

Grow with Ginkgo
J.P. Morgan Healthcare Conference

Jason Kelly, Co-Founder and CEO

January 11, 2023

Property of Ginkgo Bioworks

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This presentation and the accompanying webcast (together, the “presentation”) may contain certain forward-looking statements within the meaning of the federal securities laws, including statements regarding our plans, strategies, current expectations, operations and anticipated results of operations, both business and financial, all of which are subject to known and unknown risks, uncertainties and other factors that may cause our actual results to differ materially from those expressed or implied by such forward looking statements. These forward-looking statements generally are identified by the words "believe," "can," "project," "potential," "expect," "anticipate," "estimate," "intend," "strategy," "future," "opportunity," "plan," "may," "should," "will," "would," "will be," "will continue," "will likely result," and similar expressions. Forward-looking statements are predictions, projections and other statements about future events that are based on current expectations and assumptions and, as a result, are subject to risks and uncertainties. Many factors could cause actual future events to differ materially from the forward-looking statements in this presentation, including but not limited to: (i) volatility in the price of Ginkgo's securities due to a variety of factors, including changes in the competitive and highly regulated industries in which Ginkgo operates and plans to operate, variations in performance across competitors, and changes in laws and regulations affecting Ginkgo's business, (ii) the ability to implement business plans, forecasts, and other expectations, and to identify and realize additional business opportunities, (iii) the risk of downturns in demand for products using synthetic biology, (iv) the unpredictability of the duration of the COVID-19 pandemic and the demand for COVID-19 testing and the commercial viability of our COVID-19 testing business, (v) changes to the biosecurity industry, including due to advancements in technology, emerging competition and evolution in industry demands, standards and regulations, (vi) our ability to realize the expected benefits of merger and acquisition transactions, and (vii) our final audited revenue and other financial and performance results may differ materially from the preliminary and unaudited amounts reported herein. The foregoing list of factors is not exhaustive. You should carefully consider the foregoing factors and the other risks and uncertainties described in the "Risk Factors" section of Ginkgo's quarterly report on Form 10-Q filed with the U.S. Securities and Exchange Commission (the "SEC") on November 14, 2022 and other documents filed by Ginkgo from time to time with the SEC. These filings identify and address other important risks and uncertainties that could cause actual events and results to differ materially from those contained in the forward-looking statements. Forward-looking statements speak only as of the date they are made. Readers are cautioned not to put undue reliance on forward-looking statements, and Ginkgo assumes no obligation and does not intend to update or revise these forward-looking statements, whether as a result of new information, future events, or otherwise. Ginkgo does not give any assurance that it will achieve its expectations.

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We believe...

1

2022 was a banner year for Ginkgo and the industry

Ginkgo's first full year as a public company saw tremendous fundamental growth. While markets may be turbulent, we are executing well and are encouraged by the progress we're seeing across the bioeconomy.

2

Ginkgo’s platform will impact therapeutics discovery and manufacturing across all modalities

Integration of molecular tools, genomics, laboratory automation, and machine learning are enabling an explosion in therapeutics discovery and manufacturing for cell and gene therapy, small molecules, biologics, microbiome, and RNA therapeutics and vaccines.

3

Synthetic biology is a national priority

Biomanufacturing and biosecurity are key to the future of innovation and public health.

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Synthetic biology is a national priority

DNA

LISTED

NYSE

SEP 2021

“I’m very pleased with the robust program growth we achieved in 2022 – nearly doubling the number of programs we added in 2021. We also expect to meet our Total revenue guidance for the year, and I’m particularly happy that we’re expecting our full year revenue to land at over 35% above the high end of our initial guidance shared in March 2022. Lastly, we ended the year with about $1.3 billion in cash, providing a margin of safety to the business as we continue to scale.”





Ginkgo is a CRO with technology you don't have in-house

Marcus Schindler (He/Him) • Following
Executive Vice President & Chief Scientific Officer at Novo Nordisk
3mo •

In Research & Early Development we are constantly evaluating our scientific processes for opportunities for innovation, enabling us to work in faster, smarter ways. We have a strong legacy of working with cutting-edge yeast expression systems, which are fundamental to the production of our drugs. But we know that there are opportunities for improvement and innovation. Therefore, we are changing the way we work and opening up to external partners who bring new and complementary expertise.

Ginkgo Bioworks, Inc. are leaders in reprogramming biology to develop novel expression hosts. These strong capabilities in synthetic biology are rooted in the ability to re-write genomes to engineer new, bespoke biological systems. In our collaboration we aspire to combine our skills to design expression systems that are tailored to our needs. This is a unique opportunity to generate next-generation expression systems, ultimately transforming how we produce our drugs.

c&en
CHEMICAL & ENGINEERING NEWS

Bayer outsources biologicals research to Ginkgo

Ginkgo absorbs a partnership, and Bayer remains an anchor customer

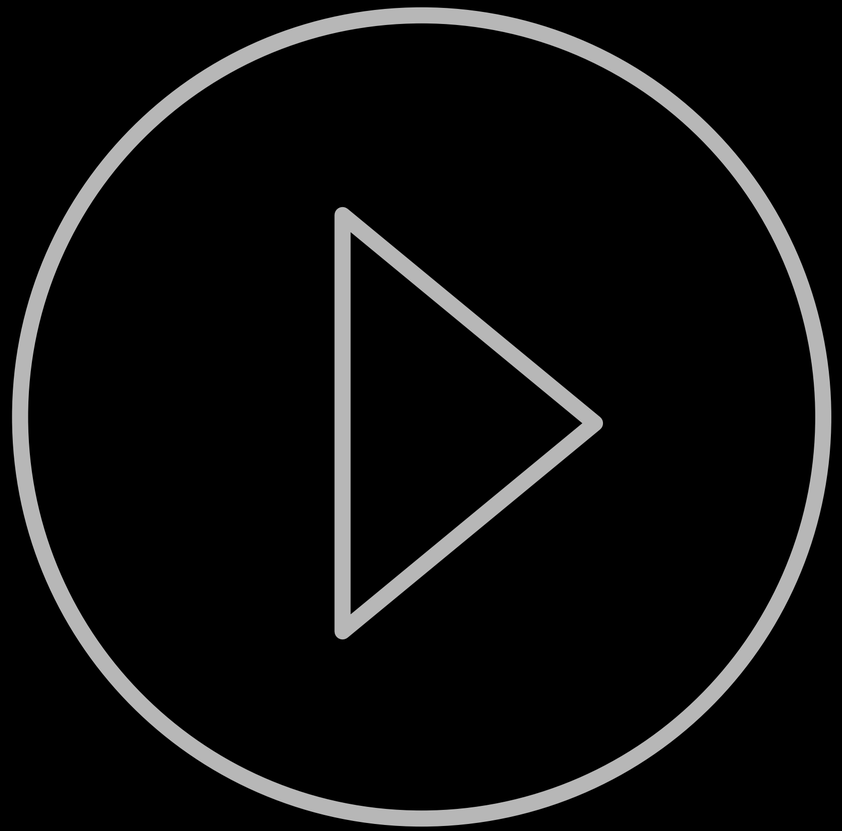
by ***Matt Blois***

April 28, 2022 | A version of this story appeared in **Volume 100, Issue 15**

Ginkgo is a CRO with technology you don't have in-house

- 550K+ sq ft. of facilities
- 1,200+ FTE
- Continuous improvement of capabilities and scale

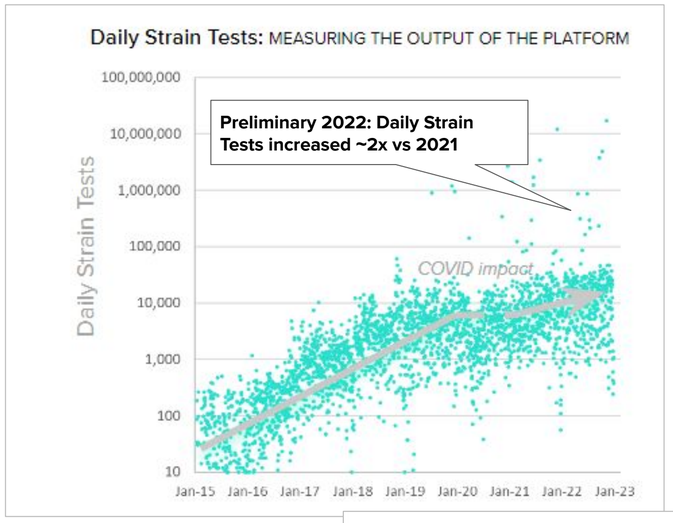


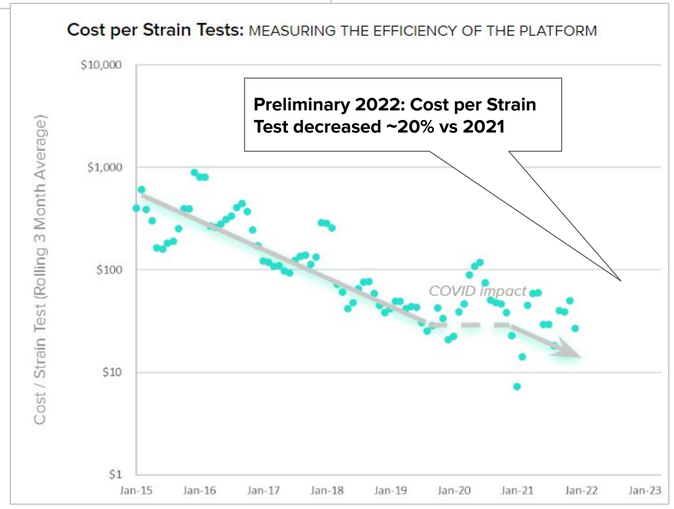


Customers sign up to access unique scale in foundry and codebase

Foundry

A Foundry scale economic allows us to take more shots on goal





Note: Strain tests are an incomplete, but helpful, measure of Foundry scale. We look at other metrics including the number of active programs, number of "campaigns", etc.

We can invest in both Foundry and Codebase scale to increase success rate of customer programs

Codebase

Our Codebase grows alongside the Foundry and allows us to use Foundry resources more efficiently, to take better shots on goal

Warp Drive Bio

BAYER

radiant GENOMICS

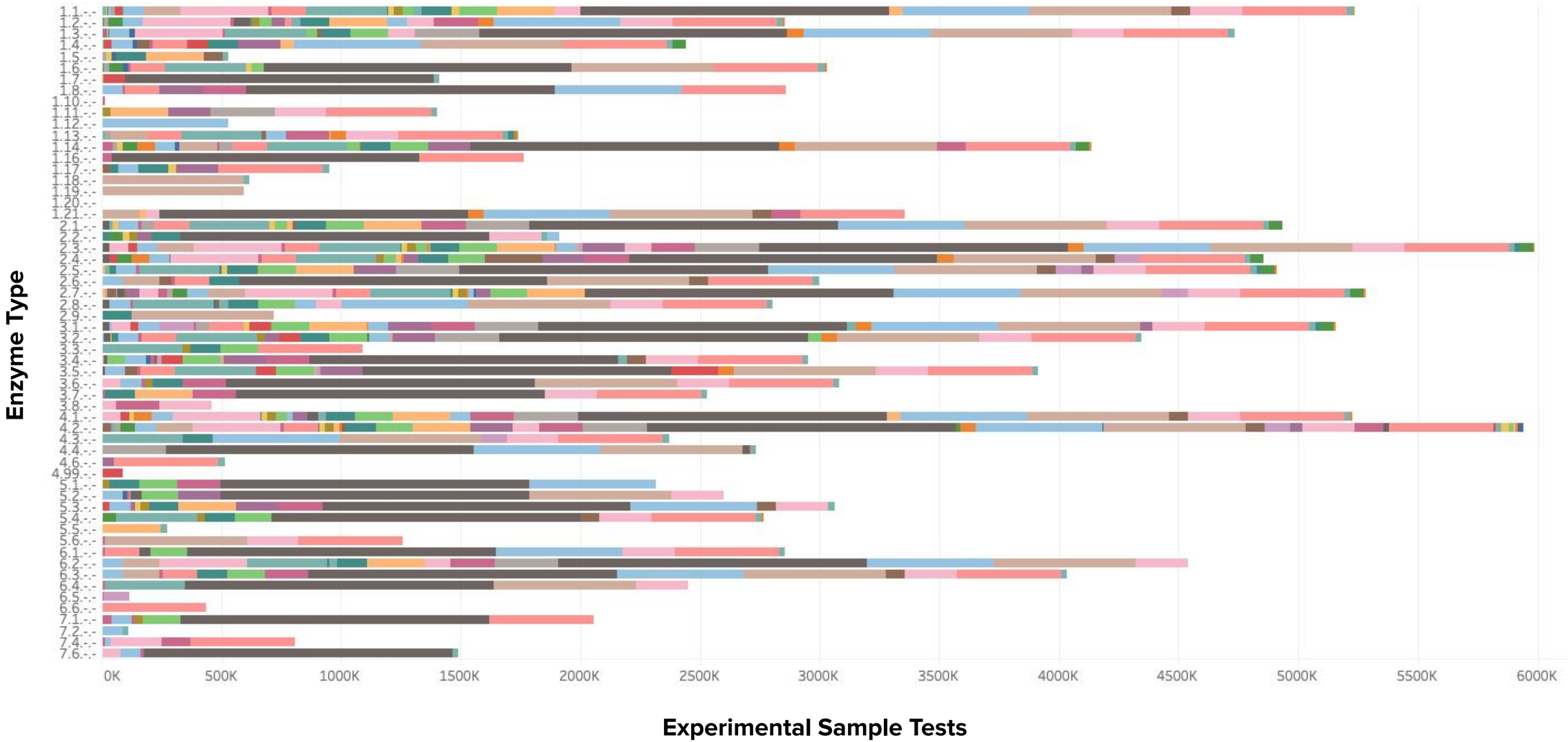
LODO THERAPEUTICS

>1 billion proprietary gene sequences

Diverse capabilities in mammalian therapeutics

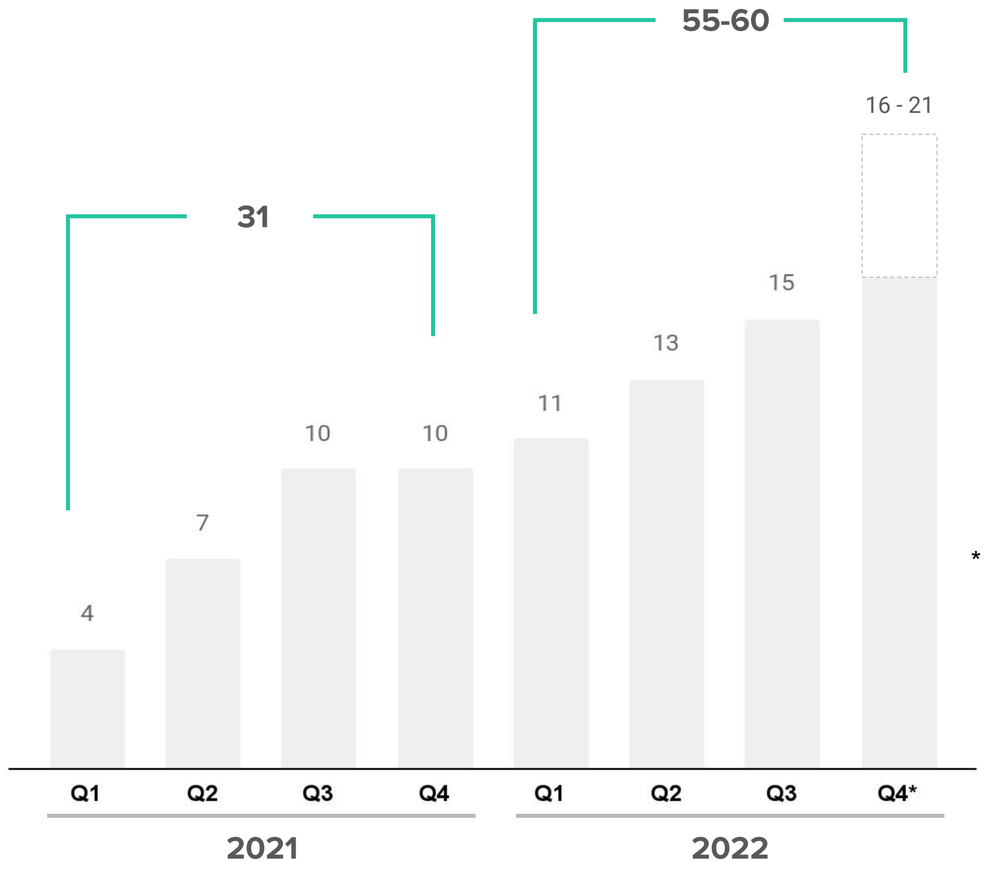
Circularis

Huge data sets are needed to train AI and machine learning models; we have designed and screen millions of enzymes across our programs



Program sales and launch scaling is going well

New Program Launch Trajectory



*New Program figure for Q4 2022 reflects FY 2022 guidance.

Diverse New Customers

Pharma & Biotech

MERCK

novo nordisk®

Ginkgo inks $144M deal with Merck to engineer enzymes to improve ingredient manufacturing

ENDPOINTSNEWS

MICROBA™

Persephone Biosciences

Industrial & Environment

SUMITOMO CHEMICAL

FREDsense®

light bio

LYGOS

Food & Ag

evo

Consumer & Technology

BOLT THREADS

We believe...

1

2022 was a banner year for Ginkgo and the industry

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Ginkgo's platform will impact therapeutics discovery and manufacturing across all modalities

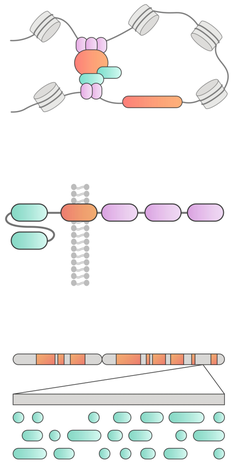
Integration of molecular tools, genomics, laboratory automation, and machine learning are enabling an explosion in therapeutics discovery and manufacturing for cell and gene therapy, small molecules, biologics, microbiome, and RNA therapeutics and vaccines.

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Synthetic biology is a national priority

We believe Ginkgo's platform will impact therapeutics discovery and manufacturing across all modalities

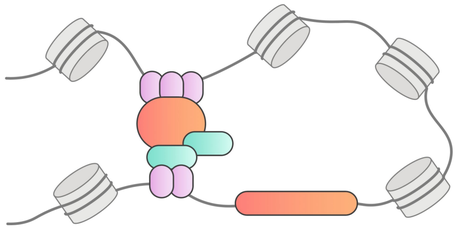
	Cell Therapy	Gene Therapy	Small molecule	Biologics	Microbiome	RNA Tx and vaccines
Discovery	Confidential partner	Selecta Biosciences	Roche	Selecta Biosciences	MICROBA	Confidential partner
	Internal platform development	Confidential partners	saponiQx	TOTIENT	Tantu Therapeutics	Esperovax TARGETED ORAL BIOLOGICS
			MERCK		synlogic	
			Lilly		Persephone Biosciences	prokarium living cures
		Biogen	Optimvia	novo nordisk®		aldevron
Manufacturing			Antheia			moderna



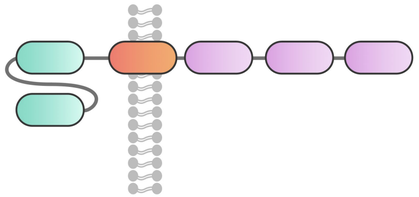
Full stack engineering platform to enable the discovery & optimization of next generation cell therapies

PLATFORMS

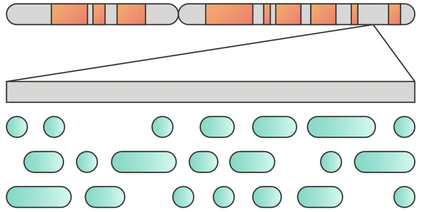
Regulatory Elements



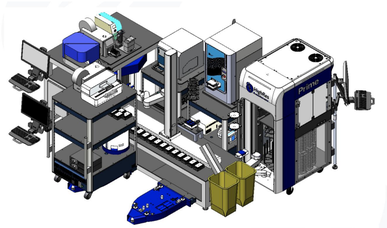
Novel CAR Designs



Stem Cell (iPSC) Engineering



Agile HTS at scale underlies all work



FOCUS AREA

- Promoters induced by extracellular environments and cell intrinsic states
- Tissue-specific promoters to improve safety profiles
- Strong and stable expression to increase potency

- Pooled CAR screening in primary immune cells
- Libraries of novel intracellular signaling domains (ICDs), extracellular antigen recognition domains (ECDs), and armoring domains
- Bespoke and off-the-shelf screens

- Promoter screening
- Safe harbor discovery
- Advanced disease models

- Broad, flexible platform for unparalleled assay development at scale
- Automated execution and data analytics across mammalian epigenome, transcriptome, proteome and functional readouts
- Custom software integrates with diverse lab hardware

THERAPEUTIC NEED

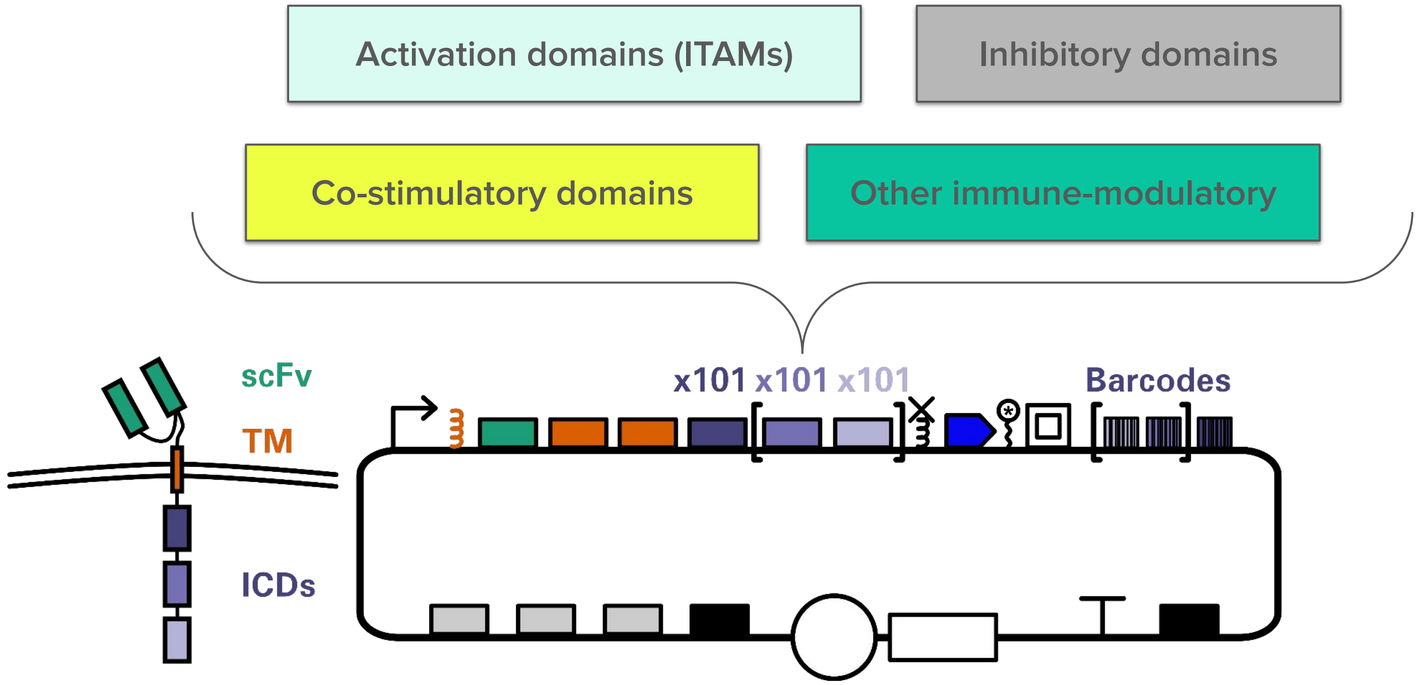
Improving potency and safety for genetic medicines

Driving CAR-T efficacy in solid tumors

Enabling allogeneic cells for therapeutics and more predictive in vitro models

Ginkgo CAR libraries in 2-ICD and 3-ICD formats to screen up to 10^4 - 10^6 unique designs

Leveraging our core competencies in DNA synthesis, assembly and sequencing to build combinatorial 2nd and 3rd generation CAR libraries



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Serial tumor rechallenge assay to induce T cell exhaustion

Problem

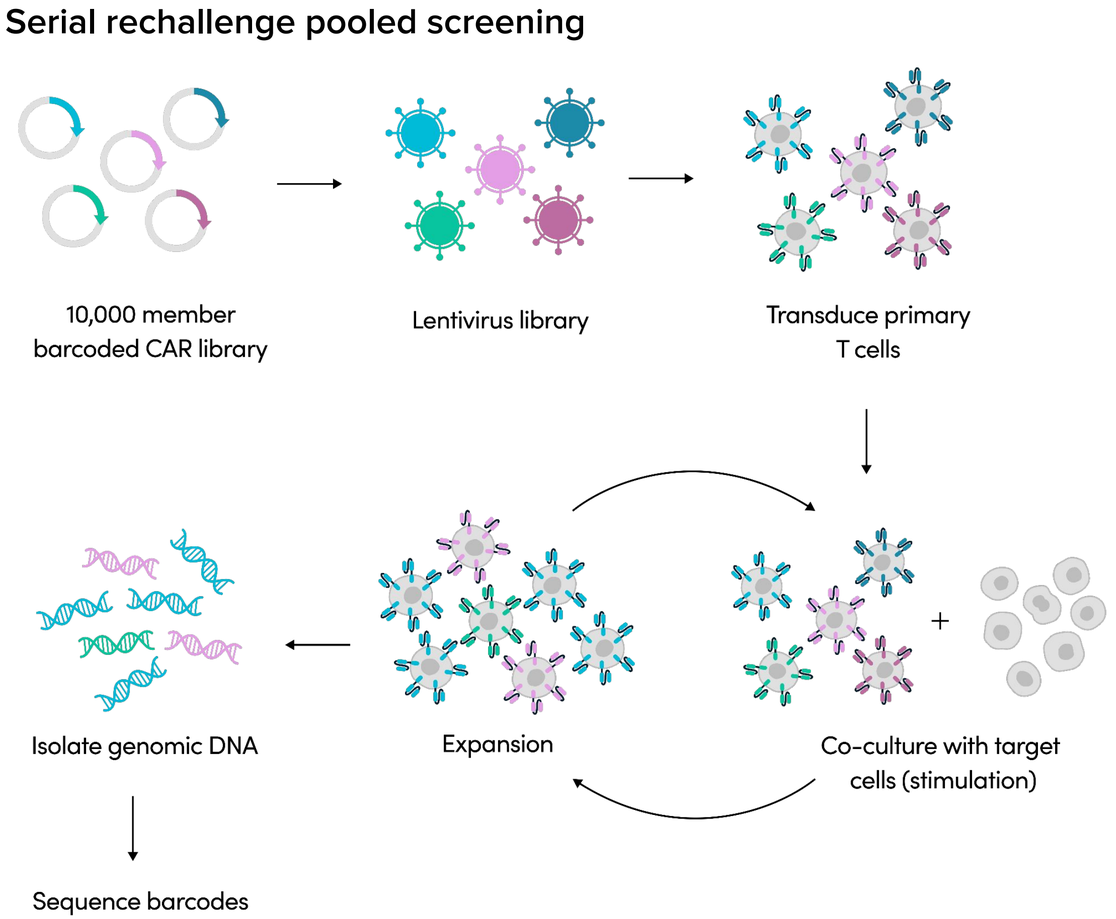
Limited CAR-T efficacy in solid tumors due to T cell exhaustion & limited persistence after antigen engagement

Approach

Pooled library generation of 10,000 unique ICD combinations followed by screening in serial tumor rechallenge assay over 3 weeks followed by next-generation sequencing of barcodes

Flexibility

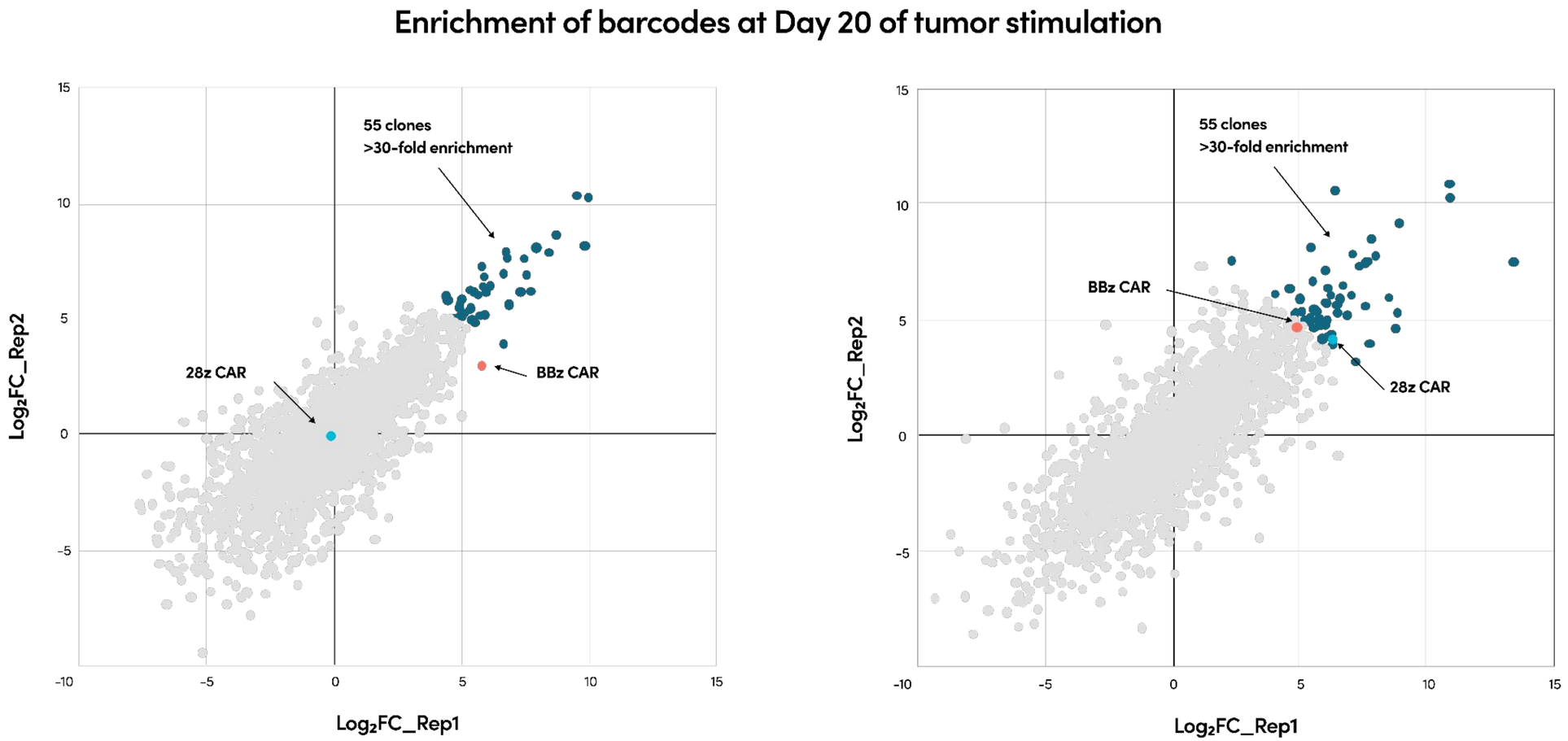
Same libraries have been screened against suspension, adherent and spheroid target cells



Ginkgo identified multiple designs that outperformed standard CD28-CD3z and 41BB-CD3z designs in a serial tumor rechallenge model for T cell exhaustion

10,000 member 2-ICD format library screen identifies ICDs that outperform standard 28z and BBz

Automated Foundry allows screening of multiple libraries in parallel to identify shared designs



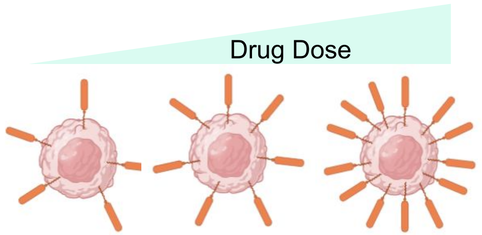
High affinity ECD to solid tumor antigen

Low affinity ECD to solid tumor antigen

Platform expansion leveraging the Ginkgo Foundry

Additional screen conditions

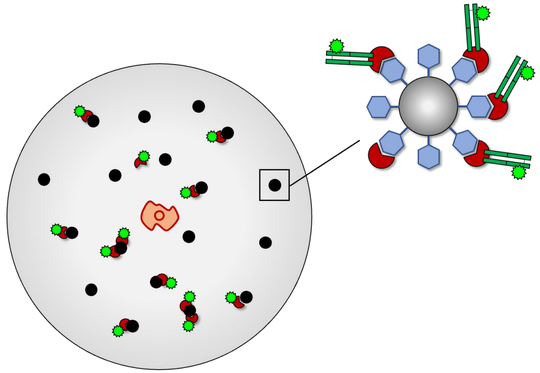
Screening under controlled antigen density



Screening under immunosuppressive conditions

- Soluble factors, e.g. TGFb
- Hypoxia
- Tregs

Additional single cell assays



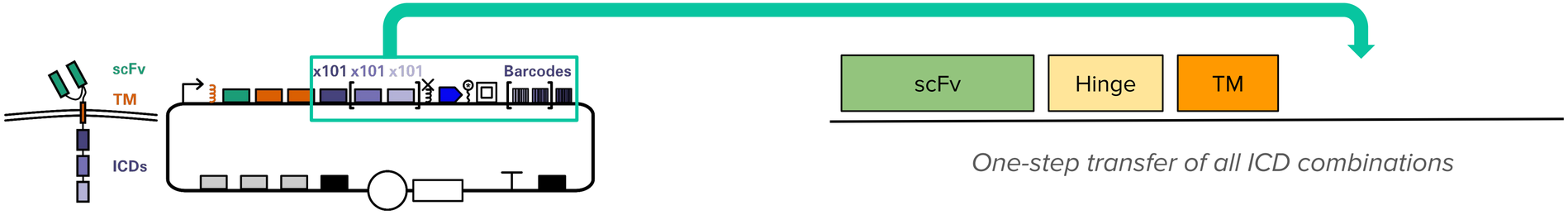
Encapsulation-based screening for additional pooled screen readouts

Validation in animal models



- Validation of novel CAR designs
- Development of pooled in vivo screens

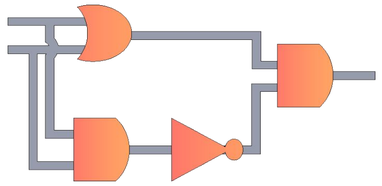
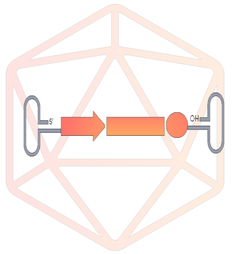
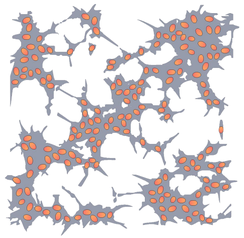
Rapid transfer to new CAR backbones



One-step transfer of all ICD combinations

Full stack engineering platform to enable the discovery & optimization of next generation gene therapies

PLATFORMS

Regulatory Elements	Capsid Engineering	ITR Engineering	Manufacturing
			

FOCUS AREA

Regulatory Elements	Capsid Engineering	ITR Engineering	Manufacturing
• Cell-type specific promoters to improve safety profiles • Regulatory elements for increased expression • Response to extracellular and intracellular signals	• Capsid design using rational and unbiased approaches • Pooled and arrayed screening (individually package and evaluate up to 10^4 variants) • Screening in disease-relevant models	• Strong internal DNA synthesis and sequencing capabilities that are being used to generate inverted terminal repeat (ITR) libraries • Generate and characterize variant ITR cassettes with different serotypes in higher throughput	• Modulate host and viral factors systems biology at scale for both virus and plasmid

THERAPEUTIC NEED

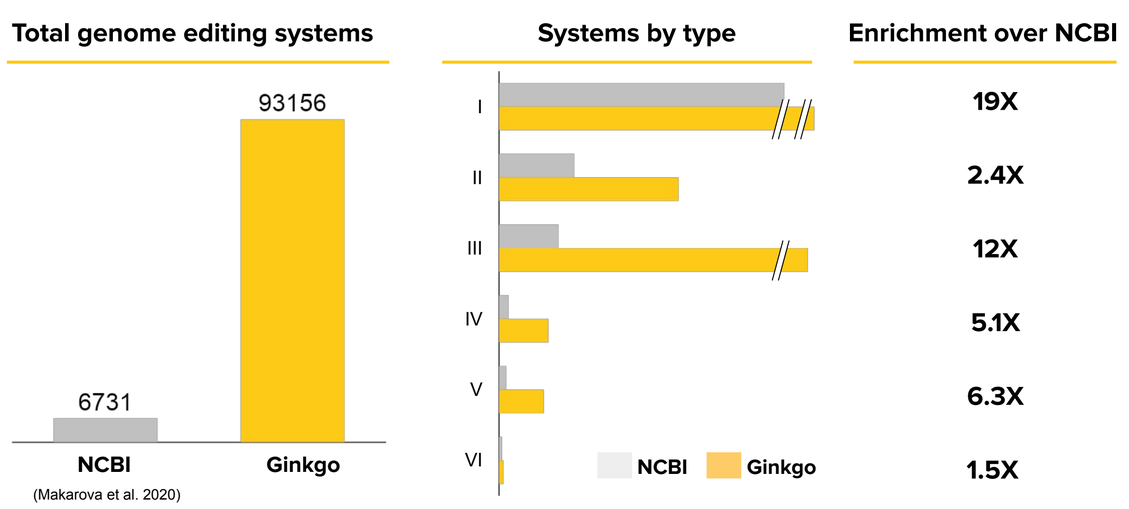
Regulatory Elements	Capsid Engineering	ITR Engineering	Manufacturing
Targeting and reducing toxicity	**Targeting and reducing toxicity**	**Transduction, packaging efficiency and transgene expression**	**Pain points around scaling and output**

Note: Methodology & processes for AAV can apply to other viral-based delivery methods

Metagenomic mining identifies novel base editors and serine recombinases

Ginkgo has sequenced trillions of bases of DNA from uncultured microbes, identifying libraries of base editors and serine recombinases much larger than what is available in public databases like NCBI (National Center for Biotechnology Information)

>90K CRISPR-like Systems in our Metagenomic Database

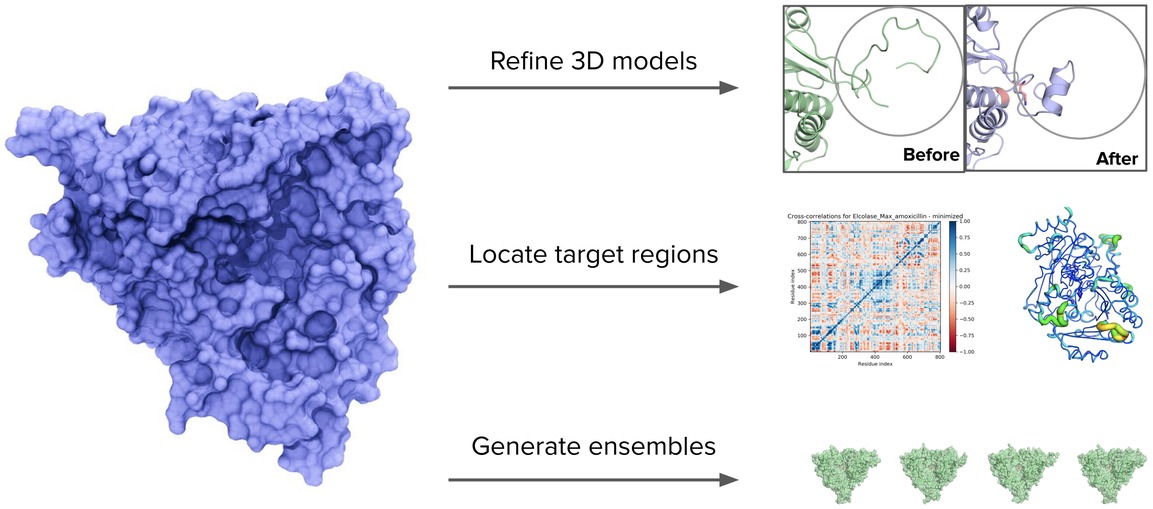


~80,000 serine recombinases identified with similar methods (~10X enrichment over NCBI)

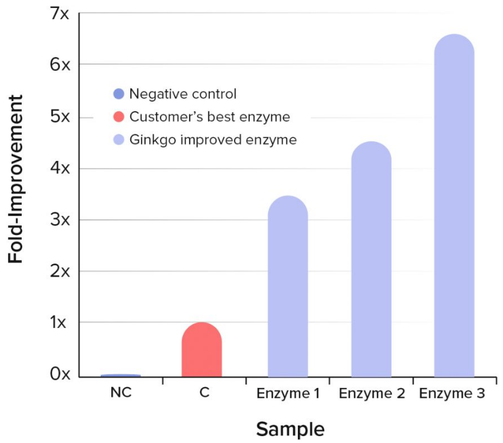
Improving the specificity and activity of a biocatalyst

Enzyme's low synthesis to hydrolysis ratio (S:H) and formation of an undesirable byproduct was limiting our partner's API manufacturing efficiency. **Goal**: Increase activity and reduce manufacturing costs

Generate and screen >1000 candidate enzymes using structural modeling and machine learning



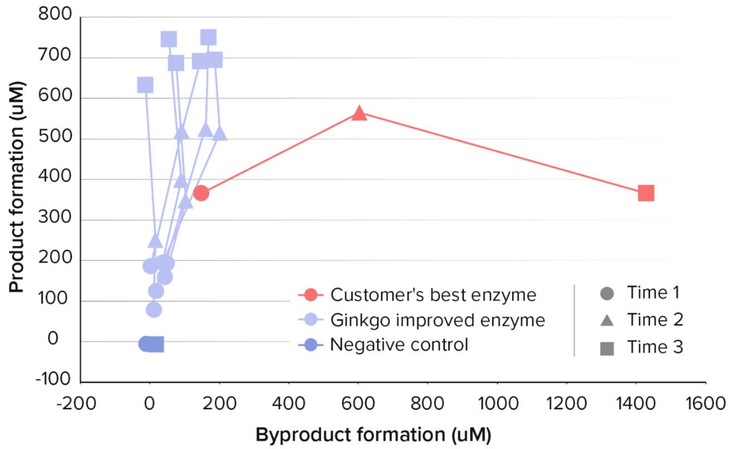
Biocatalyst Activity



6.5x

Improvement in activity

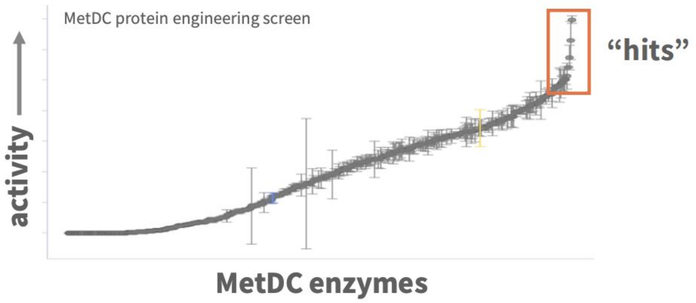
Improved Enzyme Specificity

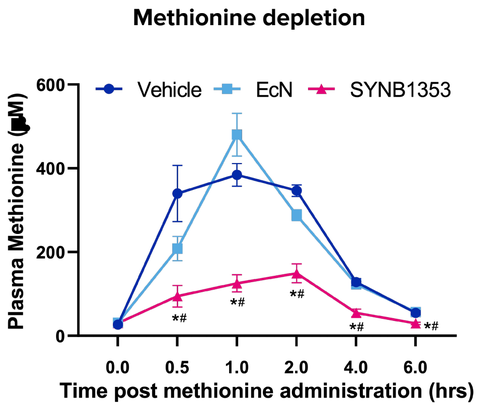


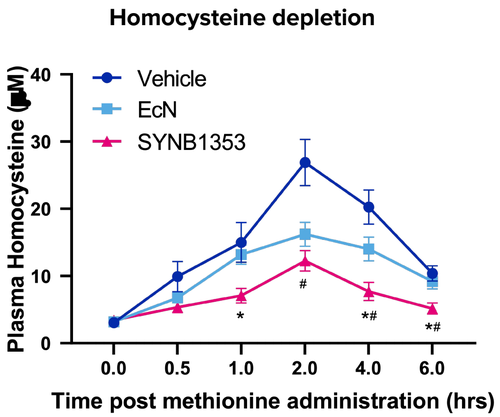
5x

Improvement in desired product formation

Engineering living medicines for chronic disease







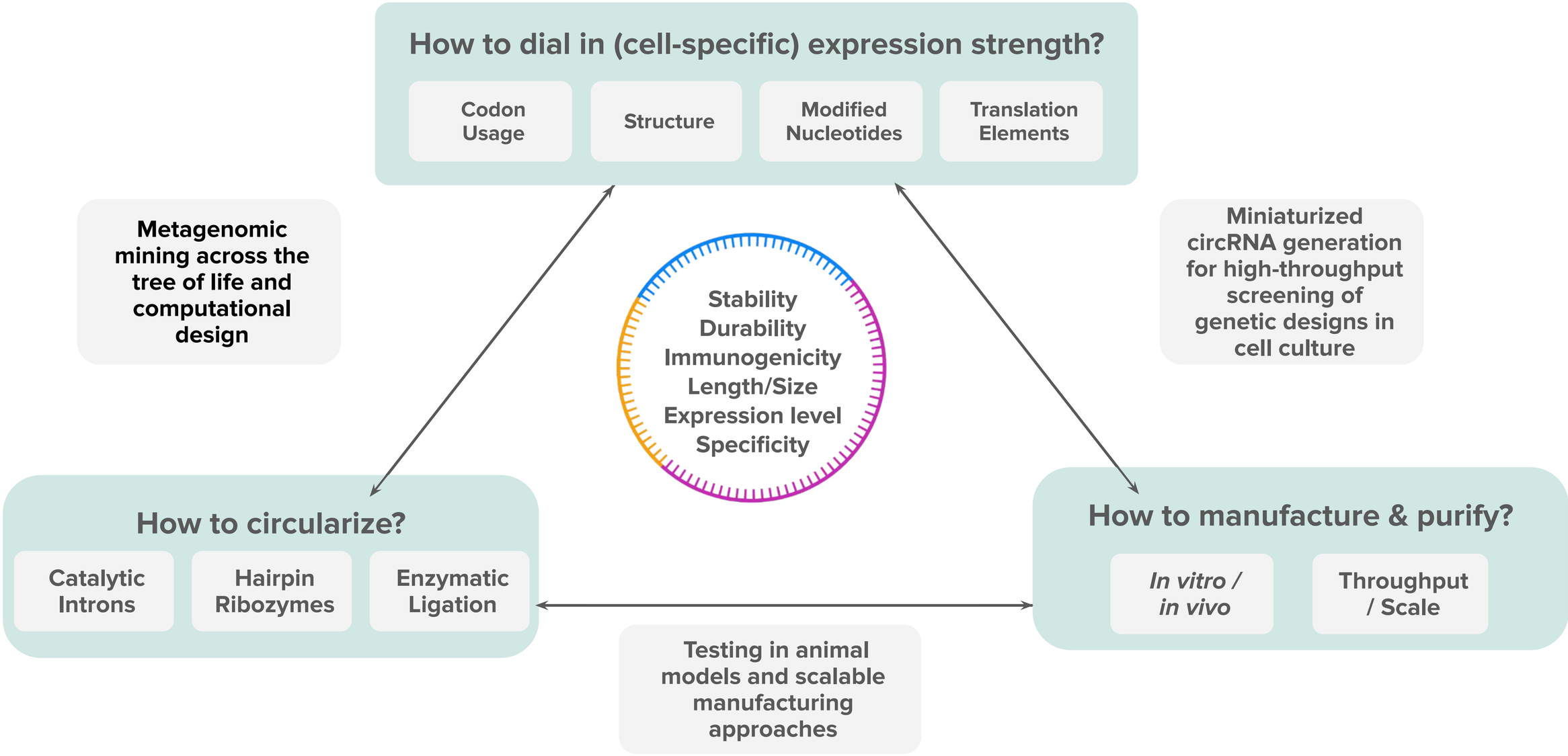
Synlogic Announces SYNB1353 Achieves Proof of Mechanism for Treatment of Homocystinuria and Provides Business Update

Synlogic — 11.30.22

SYNB1353 is a novel, orally administered, non-systemically absorbed drug candidate designed to lower homocysteine levels in patients with HCU by consuming methionine, a precursor to homocysteine, in the gastrointestinal tract. It is the first drug candidate developed through a research collaboration between Synlogic and Ginkgo Bioworks and the first investigational medicine developed on Ginkgo's platform to enter the clinic.

Building a modular platform for developing circRNA therapeutics and vaccines

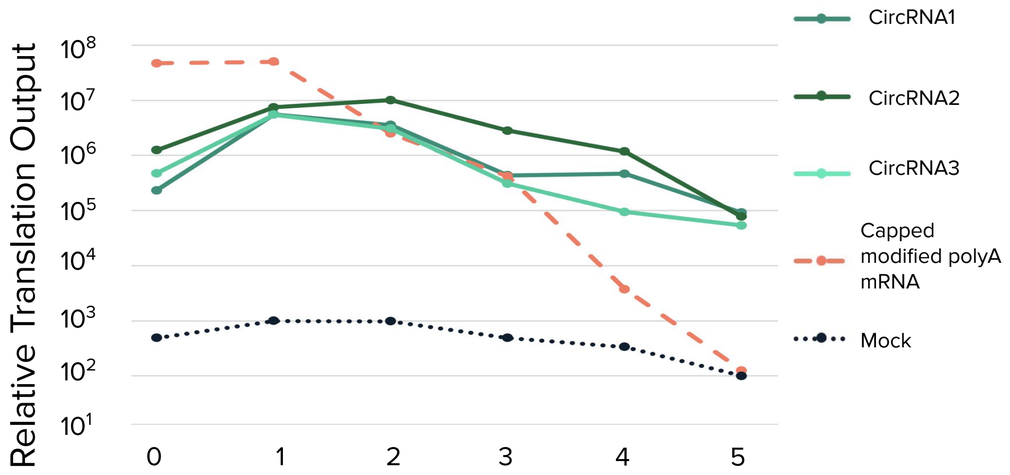
Module choice can be tailored based on partner's needs



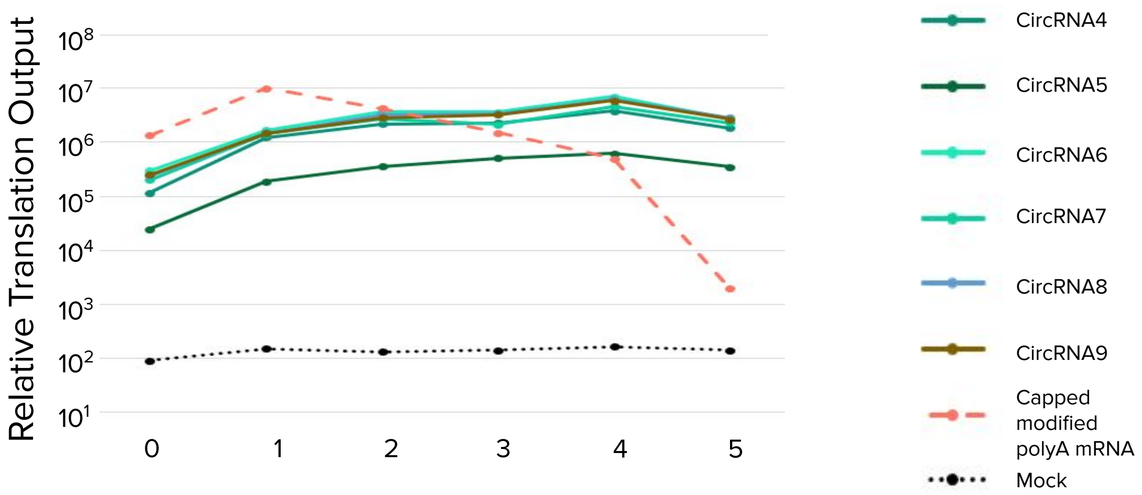
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Prolonged expression of circular RNA generated by two different mechanisms in cell culture relative to mRNA

Catalytic introns



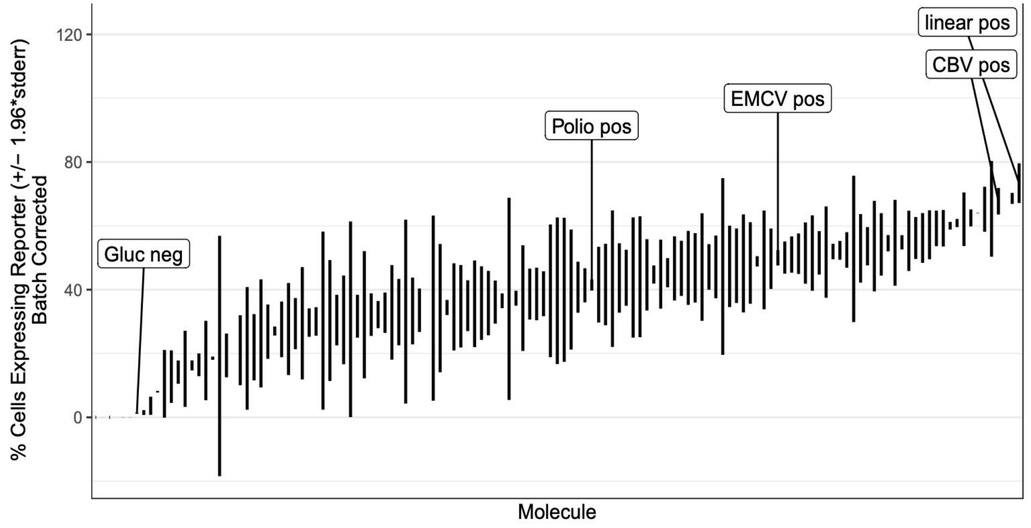
Hairpin ribozymes



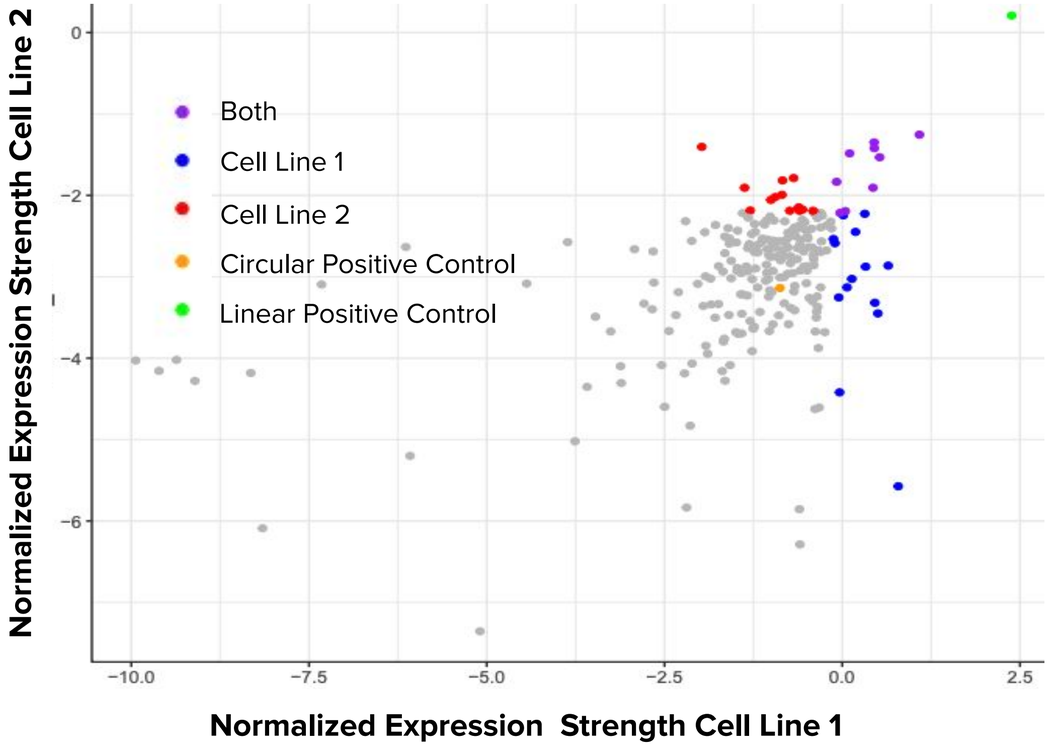
Time course of reporter expression from transfected circRNA constructs shows durability of circular RNA vs. capped modified polyA mRNA

Identifying translational elements of diverse length, structure, and origin to support a range of expression and specificity

Ginkgo designed and tested a 500-member library of different internal ribosome entry sites (IRES) as well as additional structural elements drives a range of reporter expression



Top 25 IRES variants have different cell type specificities



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Synthetic biology is a national priority

Biomanufacturing and biosecurity are key to the future of innovation and public health.

Synthetic biology is a national priority



"What are other areas where we cannot allow China to dominate? Two areas we're looking at right now: ***synthetic biology*** *and advanced energy"*

READ MORE

THE WHITE HOUSE
WASHINGTON

Executive Order on Advancing Biotechnology and Biomanufacturing Innovation for a Sustainable, Safe, and Secure American Bioeconomy

Sep 12, 2022

"We need to invest in and ***promote biosafety and biosecurity to ensure that biotechnology is developed and deployed in ways that align with United States principles and values and international best practices****, and not in ways that lead to accidental or deliberate harm to people, animals, or the environment."*

READ MORE

CDC Traveler-based Genomic Surveillance (TGS) program serves as an early warning system, detecting new variants

CDC Announces Negative COVID-19 Test Requirement from Air Passengers Entering the United States from the People's Republic of China

CDC is also expanding the Traveler-based Genomic Surveillance program (TGS), a voluntary program that serves as an early warning system to detect and

For Immediate Release: December 28, 2022 ; of the virus that causes COVID-19.

Why the CDC is inviting travelers from China to swab their noses at LAX

BY MELISSA HEALY | STAFF WRITER

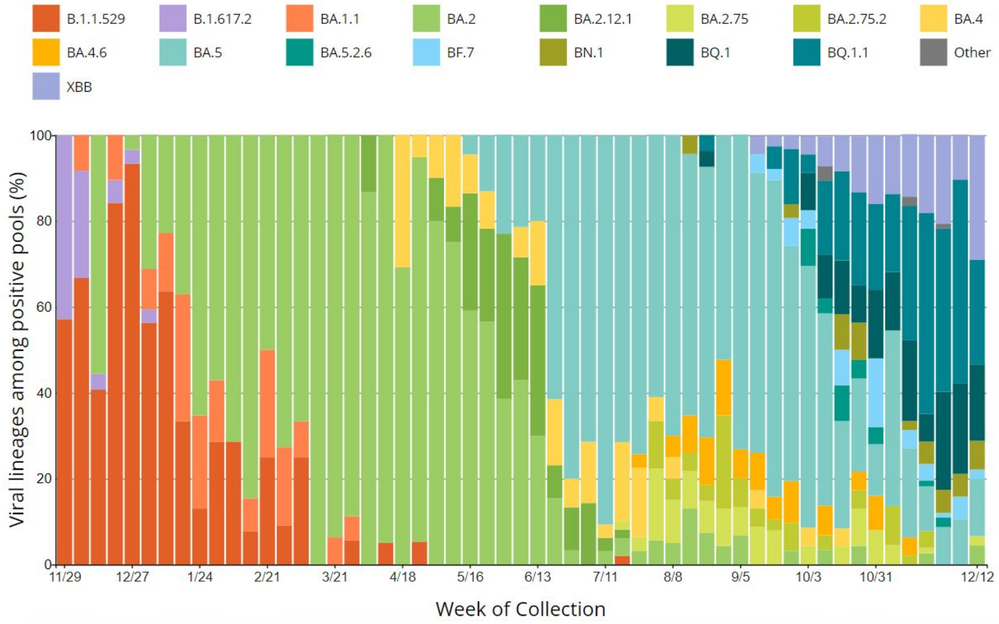
JAN. 3, 2023 12:36 PM PT

Los Angeles Times

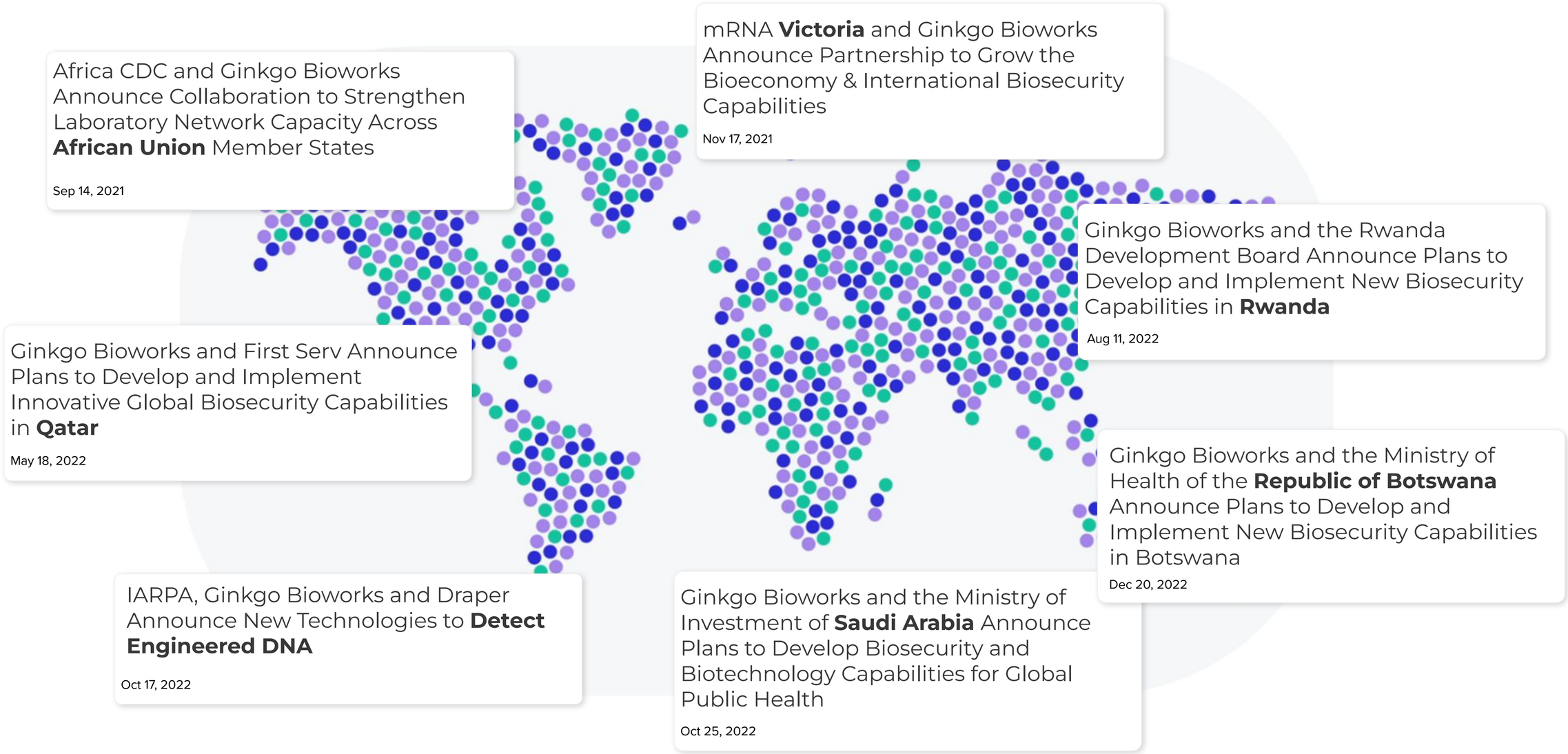
As COVID surges in China, US begins testing more travelers

By LAURA UNGAR and SHELBY LUM January 5, 2023

Variants Detected, by Collection Week



We are also making the early warning system global



Africa CDC and Ginkgo Bioworks Announce Collaboration to Strengthen Laboratory Network Capacity Across **African Union** Member States

Sep 14, 2021

mRNA **Victoria** and Ginkgo Bioworks Announce Partnership to Grow the Bioeconomy & International Biosecurity Capabilities

Nov 17, 2021

Ginkgo Bioworks and the Rwanda Development Board Announce Plans to Develop and Implement New Biosecurity Capabilities in **Rwanda**

Aug 11, 2022

Ginkgo Bioworks and First Serv Announce Plans to Develop and Implement Innovative Global Biosecurity Capabilities in **Qatar**

May 18, 2022

Ginkgo Bioworks and the Ministry of Health of the **Republic of Botswana** Announce Plans to Develop and Implement New Biosecurity Capabilities in Botswana

Dec 20, 2022

IARPA, Ginkgo Bioworks and Draper Announce New Technologies to **Detect Engineered DNA**

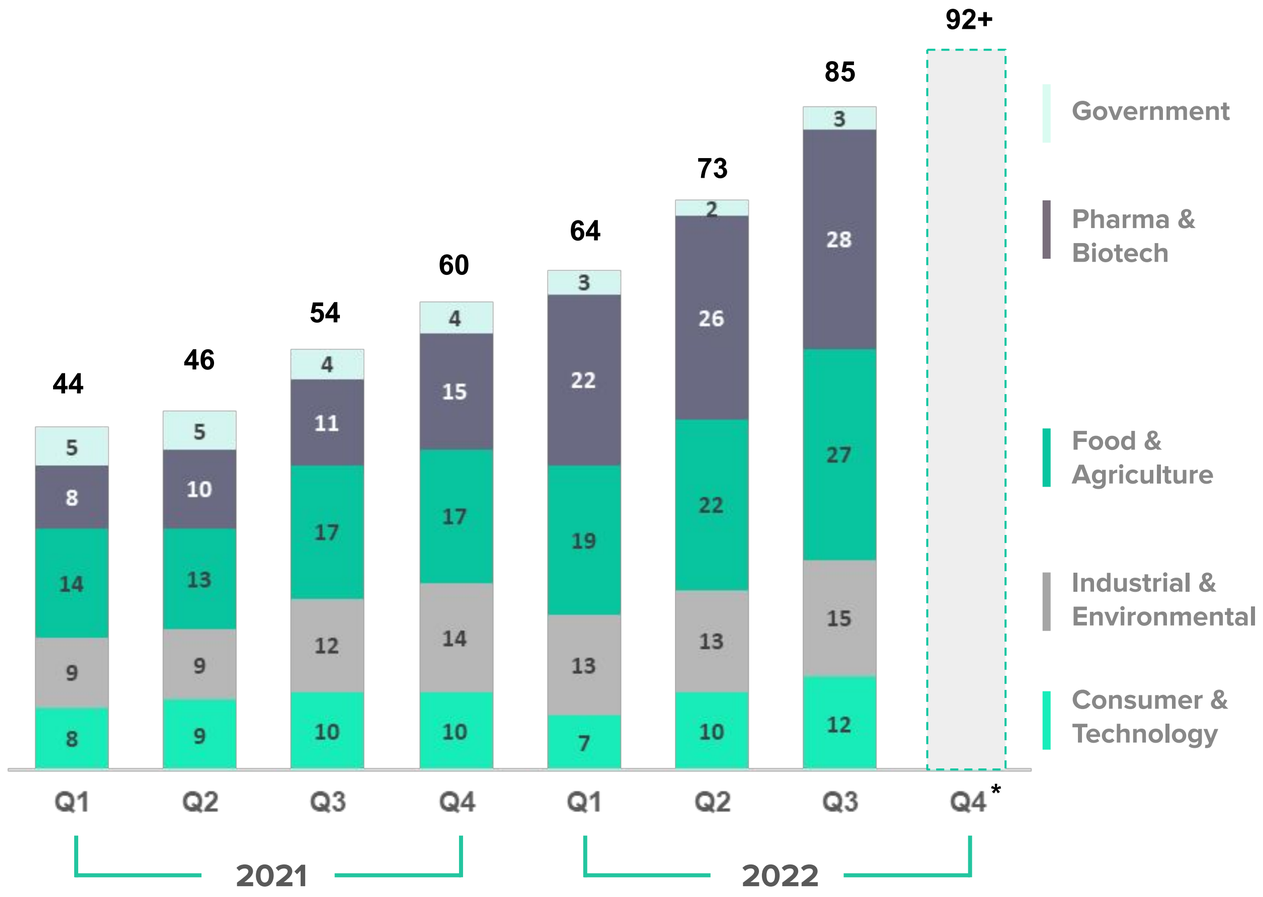
Oct 17, 2022

Ginkgo Bioworks and the Ministry of Investment of **Saudi Arabia** Announce Plans to Develop Biosecurity and Biotechnology Capabilities for Global Public Health

Oct 25, 2022

Synthetic biology has the potential to impact all physical goods markets

Current Active Programs by Industry



Notable customers outside of biopharma

BAYER

CORTEVA™ agriscience

Givaudan

KERRY

SUMITOMO CHEMICAL

Cargill™

CRONOS GROUP

ROBERTET

*Current Active Program figure for Q4 2022 reflects preliminary estimates for the three months ended December 31, 2022.

J

What is more important to society, atoms or bits?

Atoms and bits are both important to society, but they play different roles and have different implications.

Atoms refer to the physical building blocks of the world around us. They are the basic units of matter that make up everything we can see and touch. Atoms are important for society because they are the foundation of the physical world and the resources we use to sustain ourselves and build the infrastructure that supports our society. For example, atoms make up the materials we use to build homes, roads, bridges, and other structures; the fuels we use to power our vehicles and generate electricity; and the food we eat to nourish our bodies.

Bits, on the other hand, refer to the basic units of information. They are used to represent and process data in digital systems, such as computers, smartphones, and the internet. Bits are important for society because they enable us to communicate, share information, and access knowledge on a global scale. They also enable us to process and analyze large amounts of data, which can lead to advances in fields such as medicine, science, and finance. Additionally, they power the digital economy, enabling businesses to operate in a highly connected environment

J

OK ChatGPT, but if you HAD to pick one -- what is more important to society, atoms or bits?

If I had to pick one, I would say that atoms are more important to society. This is because atoms are the building blocks of the physical world, and they are essential for our survival and well-being. They make up the food we eat, the water we drink, and the air we breathe. They also make up the materials we use to build the infrastructure that supports our society, such as homes, roads, bridges, and power plants. Without atoms, society would not be able to function in its current form.

GINKGO BIOWORKS

Let’s grow the world we want to see

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