Powering the Synthetic Biology and Genomics Revolutions

September 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.

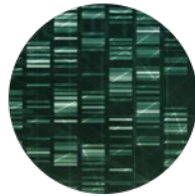# Writing Synthetic DNA on Silicon Platform

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
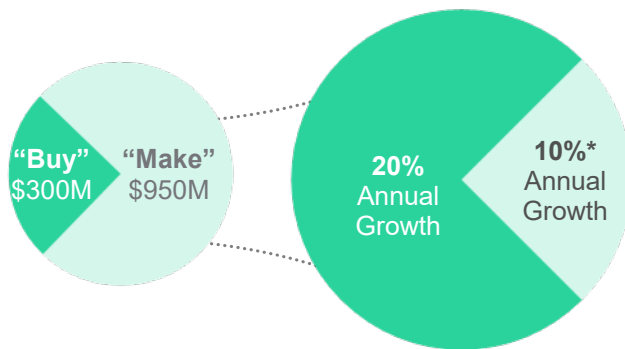
VERSATILE PLATFORM
Broad applications

Our Strategy

SYNTHETIC BIOLOGY:
GENE SYNTHESIS

GENOMICS: TARGETED NGS

OPEN NEW MARKETS

Near-term strategic priorities	Long-term initiatives

- Lead the Buyer market
- Convert Makers into Buyers

"Buy"
$300M

"Make"
$950M

20%
Annual
Growth

10%*
Annual
Growth

*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

- 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
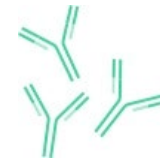
DRUG DISCOVERY

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]					• Continue to drive growth, add market share • NPI roadmap
Genomics: Targeted NGS[2]					• Convert NGS pilot accounts to production • Launch back-end production in China
Biological Drug Discovery and Development[3]					• Expand proof-of-concept data package • Longer-term: Establish partnerships
Digital Data Storage in DNA					• Design of CMOS driver chip • 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 PLATFROM TECHNOLOGY ADDRESSES

LARGE MARKET OPPORTUNITIES

$1.3B
SYNTHETIC BIOLOGY

$0.5B
GENOMICS: TARGETED NGS

LARGE MARKET
DRUG DISCOVERY/ DEVELOPMENT

$35B+
DATA STORAGE

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

- Fast Customization
- Performance
- Full Kit
- High Quality

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

- Permanence
- Density
- Ease of Copying
- Universal Format

SHORT TERM GOAL
Grow Revenue

MID TERM GOAL
Develop novel therapeutics

LONG TERM GOAL
Enter technology market

Source: BCC Report (2017), Markets and Markets (2014) DeciBio (2015)
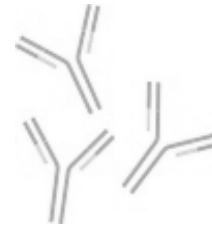
Source: LDC Market Analysis, LTO Program Technology Provider Companies

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

We need a new type of DNA supplier to meet demand

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

Source: BCC Research

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

Gene Synthesis Market: Buyers and Makers

$1.3B / Year

Large Scale, Commercial Users

Value: Speed, Throughput and Quality

" **Can't get what I need** "

"Make"
Synthesis Supplies
(Enzymes, Primers, Cells, Plates)

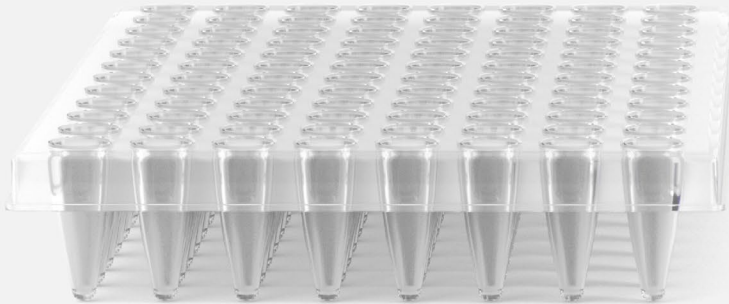**"Buy"**
Synthetic DNA
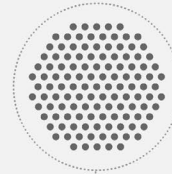**$300M**

$950M
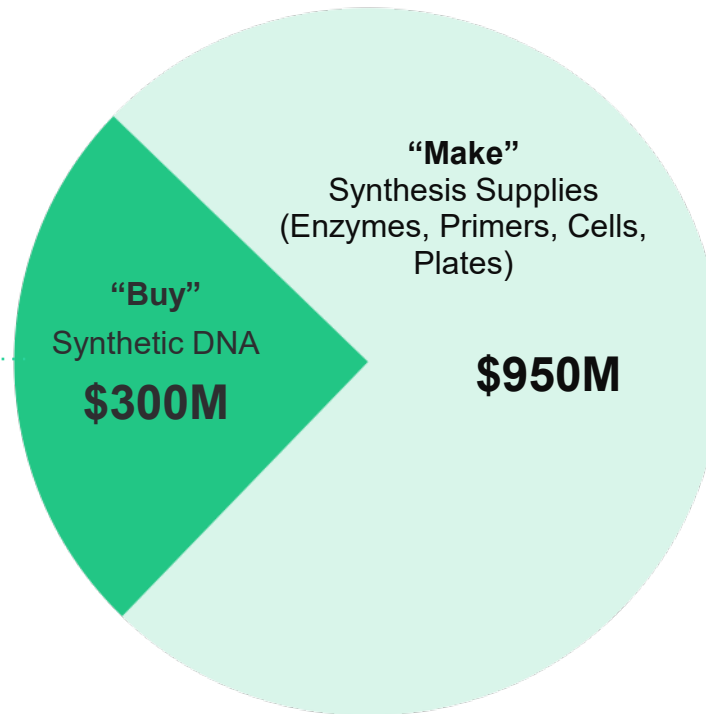
Small Scale, Academic Users

Price-Sensitive

" **I Hate Cloning** "

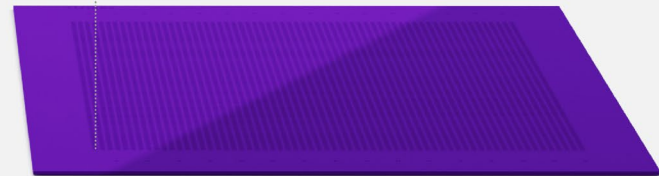Source: BCC Report (2017), Markets and Markets Molecular Biology (2014)

Rewriting DNA with the Power of Silicon

121 devices per cluster

96 WELL PLATE
makes 1 gene

TWIST SILICON PLATFORM
can make 9,600 gene

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

Key Advantages

HIGH QUALITY

UNIQUE CUSTOMER EXPERIENCE

LOWER COST

UNPRECEDENTED THROUGHPUT / SCALE

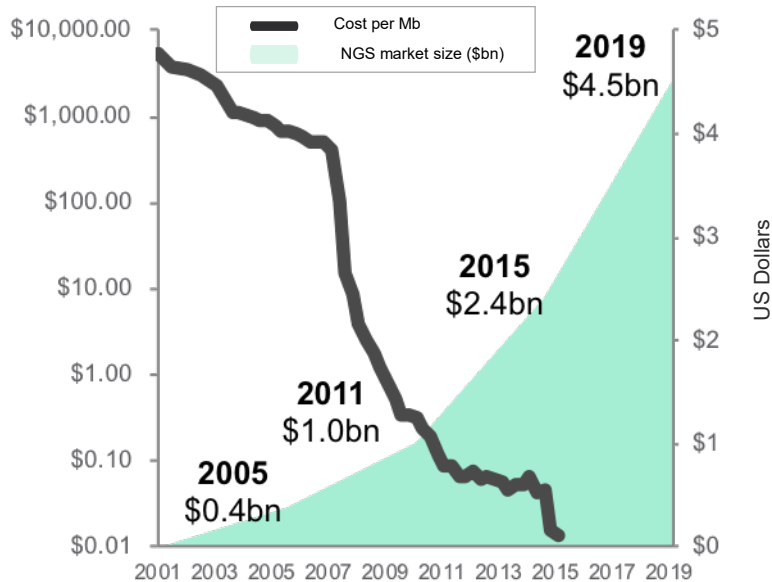**CONSISTENT RELABILITY**

COMPETITIVE TURNAROUND TIME

COMPREHENSIVE PRODUCT OFFERING

Our Disruptive Technology is Enabling New Markets and Applications

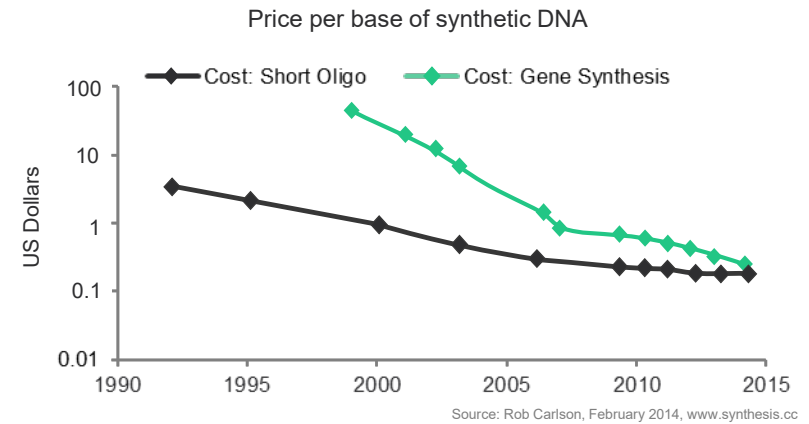## COST PER BASE PAIR VS NGS MARKET SIZE

Legend: Cost per Mb; NGS market size ($bn)

2019 $4.5bn
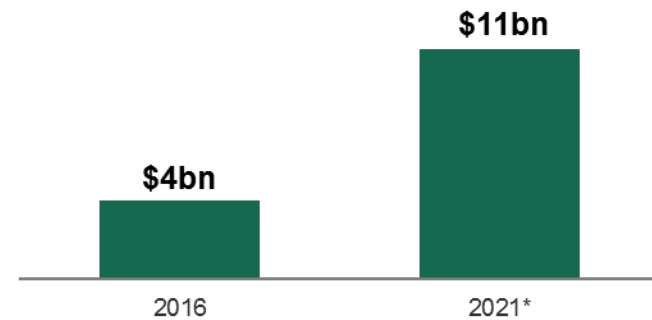**2015** $2.4bn
2011 $1.0bn
2005 $0.4bn

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

Price per base of synthetic DNA

Legend: Cost: Short Oligo; Cost: Gene Synthesis

Source: Rob Carlson, February 2014, www.synthesis.cc

GLOBAL VALUE OF SYNTHETIC BIOLOGY MARKET

$4bn — 2016
$11bn — 2021*

Source: BCC Research *Expected growth

A Unique Way to Order your DNA Online …

E-Commerce is Enabling Capture of Long Tail

E-COMMERCE IMPACT
Q3-18 VS. Q3-19*

Less than 60% lower PO size as we reach long tail

3.2x more orders

*unaudited, ex-Ginkgo, synbio

- Sequence Intake
- Codon Optimization
- Shipping & Taxes
- Quoting
- Payment
- Order
- Tracking
- Notifications
- Shipping
- Invoicing

Now Available:
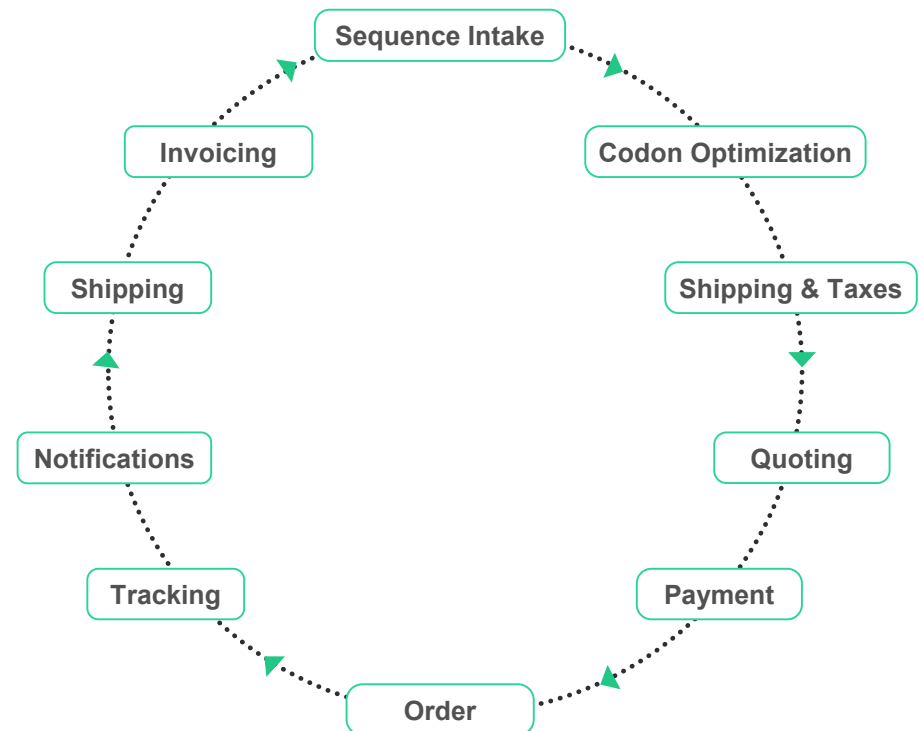
5kb Genes
at disruptive price

- Increase serviceable market
- Enable maker to buyer conversion

3.2kb ————————————→ 5kb
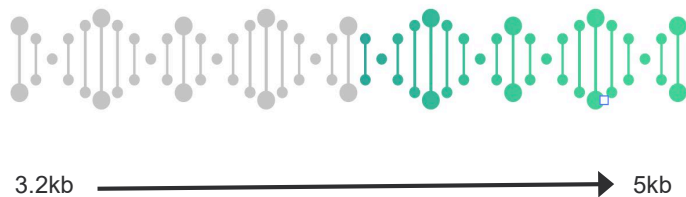
API

- Seamless integration
- Increase service stickiness

WITHOUT API

TWIST SERVER   YOUR SERVER

WITH API

TWIST SERVER   YOUR SERVER

"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

P3
PANDEMIC PREVENTION PLATFORM
60 DAYS TO STOP A PANDEMIC
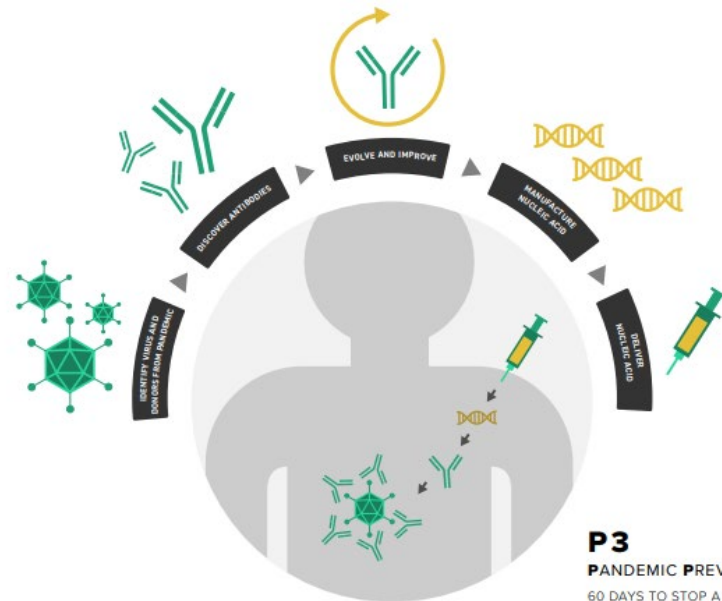
Targeted NGS is enabling reading of patient's and/or pathogen's DNA to inform precision or personalized medical treatment

- Reduced sequencing cost per sample

- Faster time to results

- Increased sensitivity / complete coverage of difficult regions

Targeted NGS Value Chain

Library Prep
- Enzyme, Buffer, Primers, Barcodes

Capture
- Oligos (10s to 100,000s, pooled, high quantities)
  - Catalog: All Exome (~20,000 known human genes)
  - Custom: panels of 1 to 1,000s of genes, customer specific
- Buffer, beads, enzyme

$0.5B SAM

Sequencing
- DNA sequencing
- Illumina dominant
- Ion Torrent, PacBio, ONT niche players

Analysis
- Primary, secondary and tertiary analysis
- Standardized (GATK)

Clinical Report
- Optional
- Biology intensive

Applications
- Research
- Translational
- Molecular Dx
- Microbiology
- Applied Markets

Targeted NGS – Strong Value Proposition
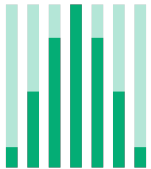
PERFORMANCE / COST

- High Uniformity
- Low Sequencing Costs
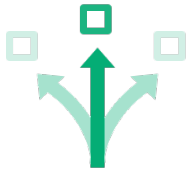
CUSTOMIZATION

- 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 testing:
initial use tests

Test in customer workflow; Optimization for specifications

Pricing and commercial discussions
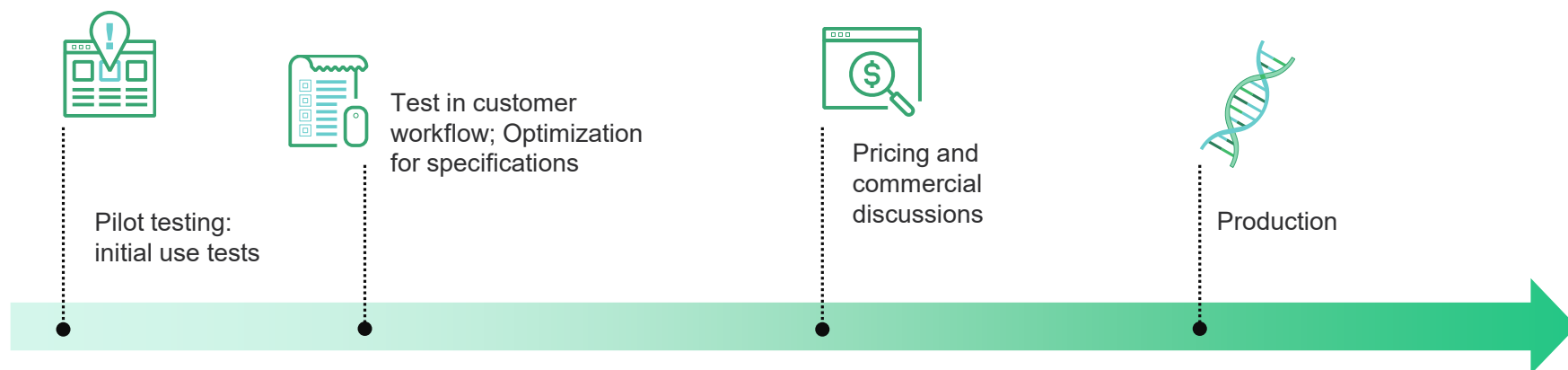
Production

- 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 150 customers in Q3-FY19*	Out of 84 major potential customers: 26 have adopted Twist in their production

*unaudited

NGS Products

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.

Strong Orders Growth

Customer Growth

CUSTOMER COUNT

Quarterly Revenue Ramp

QUARTERLY REVENUE RAMP ($M)

Legend:
- YoY growth %
- QoQ growth %
- NGS
- Non-Ginkgo
- Ginkgo

YoY growth %: 103%, 140%, 167%, 120%, 109%

QoQ growth %: 9%, 23%, 44%, 5%, 29%, 37%, 18%

Data by quarter:
- Apr-Jun 17: Ginkgo $0.8, Non-Ginkgo $2.4
- Jul-Sep 17: Ginkgo $1.4, Non-Ginkgo $2.0
- Oct-Dec 17: Ginkgo $1.5, NGS $0.2, Non-Ginkgo $2.6
- Jan-Mar 18: Ginkgo $2.4, NGS $0.6, Non-Ginkgo $3.2
- Apr-Jun 18: Ginkgo $1.6, NGS $1.0, Non-Ginkgo $3.9
- Jul-Sep 18: Ginkgo $3.2, NGS $0.9, Non-Ginkgo $4.3
- Oct-Dec 18: Ginkgo $2.7, NGS $3.8, Non-Ginkgo $5.0
- Jan-Mar 19: Ginkgo $2.2, NGS $5.5, Non-Ginkgo $5.9
- Apr-Jun 19: Ginkgo $2.2, NGS $5.6, Non-Ginkgo $5.8

Two quarters gross margin positive: 13%, 16%

Strong Revenue Growth

FULL-YEAR REVENUE ($M)

- ● Revenue CAGR (2016-18)
- **NGS**
- **S-Bio**

+235%

Full-year 2016: $2.3
Full-year 2017: $10.8
Full-year 2018: S-Bio $22.7, NGS $2.7
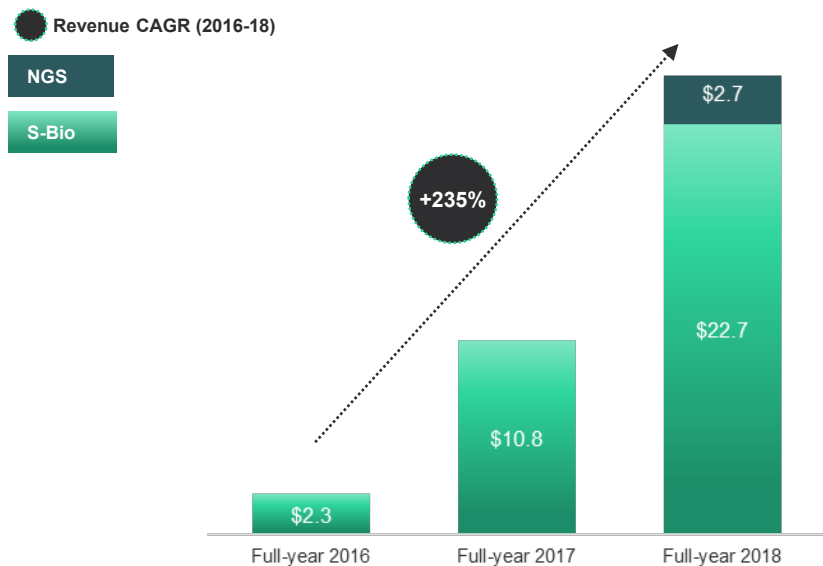
$M except for #	2016	2017	2018
Order value	N/A	$17.5	$39.4
Revenue	$2.3	$10.8	$25.4
# of customers	97	286	717
Gross profit	($7.2)	($13.3)	($6.8)
Net Op. Loss	($43.7)	($58.5)	($70.6)

9 -MONTHS REVENUE ($M) JUNE 30th

- ● Revenue growth %
- **NGS**
- **S-Bio**

+127%

9-months 2018: S-Bio $15.2, NGS $1.8
9-months 2019: S-Bio $23.7, NGS $14.9
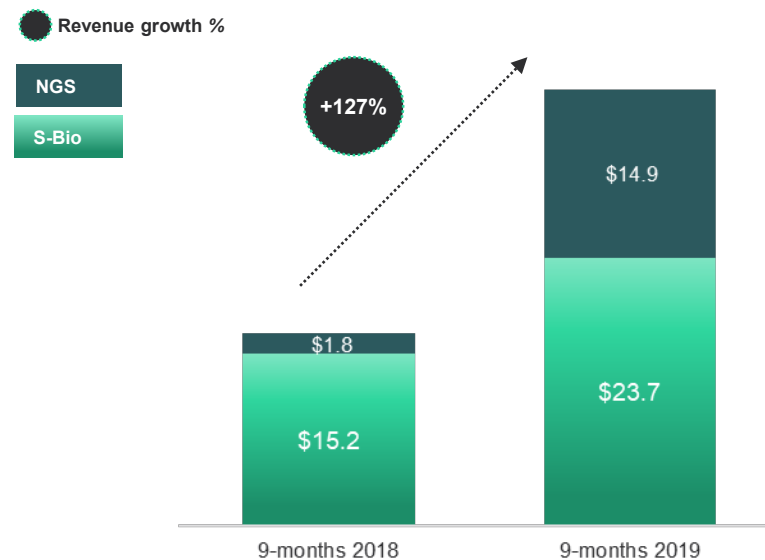
$M except for #	2018	2019
Order value	$26.6	$49.9
Revenue	$17.0	$38.6
# of customers	379	834
Gross profit	($6.1)	$3.6
Net Op. Loss	($50.9)	($77.3)

Other Growth Verticals

$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
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

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
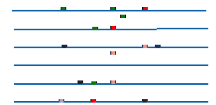
To Stack of Needles

- 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
```
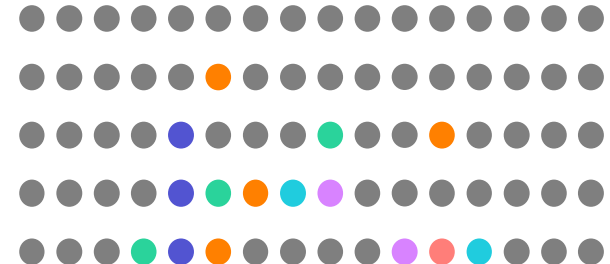
Gene Synthesis	
Single Site	
Multi-Site	
Stretch	
Multi-Domain	

"Human Repertoire Inspired"

ANTIBODY OPTIMIZATION

NOVEL DRUG DISCOVERY

CUSTOM SOFTWARE

TAO Software

NOVEL CLASS OF GPCR, ION CHANNEL AND TRANSPORTER ANTIBODY LIBRARIES

Bio-Betters

High Diversity, High Quality Molecules

- Affinity (pM)
- Half-life
- Expression
- Immunogenicity
- Solubility
- Druggability

Leveraging Technology to Develop Therapeutics for Hard-to-Drug Targets

1 library

OR
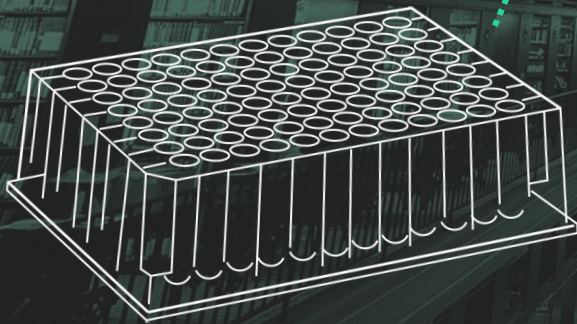
100s of libraries

Pan hundreds of antibody libraries against every target

LIBRARY
OF
LIBRARIES

TWIST
BIOPHARMA

Writing the Future of Biologics

- Three different functional leads generated against same GPCR target using three approaches and two libraries (GPCR, VHH single domain libraries)
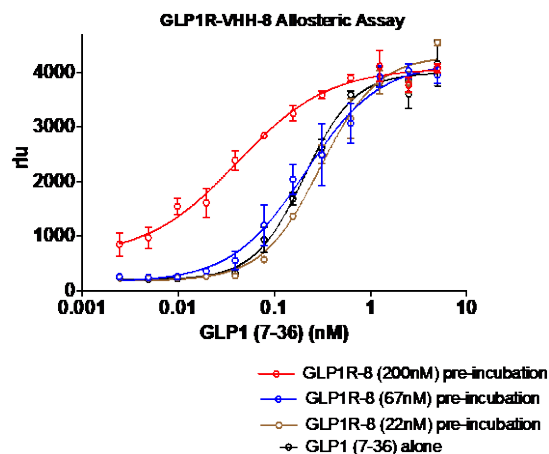
Positive Allosteric Modulator

GLP1R-VHH-8 Allosteric Assay

Legend:
- GLP1R-8 (200nM) pre-incubation (red)
- GLP1R-8 (67nM) pre-incubation (blue)
- GLP1R-8 (22nM) pre-incubation (brown)
- GLP1 (7-36) alone (black)

	200nM	67nM	22nM	GLP1 (7-36) alone
EC50	0.04094	0.2108	0.2979	0.2059

Agonist

- GLP-1
- Ab1-Lc
- Ab1-Hc

Antagonist

Legend:
- + no Ab (black)
- + 100nM TB01-3_GLP1R (red)
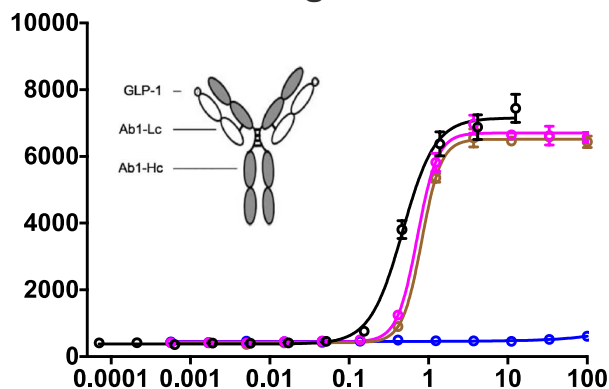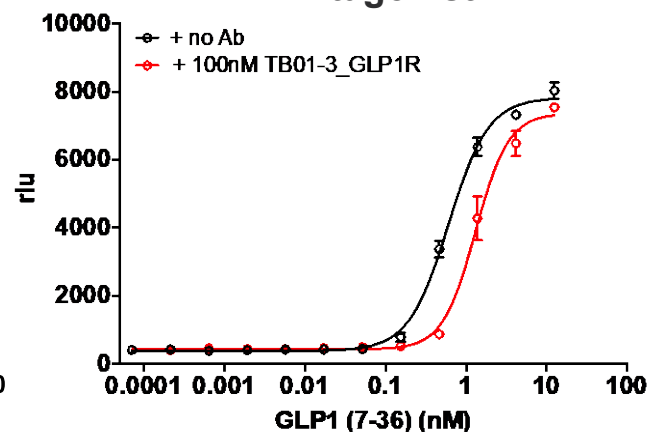
	+ no AB	+ 100nM TB01-3_GLP1R
EC50	0.6053	1.311

TAO: How it Works

4 months

CDR–H1: 968
CDR–H2: 229
CDR–H3: 267
CDR–L1: 329
CDR–L2: 2118
CDR–L3: 42
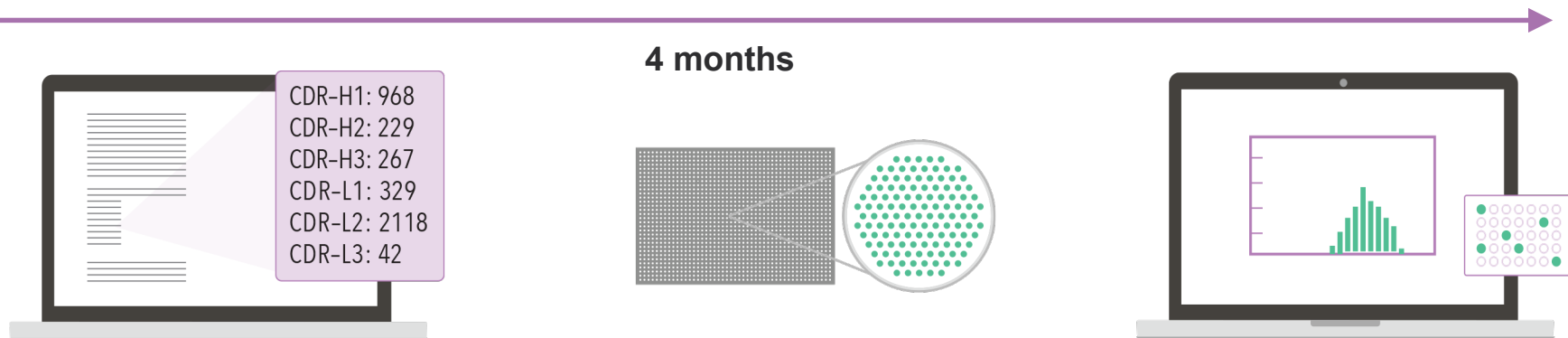
1 **Input antibody sequence into software**

2 **Order oligo pools & template DNA**

3 **Twist Biopharma creates library & screens against target**

Parental Antibody (325 nM)

Optimized Antibody (4.5 nM)

72 ×

Affinity Increase

Biopharma Collaborations

TWIST BIOPHARMA

Two agreements signed in April 2019

LakePharma — The Biologics Company

Discovery through IND Application

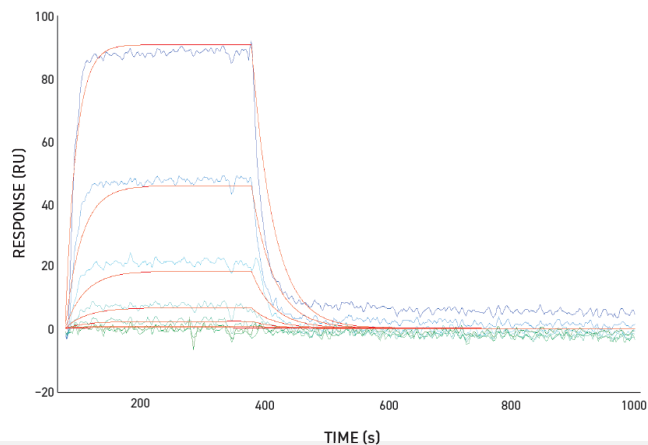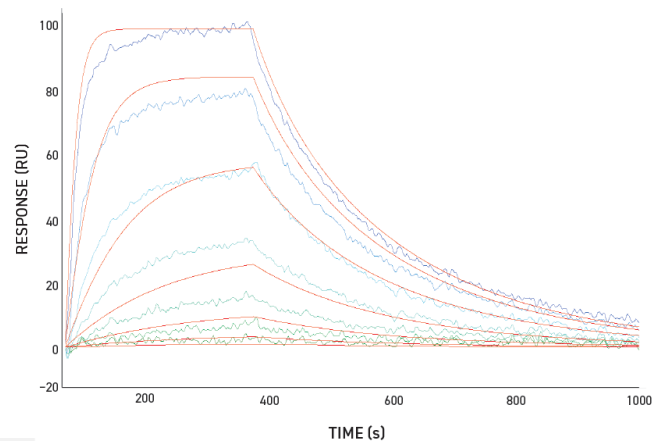- LakePharma has ability to offer Twist's proprietary solutions to existing and future biopharma customers

- Libraries, Antibody Optimization Solution

- Twist customers have access to LakePharma's integrated discovery and development services

PANDION THERAPEUTICS

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

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DNA: Nature's Choice for Data Storage

**MAN-MADE,
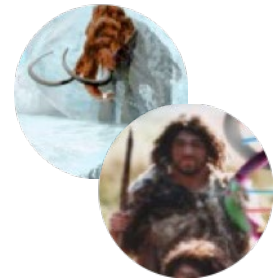NOT PERMANENT**

STABLE FOR 1000s of YEARS

**20,000
Years ago**

Sequencing the nuclear genome of the extinct woolly mammoth

Webb Miller[1], Daniela I. Drautz[1], Aakrosh Ratan[1], Barbara Pusey[1], Ji Qi[1], Arthur M. Lesk[1], Lynn P. Tomsho[1], Michael D. Packard[1], Fangqing Zhao[1], Andrei Sher[2]‡, Alexei Tikhonov[3], Brian Raney[4], Nick Patterson[5], Kerstin Lindblad-Toh[5], Eric S. Lander[5], James R. Knight[6], Gerard P. Irzyk[6], Karin M. Fredrikson[7], Timothy T. Harkins[7], Sharon Sheridan[7], Tom Pringle[8] & Stephan C. Schuster[1]
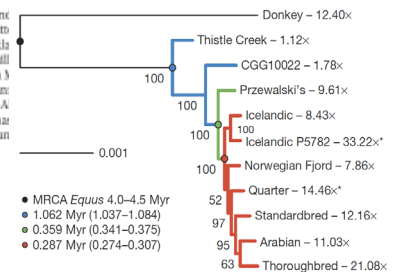
**40,000
Years ago**

A Draft Sequence of the Neandertal Genome

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**560,000 - 780,000
Years ago**

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

Ludovic Orlando[1]*, Aurélien Ginolhac[1]*, Guojie Zhang[2]*, Duane Froese[3], And Enrico Cappellini[1], Bent Petersen[6], Ida Moltke[4,2], Philip L. F. Johnson[5], Matt Thorfinn Korneliussen[1], Anna-Sapfo Malaspinas[1], Josef Vogt[6], Damian Sekla Andrei Dolocan[12], Jesper Stenderup[1], Amhed M. V. Velazquez[1], James Cahill Grant D. Zazula[13], Andaine Seguin-Orlando[1,14], Cecilie Mortensen[1,14], Kim M Jacobo Weinstock[16], Kristian Gregersen[1,17], Knut H. Røed[18], Véra Eisenmann Douglas F. Antczak[21], Mads F. Bertelsen[22], Søren Brunak[6,23], Khaled A. S. A John Mundy[20], Anders Krogh[1,6], M. Thomas P. Gilbert[1], Kurt Kjær[1], Thomas Jesper V. Olsen[10], Michael Hofreiter[25], Rasmus Nielsen[1,6], Beth Shapiro[26], Jun

Donkey – 12.40×
Thistle Creek – 1.12×
CGG10022 – 1.78×
Przewalski's – 9.61×
Icelandic – 8.43×
Icelandic P5782 – 33.22×*
Norwegian Fjord – 7.86×
Quarter – 14.46×*
Standardbred – 12.16×
Arabian – 11.03×
Thoroughbred – 21.08×

100
100
100
100
52
97
95
63

0.001

● MRCA *Equus* 4.0–4.5 Myr
● 1.062 Myr (1.037–1.084)
● 0.359 Myr (0.341–0.375)
● 0.287 Myr (0.274–0.307)

Data Storage in DNA

1   Coding

00 → A
01 → G
10 → C
11 → T

2   Synthesis

3   Storage

4   Retrieval

5   Sequencing

A G T T A C
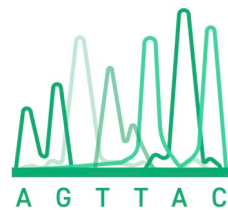
6   Decoding

A → 00
G → 01
C → 10
T → 11

Permanence ● **Density** ● **Random Access** ● **Universal format**

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

LOGARITHMIC SCALE
PRICE PER BASE OF DNA

$100
$1
$0.01
$0.0001
$0.000001
$0.00000001
$0.0000000001
$0.000000000001

Raw Oligo Pool cost** *** (3)

Sequencing Price** (1)

Hard Drive Price
(converted*)** (2)

Tape Price
(converted*)** (2)

Technologies
optimized for memory

cost floor ~10^{-16}

2000   2010   ~2020   ~2030
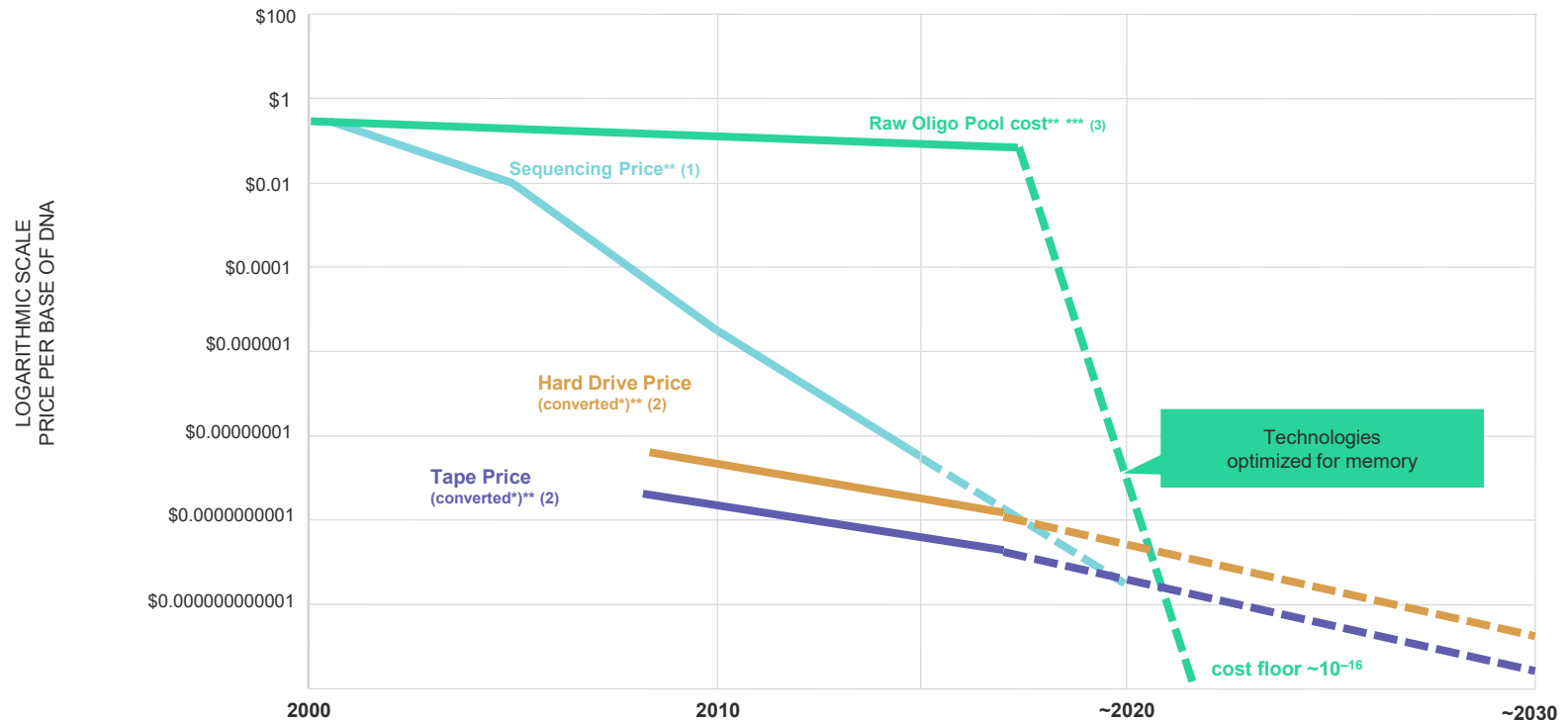
* DNA bases per byte for hard drive and tape shown at typical published encoding ranges from about 5:1 to 6.25:1

** 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

Agilent Technologies

Bill Banyai, PhD
COO, Co-founder

Complete genomics

Bill Peck, PhD
CTO, Co-founder

Complete genomics

Jim Thorburn
CFO

Televerde
Generating Demand. Accelerating Sales.
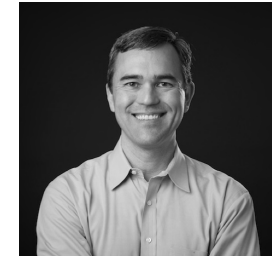
Aaron Sato
CSO, Twist Pharma

LakePharma
The Biologics Company

Patrick Finn, PhD
SVP, Commercial Operations

enzymatics

Patrick Weiss
SVP, Research and Development

operon
molecules for life

Paula Green
VP Human Resources

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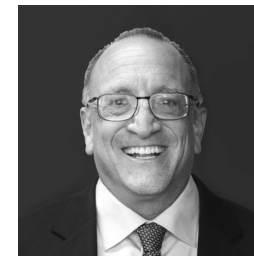
Mark Daniels
Chief Legal Officer, Chief Ethics and Compliance Officer, SVP and Secretary

BROADCOM

Martin Kunz
SVP, Operations

eurofins Genomics

Strong Momentum and Milestones Achieved

IPO
October 2018

Antibody Design Capability and Drug Discovery
June 2018

eCommerce Launch for Synbio
May 2018

Long Term Contract
Expanded to 1.3 billion bp - March 2018

NGS Launch
AGBT February 2018

Data Storage
Demonstration - May 2016

Beta Access
Commercial launch - April 2016

2013 — —//— 2016 —————— 2018 ——————→

Founded
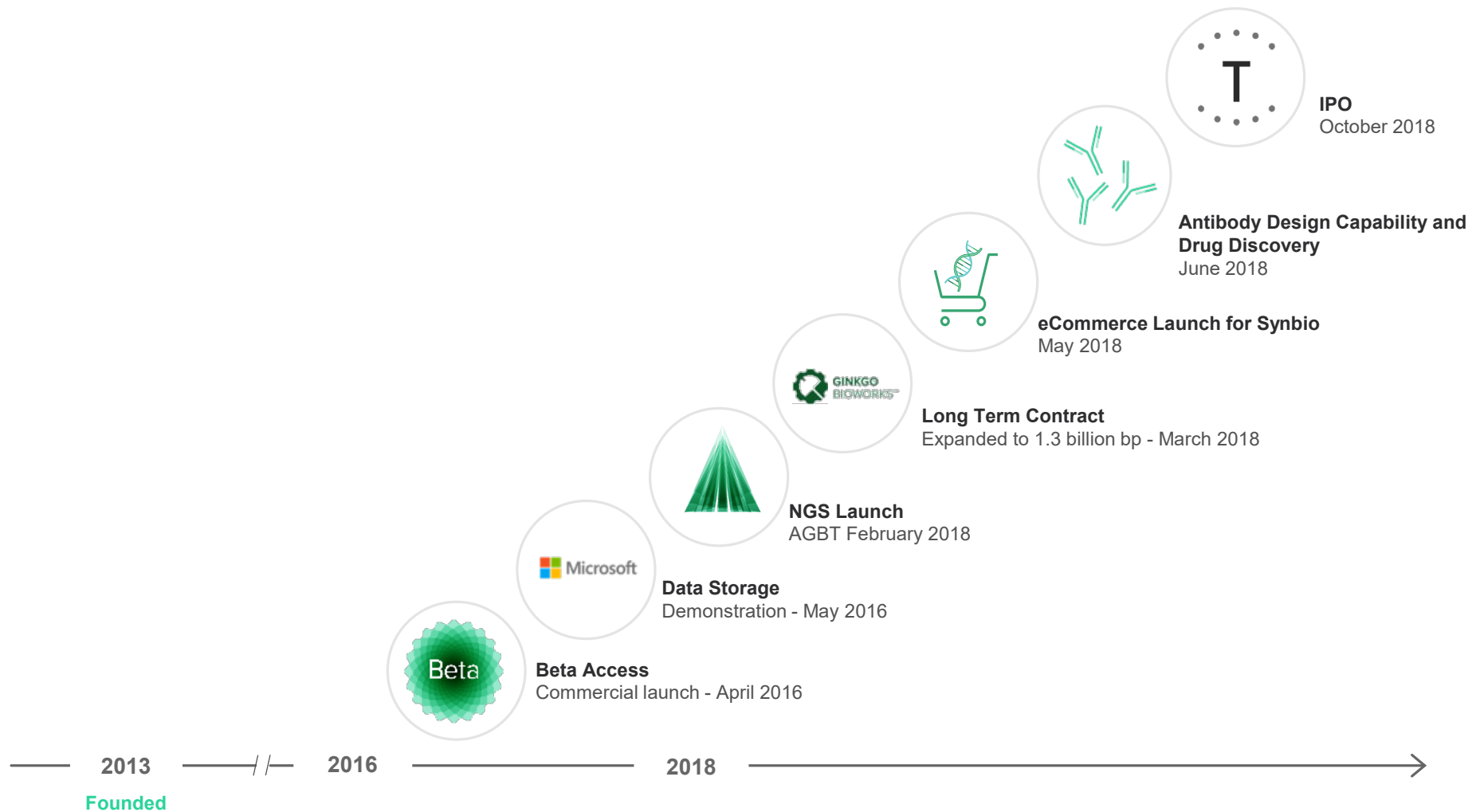
Significant opportunities to drive further growth

Continued successful launch of eCommerce

Drive adoption of NGS products

Expand gene product offering to include longer genes

Generate scale efficiencies and expand in China

Launch antibody discovery / development business

Establish partnerships for drug discovery & development

Data storage partnerships and revenue

Proprietary drug development

NEAR-TERM DRIVERS

LONG-TERM DRIVERS

Why Twist?

Breakthrough Technology
1st DNA Writing on
Silicon Platform

Broad Application
Multiple Product
Categories
and End Markets

High Revenue Growth
2017-2018 revenue growth
from $10.8M to $25.4M

Large Growing Markets
Synthesis DNA, NGS TE, Drug Discovery
and Data Storage

**Unique Platform & Value
Proposition**
Focus on Speed, Affordability,
and High Quality

Attractive Dynamics
No FDA Approvals or
Reimbursements

Experienced Team
with Strong Backing

TWIST
BIOSCIENCE