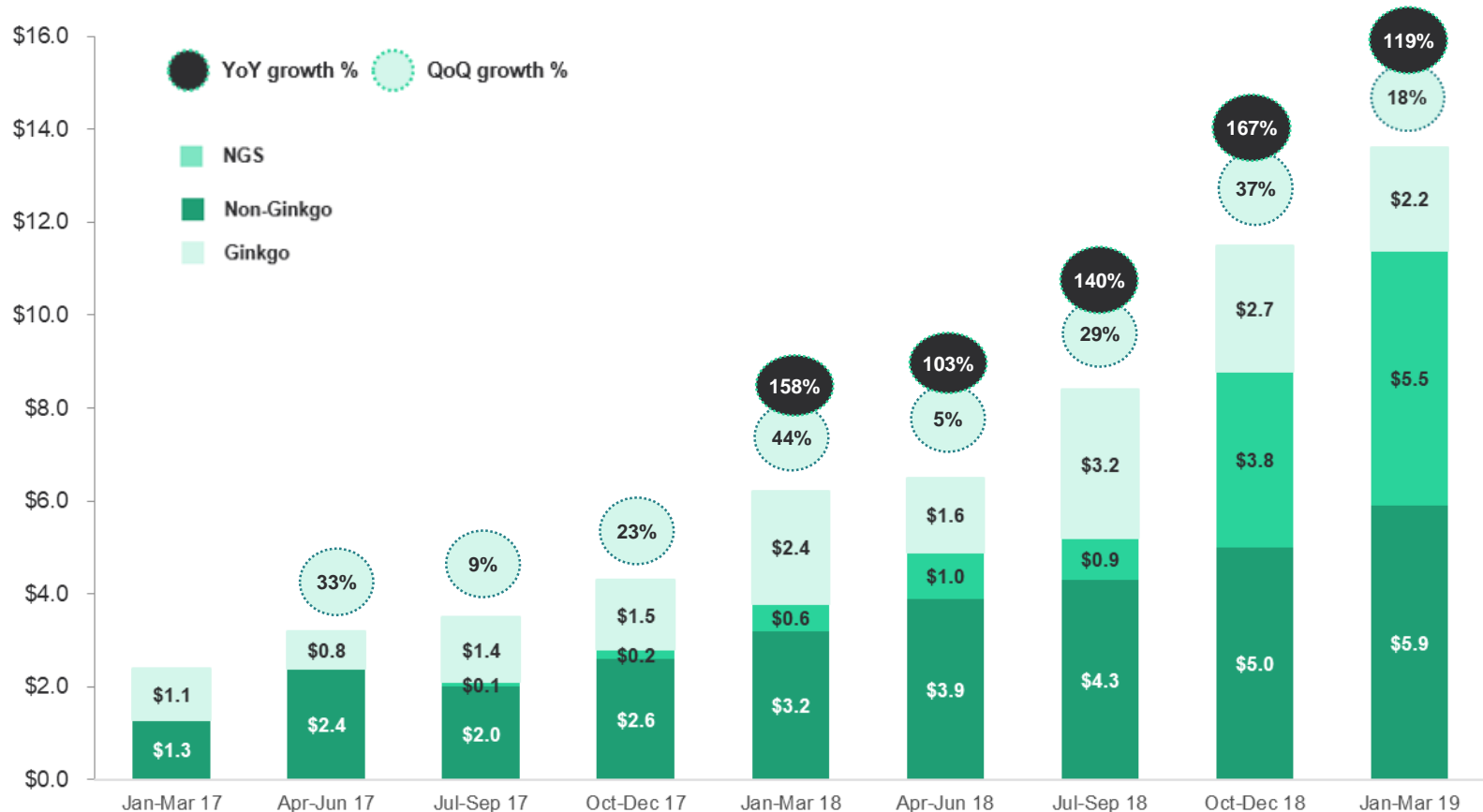
CUSTOMER COUNT



Quarterly Revenue Ramp



QUARTERLY REVENUE RAMP (\$M)

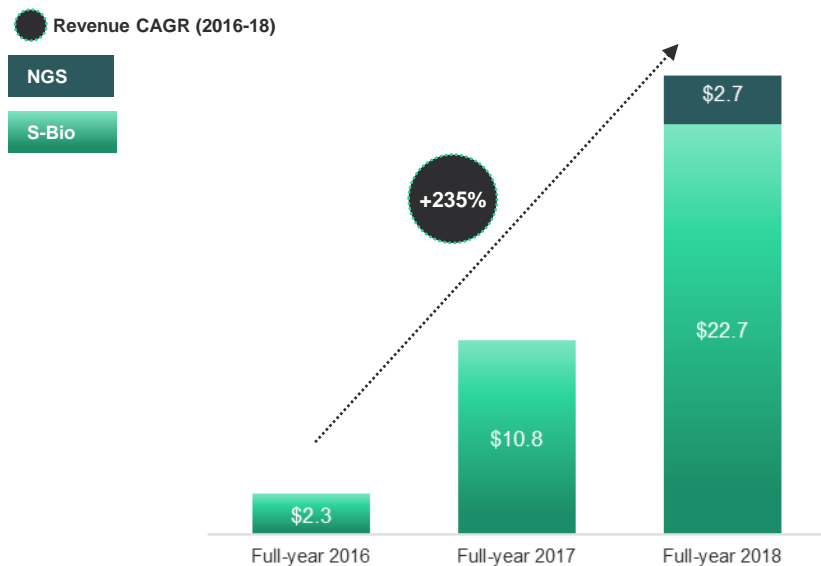


First quarter gross margin positive: 13%

Strong Revenue Growth

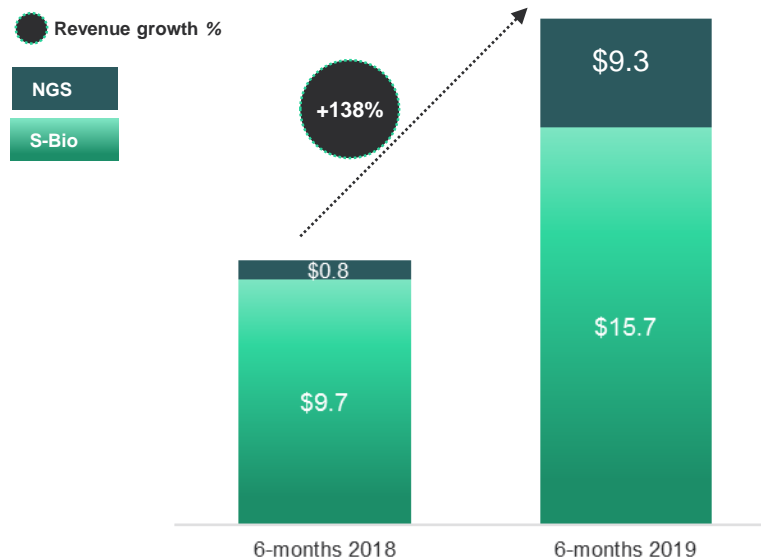


FULL-YEAR REVENUE (\$M)



\$M except for #	2016	2017	2018
Order Value	N/A	\$17.5	\$39.4
Revenue	\$2.3	\$10.8	\$25.4
# of Customers	97	286	717
Gross Profit	(\$7.2)	(\$13.3)	(\$6.8)
Net Op. Loss	(\$43.7)	(\$58.5)	(\$70.6)
Net Cash Used	(\$38.6)	(\$51.3)	(\$66.2)

6-MONTHS REVENUE AS OF MARCH 31



\$M except for #	2018	2019
Order Value	\$15.9	\$31.8
Revenue	\$10.5	\$25.0
# of Customers	400	821
Gross Profit	(\$5.1)	\$1.4
Net Op. Loss	(\$33.4)	(\$49.2)
Net Cash Used	(\$32.5)	(\$42.5)

Other Growth Verticals

TWIST'S PLATFORM EXTENDS TO



\$1.3B

SYNTHETIC
BIOLOGY

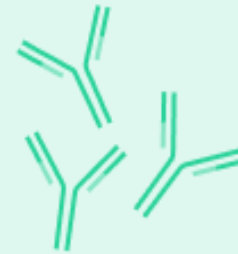
- Competitive Turnaround Time
- Lower Cost
- High Throughput
- High Quality

SHORT TERM GOAL
Grow Revenue

\$0.5B

GENOMICS:
TARGETED NGS

- Fast Customization
- Performance
- Full Kit
- High Quality



LARGE MARKET
DRUG DISCOVERY/ DEVELOPMENT

- High Quality Diversity Hits / Leads
- Shorter Time and Cost from Target to IND

MID TERM GOAL
Develop novel therapeutics



\$35B+

DATA STORAGE

- Permanence
- Density
- Ease of Copying
- Universal Format

LONG TERM GOAL
Enter technology market

Source: BCC Report (2017), Markets and Markets (2014) DeciBio (2015)

Source: LDC Market Analysis, LTO Program
Technology Provider Companies

Novel Protein Libraries for Drug Discovery To Enable Efficiency in Drug Discovery



From Needle
in a Haystack



- Random diversity
- Biased representation
- >99% inefficiency
- Lengthy optimization cycle
- Expensive process

To Stack
of Needles

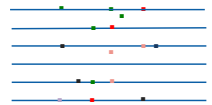


- Explicit
- Even representation
- Human repertoire based
- Fast
- Affordable

Precise Introduction of Variants,
Diversity that Enables Screening
Efficiency



```
gt catctcAccc tActtg  
gt catctcGGcc ttGttg  
gt catctcCAcc tCAttg  
gt catctctTcc tGTttg
```



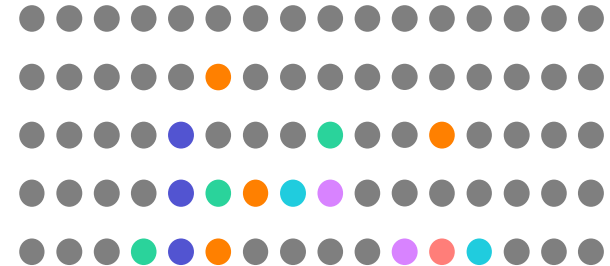
Gene Synthesis

Single Site

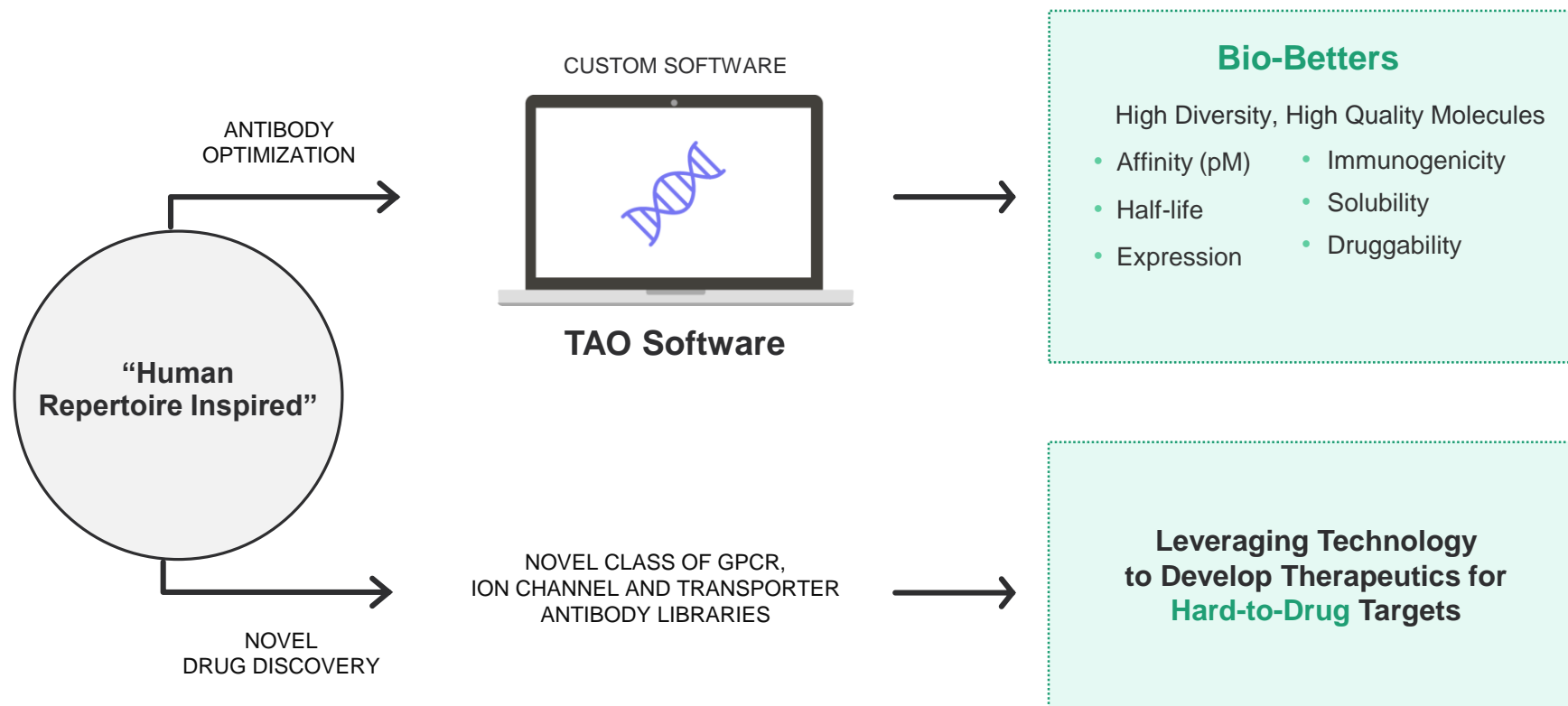
Multi-Site

Stretch

Multi-Domain



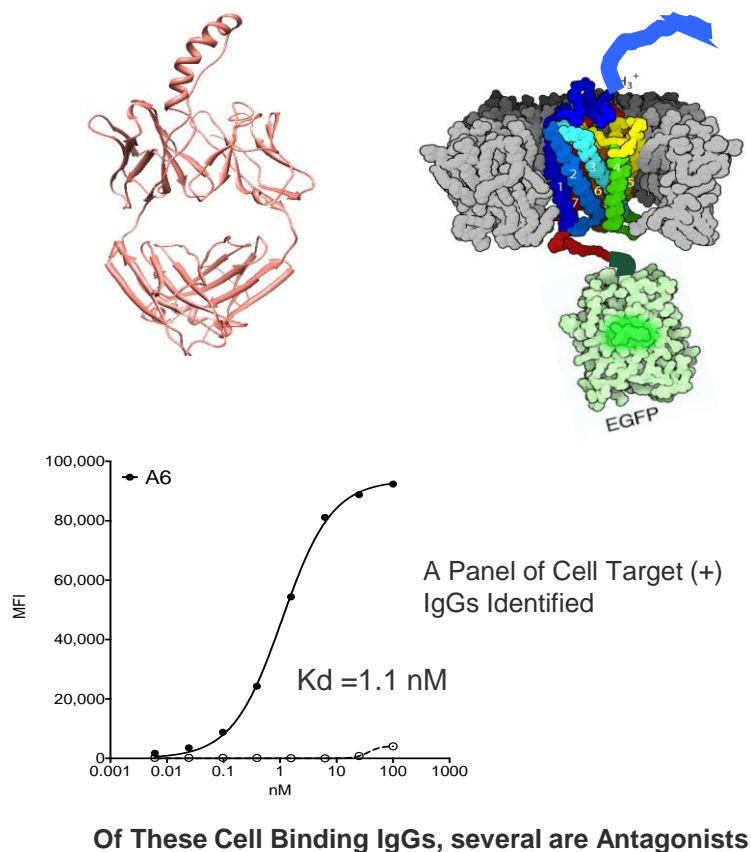
Expanding Drug Discovery Capabilities Enables Tackling Bio-Betters and Hard-to-Drug Targets



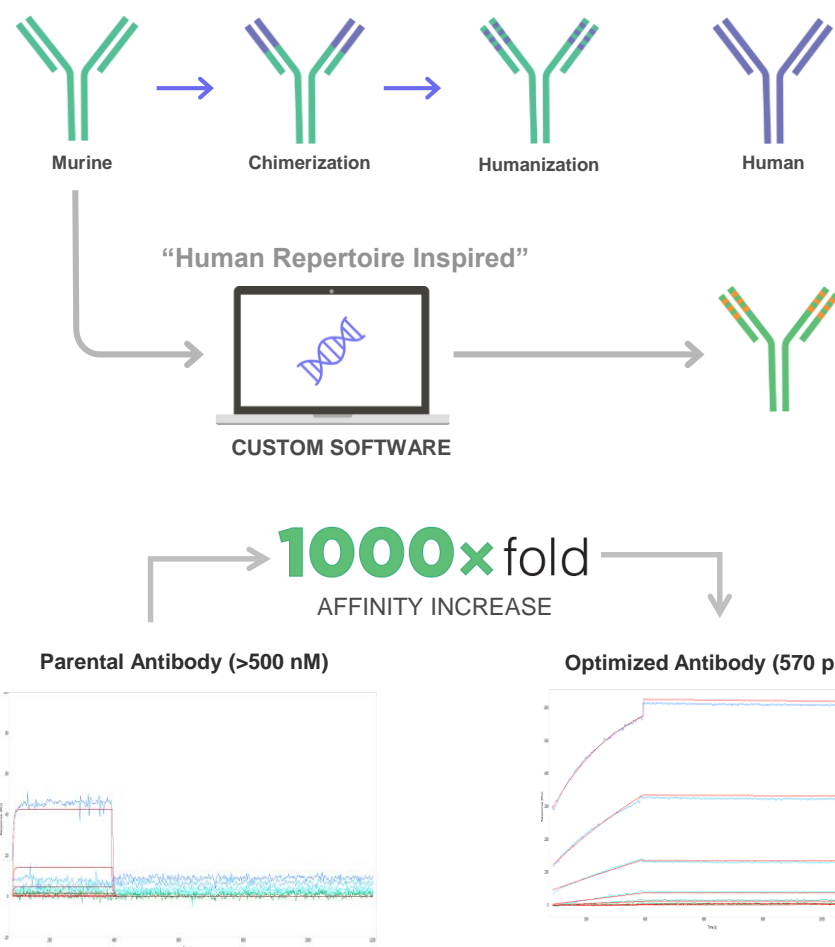
Twist Biopharma Proof-of-Concept: GPCR Library and Bio-Better



GPCR: Target 1



Bio-Better: PDL1 inhibitor



Discovery through IND Application

- LakePharma has ability to offer Twist's proprietary solutions to existing and future biopharma customers
- Libraries, Antibody Optimization Solution
- Twist customers have access to LakePharma's integrated discovery and development services



Applying Antibody Optimization Platform to Targeting Arm of a Bispecific Antibody

- Pandion is developing therapeutics to achieve localized immunomodulation to treat autoimmune and inflammatory disease
- By approaching these diseases through antibody therapeutics acting locally at the disease site, Pandion is working to change the trajectory of treatment



Other Growth Verticals

TWIST'S PLATFORM EXTENDS TO



\$1.3B

SYNTHETIC
BIOLOGY

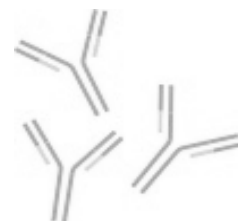
- Competitive Turnaround Time
- Lower Cost
- High Throughput
- High Quality

SHORT TERM GOAL
Grow Revenue

\$0.5B

GENOMICS:
TARGETED NGS

- Fast Customization
- Performance
- Full Kit
- High Quality



LARGE MARKET

DRUG DISCOVERY/
DEVELOPMENT

- High Quality Diversity Hits / Leads
- Shorter Time and Cost from Target to IND

MID TERM GOAL
Develop novel therapeutics



\$35B+

DATA STORAGE

- Permanence
- Density
- Ease of Copying
- Universal Format

LONG TERM GOAL
Enter technology market

Source: BCC Report (2017), Markets and Markets (2014) DeciBio (2015)

Source: LDC Market Analysis, LTO Program Technology Provider Companies

DNA: Nature's Choice for Data Storage



MAN-MADE, NOT PERMANENT



20,000
Years ago

40,000
Years ago

560,000 - 780,000
Years ago

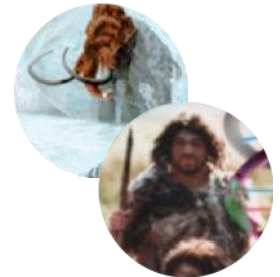
STABLE FOR 1000s of YEARS

Sequencing the nuclear genome of the extinct woolly mammoth

Webb Miller¹, Daniela I. Drautz¹, Aakrosh Ratan¹, Barbara Pusey¹, Ji Qi¹, Arthur M. Lesk¹, Lynn P. Tomsho¹, Michael D. Packard¹, Fangqing Zhao¹, Andrei Sher², Alexei Tikhonov³, Brian Raney⁴, Nick Patterson⁵, Kerstin Lindblad-Toh⁶, Eric S. Lander⁷, James R. Knight⁸, Gerard P. Irzyk⁹, Karin M. Fredrikson⁷, Timothy T. Harkins⁷, Sharon Sheridan⁷, Tom Pringle⁸ & Stephan C. Schuster¹

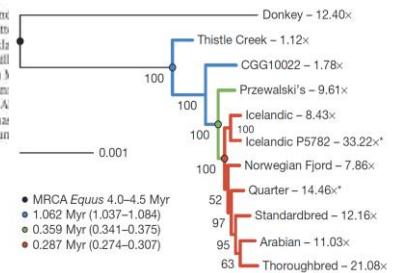
A Draft Sequence of the Neandertal Genome

Richard E. Green^{1,††}, Johannes Krause^{1,†§}, Adrian W. Briggs^{1,†§}, Tomislav Maricic^{1,†§}, Udo Stenzel^{1,†§}, Martin Kircher^{1,†§}, Nick Patterson^{2,†§}, Heng Li^{2,†}, Weiwei Zhai^{2,†||}, Markus Hsi-Yang Fritz^{2,†}, Nancy F. Hansen^{2,†}, Eric Y. Durand^{2,†}, Anna-Saplo Malaspinas^{1,†}, Jeffrey D. Jensen^{3,†}, Tomas Marques-Bonet^{2,13}, Can Alkan^{2,†}, Kay Prüfer^{2,†}, Matthias Meyer^{1,†}, Hernán A. Burbano^{1,†}, Jeffrey M. Good^{2,16}, Rigo Schultze², Ayiner Aximu-Petri², Anne Butthof², Barbara Höber², Barbara Hoffner², Madlen Siegemund², Antje Welhmann², Chad Nusbaum², Eric S. Lander², Carsten Ross², Nathaniel Novod², Jason Affourtit², Michael Egholm², Christine Verna^{2,15}, Pavlo Rudan^{2,10}, Dejana Brajkovic¹³, Željko Kucan¹⁰, Ivan Gušić¹⁰, Vladimir B. Doronichev¹², Liubov V. Golovanova¹², Carlos Lalueza-Fox¹³, Marco de la Rasilla¹⁴, Javier Fortea¹⁴, Antonio Rosas¹⁵, Ralf W. Schmitz^{16,17}, Philip L. F. Johnson¹⁸, Evan E. Eichler^{1,†}, Daniel Falush¹⁹, Ewan Birney², James C. Mullikin², Montgomery Slatkin², Rasmus Nielsen², Janet Kelso^{1,†}, Michael Lachmann^{1,†}, David Reich^{2,20,†}, Svante Pääbo^{1,††}



Recalibrating *Equus* evolution using the genome sequence of an early Middle Pleistocene horse

Ludovic Orlando^{1,4}, Aurélien Ginolhac^{1,4}, Guojie Zhang^{2,4}, Duane Froese³, Ant Enrico Cappellini¹, Bent Petersen⁵, Ida Moltke^{4,7}, Phillip L. F. Johnson⁸, Matt Thorfinn Korneljusson¹, Anna-Saplo Malaspinas¹, Josef Vögler⁹, Damien Sclka Andrei Dolocan¹², Jesper Stenderup¹, Amhed M. V. Velazquez¹, James Cahill Grant D. Zazula¹³, Andaine Seguin-Orlando^{1,14}, Cecilie Mortensen^{1,14}, Kim Jacobo Weinstock¹⁶, Kristian Gregersen^{1,17}, Knut H. Roed¹⁸, Vera Elsenman Doaglas F. Antczak⁴, Mads F. Bertelsen²⁰, Søren Brunak²⁰, Khaled A. S. A John Mundy²¹, Anders Krøgh¹⁴, M. Thomas P. Gilbert¹, Kurt Kjær¹, Thomas Jesper V. Olsen¹⁶, Michael Hofreiter²², Rasmus Nielsen²³, Beth Shapiro²⁴, Jun



Data Storage in DNA



1 Coding

00 → A
01 → G
10 → C
11 → T

2 Synthesis



3 Storage



4 Retrieval



5 Sequencing



6 Decoding

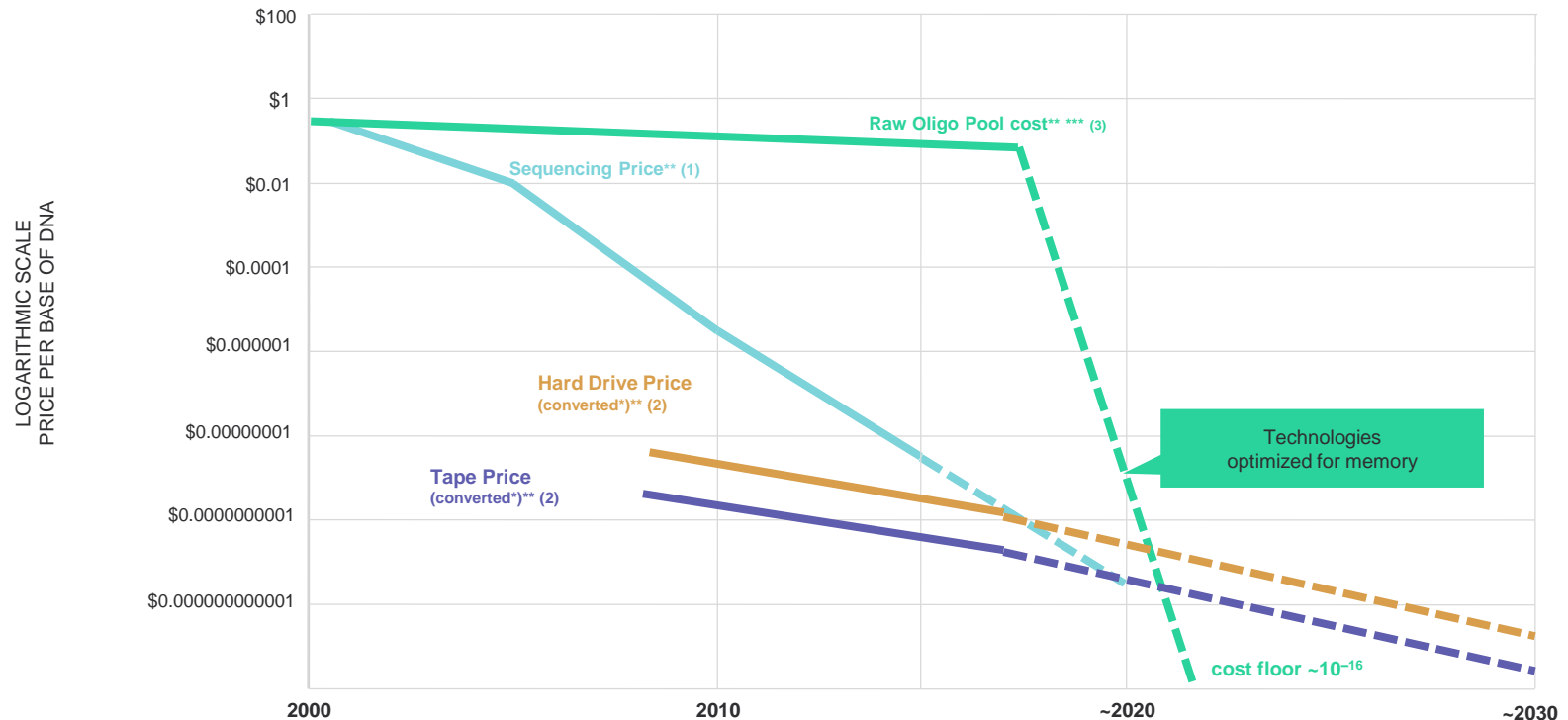
A → 00
G → 01
C → 10
T → 11

Permanence • Density • Random Access • Universal format

DNA Data Storage Trends and Projections



We believe new DNA technologies and cost efficiencies could surpass mature IT hardware solutions in 3–5 years



* DNA bases per byte for hard drive and tape shown at typical published encoding ranges from about 5:1 to 6.25:1

** All dotted lines represent extrapolations and assumes continued trajectory of historical trends, and that there will be continued decrease in price as technology improves.

*** Raw oligo pool cost extrapolation based on DARPA and another anticipated government-sponsored grant project objectives, both at specified time points

(1) www.genome.gov (2) Bob Fontana, IBM Systems, Storage Media Overview, May 4, 2016 (3) Bioeconomy Capital, Rob Carlson, January 20, 2018, www.synthesis.cc

Experienced Management Team



Emily LeProust, PhD
President, CEO, Co-founder



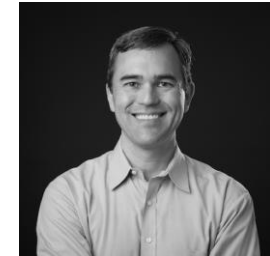
Bill Banyai, PhD
COO, Co-founder



Bill Peck, PhD
CTO, Co-founder



Jim Thorburn
CFO



Aaron Sato
CSO, Twist Pharma



Patrick Finn, PhD
SVP, Commercial
Operations



Patrick Weiss
SVP, Research and
Development



Paula Green
VP Human Resources



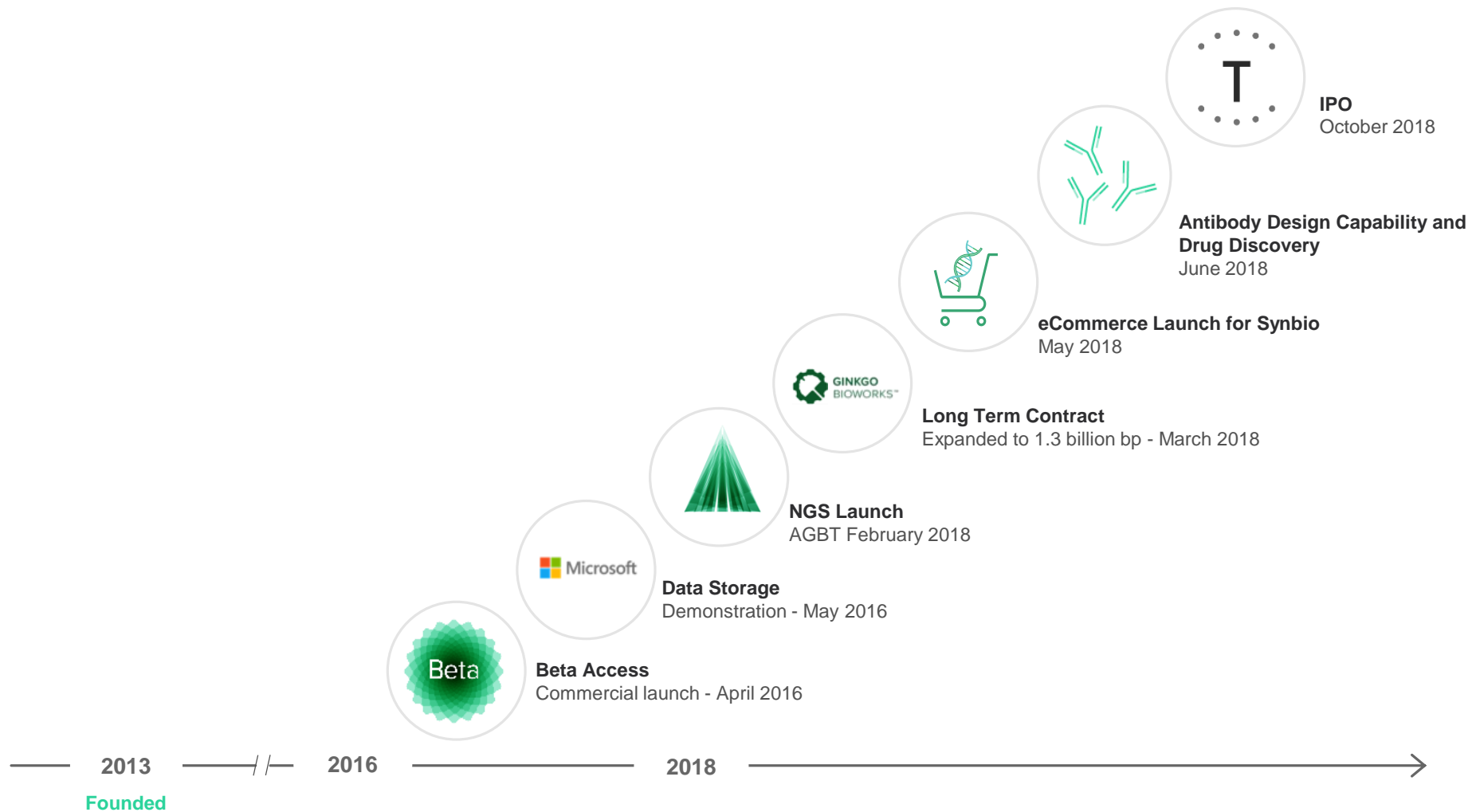
Mark Daniels
Chief Legal Officer, Chief
Ethics and Compliance
Officer, SVP and Secretary



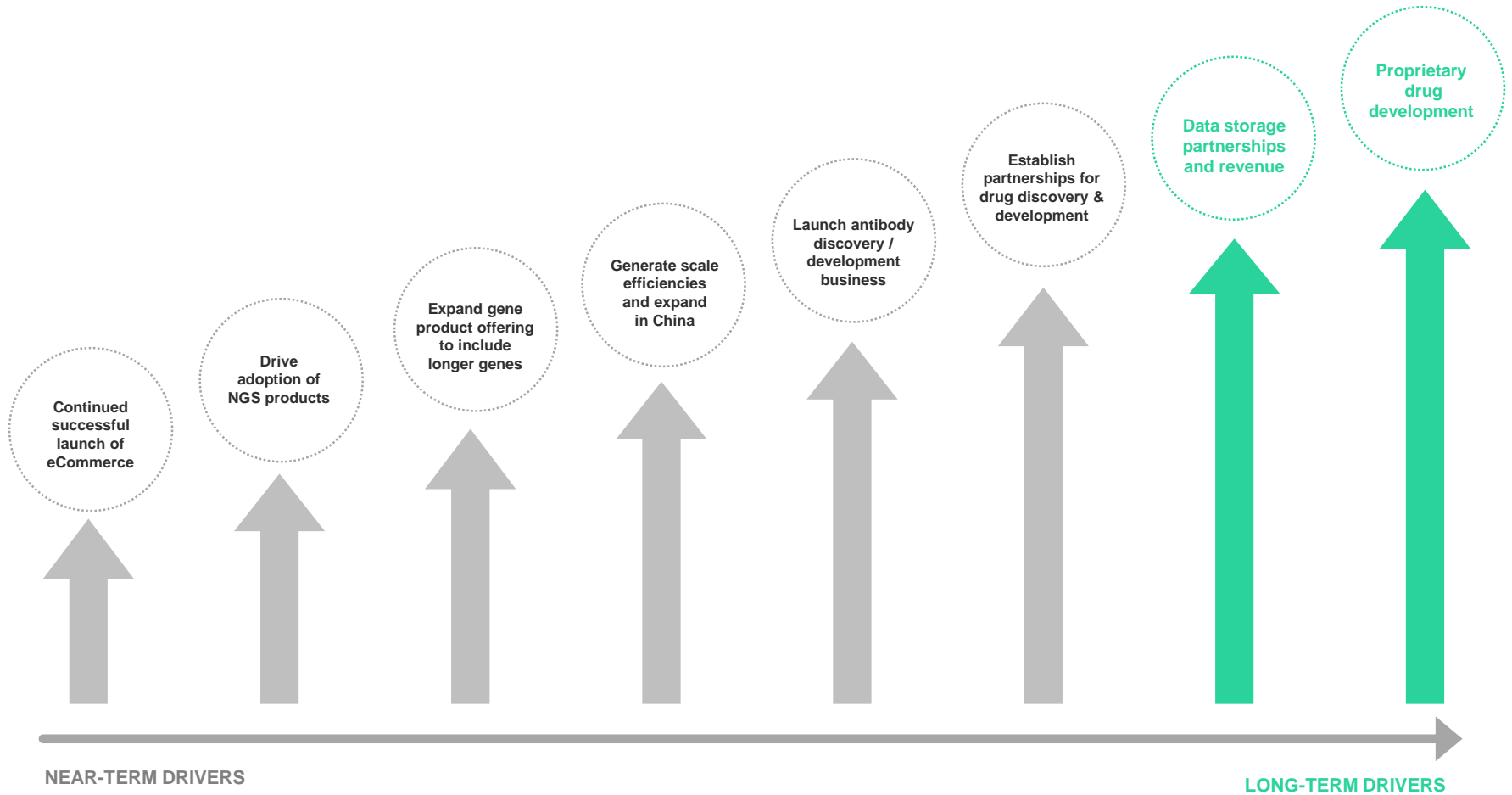
Martin Kunz
SVP, Operations



Strong Momentum and Milestones Achieved



Significant opportunities to drive further growth



Why Twist?

