



synbiobeta

BUILT WITH BIOLOGY
Q2 2021 REPORT

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Research and analysis by Mark Bünger (Futurity Studio)

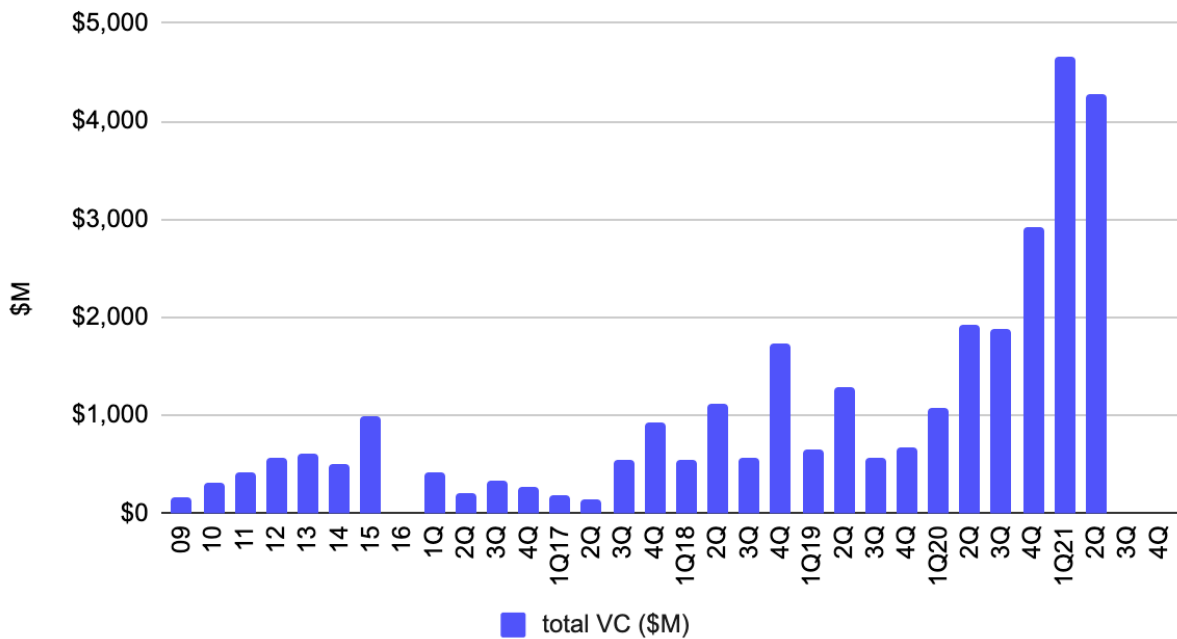
Research by Marianna Limas (SynBioBeta)

Edited by Larry Upton (SynBioBeta)

1 Synthetic biology overall investment trends

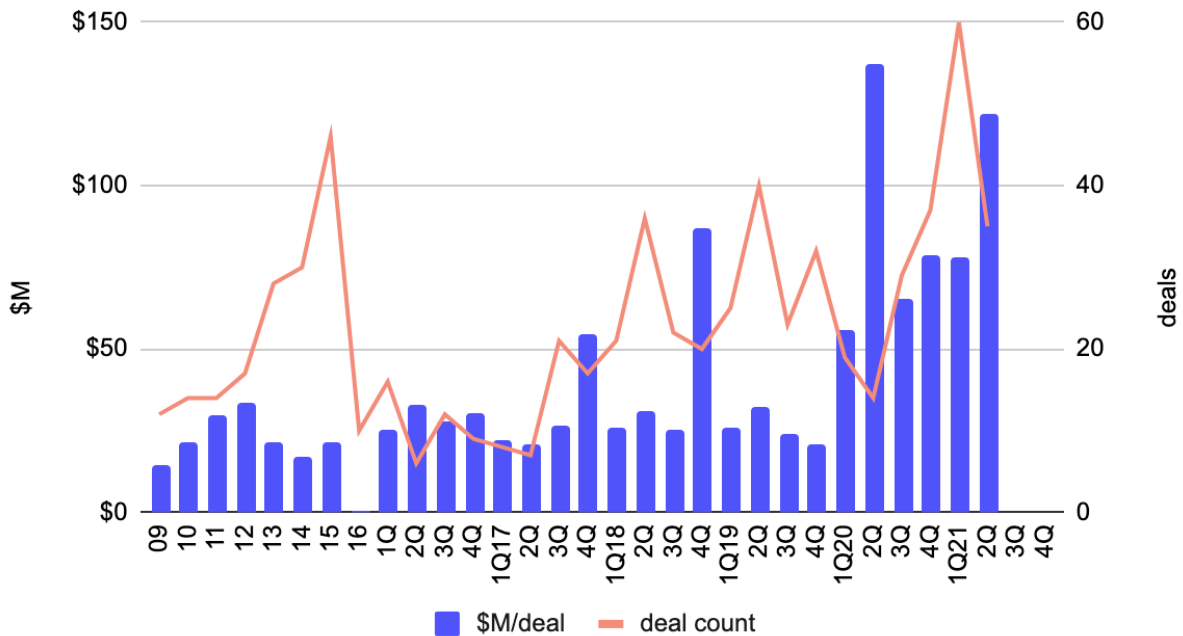
The second quarter of 2021 was another record-breaking period for the synthetic biology startup community. Building on the extremely high amount of investment we saw in Q1 (\$4.7 billion), Q2 also brought in more than \$4.2 billion in venture funding to synthetic biology startups.

Overall investment in synthetic biology



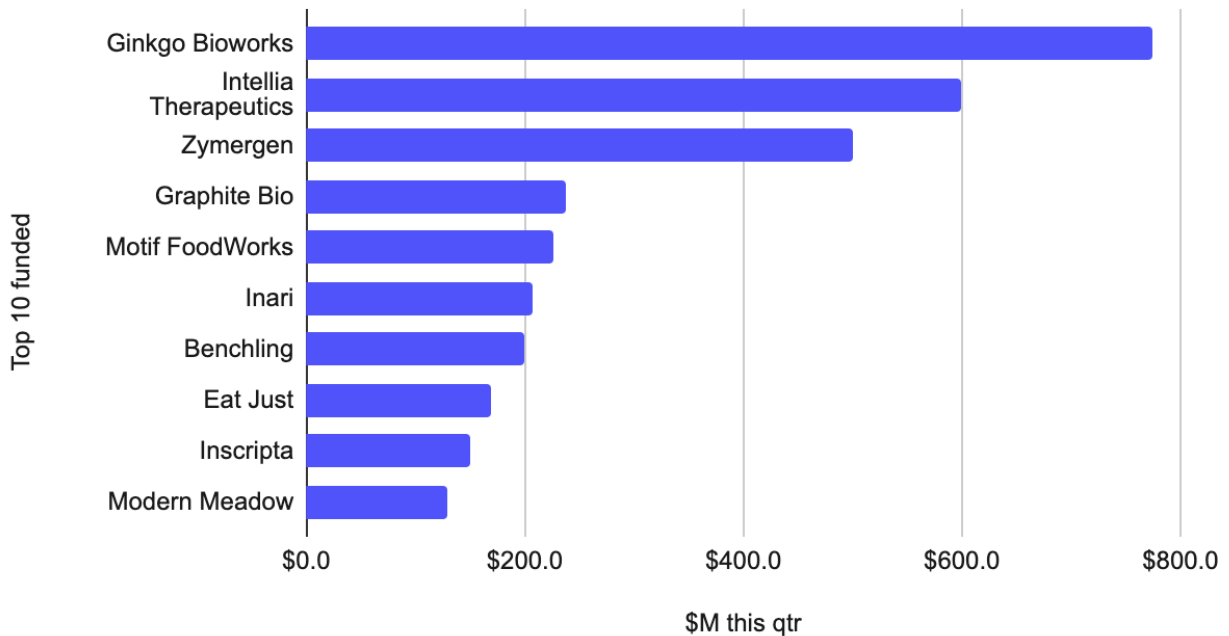
The average deal size and deal count also stayed in record territory, with 37 deals bringing in an average of \$122 million. At this point, 2021 will definitely be the best investment year ever for synthetic biology. But more than that, if the second half of the year is as strong as the first, 2021 will bring in almost as much funding as all of the years combined since we started measuring in 2009.

Average investment amount and deal count



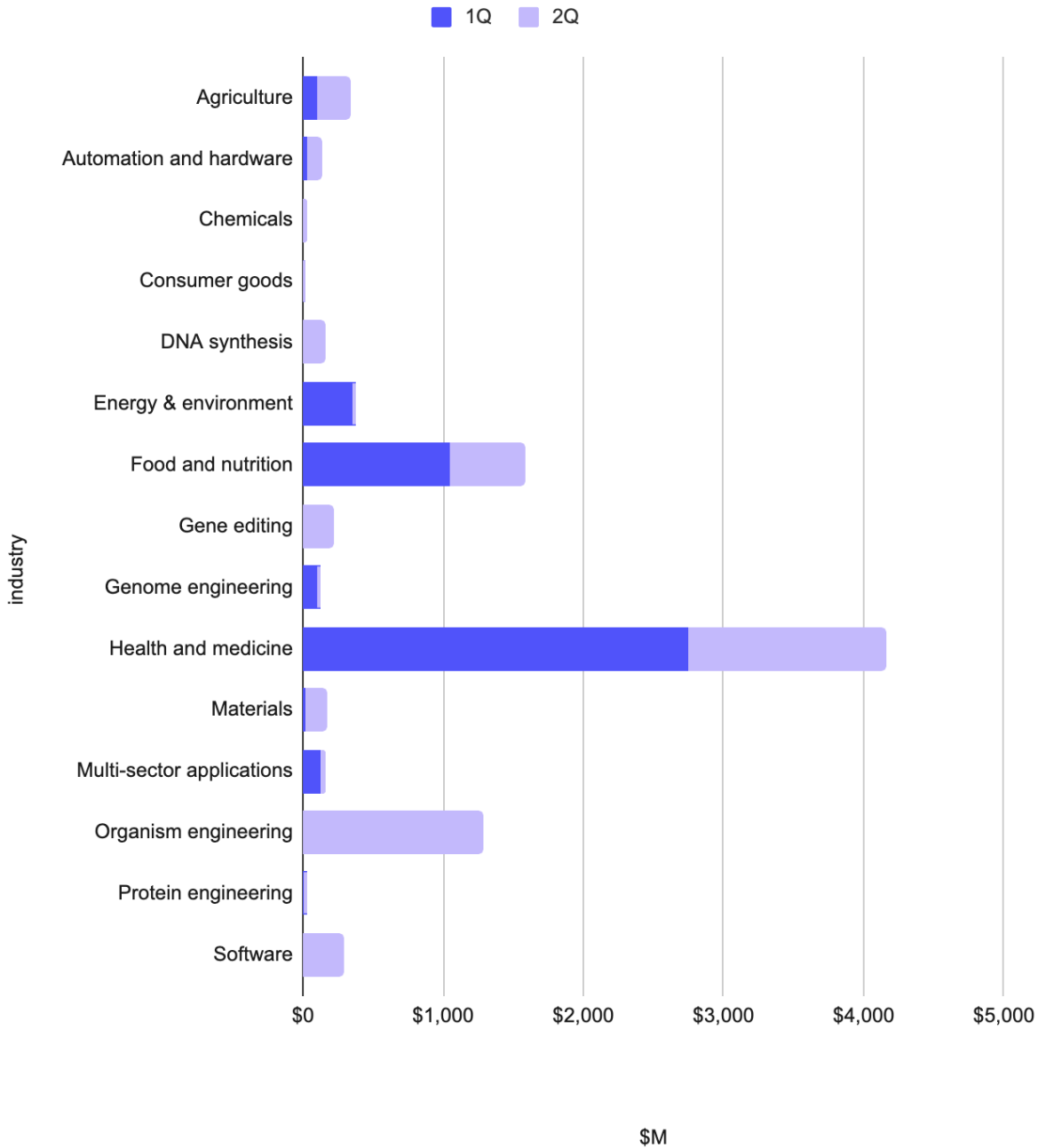
Among the top 10 biggest individual gainers this quarter were Ginkgo Bioworks, Intellia Therapeutics, and Zymergen, all bringing in more than half a billion dollars. Three tools companies - Graphite Bio, Benchling, and Inscripta – raised \$238M, \$200M, and \$150M respectively. And four food and agriculture companies – Inari, Motif FoodWorks, Eat Just, and Modern Meadow brought in from \$130M to \$226M.

\$M this qtr vs. Top 10 funded



Looking at the numbers by sector, Health and Medicine continue to lead the space with 11 deals bringing in more than \$1.4 billion in investment - not surprising, given the fact that a pandemic is still raging, and one of its heroes is synthetic biology standout Moderna. The category of Organism Engineering also brought in \$1.3 billion dollars, driven by the large deal from Ginkgo Bioworks. Food and Nutrition also saw 8 new investments with the big gainers mentioned above joined by newer companies like Jellatech, MeliBio, Mission Barns, and Orbillion Bio taking in funds.

Investment by Industry

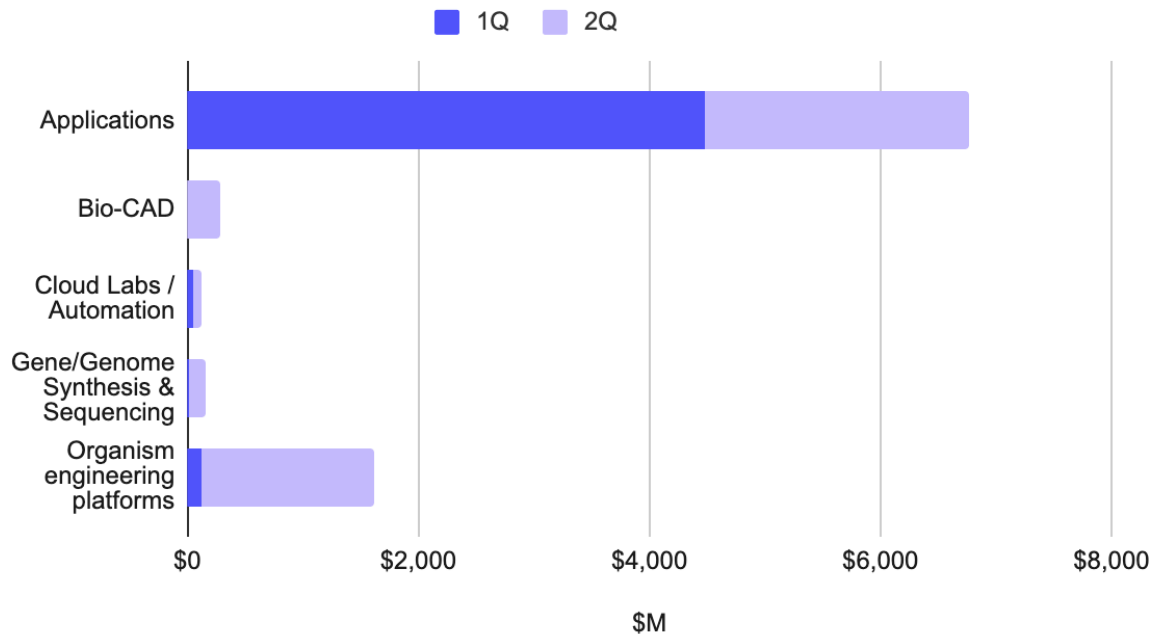


Deal count by Industry

Industry	1Q	2Q	3Q	4Q	Total
Agriculture	4	2			6
Automation and hardware	2	2			4
Chemicals		2			2
Consumer goods	1				1
DNA synthesis	1	2			3
Energy & environment	2				2
Food and nutrition	16	8			24
Gene editing		2			2
Genome engineering	1				1
Health and medicine	26	11			37
Materials	2	1			3
Multi-sector applications	2	1			3
Organism engineering		2			2
Protein engineering	1				1
Software	2	2			4
Grand Total	60	35			95

In the framework of the synthetic biology "stack" – the layers of types of technology and tools that together combine to make biology an engineering discipline – we see that Applications (like medicine, food, and chemicals) brought in the largest amount of funding at \$2.3 billion. That's understandable given that these companies have the potential to scale up into multibillion dollar industries, and many are now coming to market after years in the lab.

Investment by Stack category



Organism engineering platforms were second, but still brought in 11 times more than in Q1. In fact, the synbio tools categories gained huge multiples since Q1, from Cloud Labs / Automation at 1.6x, Gene/Genome Synthesis & Sequencing 21x, and Bio-CAD 400x its Q1 take! Molecular Assemblies (Gene/Genome Synthesis & Sequencing), Strateos (Cloud Labs / Automation), and TetraScience (Bio-CAD) were among the 2Q tools winners.

Deal count by Stack Category

Stack Category	1Q	2Q	3Q	4Q	Total
Applications	54	25			79
Bio-CAD	1	2			3
Cloud Labs / Automation	2	2			4
Gene/Genome Synthesis & Sequencing	1	2			3
Organism engineering platforms	2	4			6
Grand Total	60	35			95

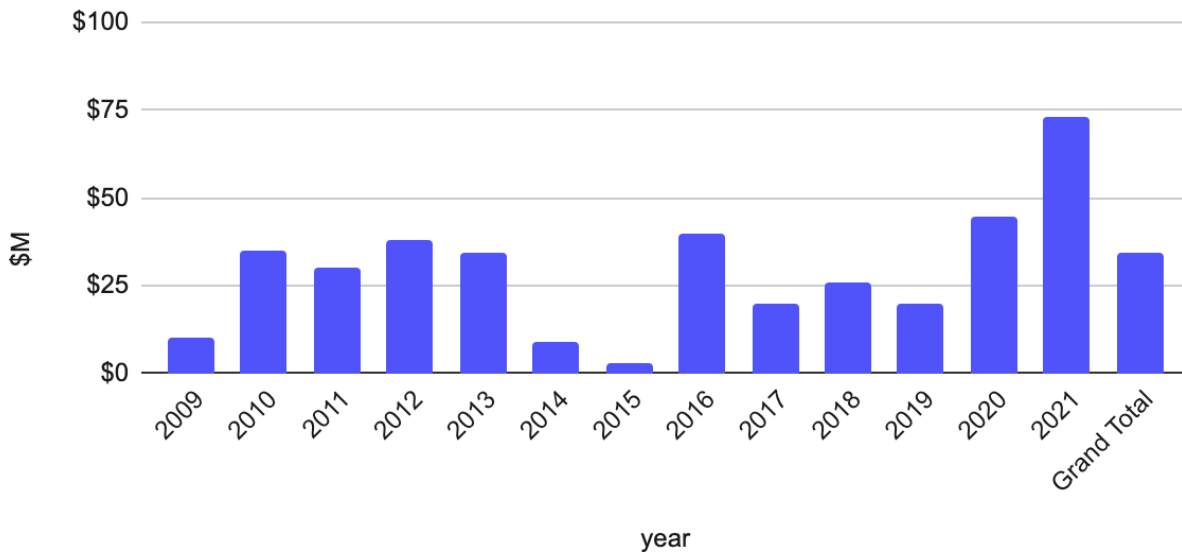
2 Industry deep-dives: Health and medicine, Food, and Agriculture

One of the biggest challenges for conventional investors looking to get into synthetic biology is the breadth of applications it can be directed to. Ranging from obviously biology-related uses like healthcare and food to esoteric spaces like perfume scents and data storage, our increasing ability to engineer DNA, proteins, and other substrates is opening up more and more each day. Moreover, using biology as a basis can improve the environmental, health, and social impact of these products and processes.

In the following sections, we explore three top application spaces – Health and medicine, Food and beverage, and Agriculture – where synbio's progress is enabling business opportunities not only for investors, but also for collaborators like corporate partners and local economic development agencies. We'll look at the specific companies that raised funds in 2Q, and explain the reasons why they are worth exploring further.

2.1 Health and medicine

Median investment



One of the most impactful applications of synthetic biology is saving lives, ending disease, and reducing pain – driving continuous and high levels of investment in the space. The median funding for Health and medicine startups so far this year is \$73 million, a change of 62% over last year, and 211% of the median of all deals ("Grand Total" in the chart above) since 2009. Among the companies raising funds were:

- Intellia Therapeutics, in its initial public offering (IPO) brought in \$600 million.¹ Founded in 2014, it uses genome editing (CRISPR/Cas9) for blood-related conditions like leukemia, hemophilia, and sickle-cell disease.
- Another IPO, Graphite Bio, raised \$238 million.² The company uses gene editing to treat a broad range of severe diseases like sickle-cell anemia, a painful and potentially deadly genetic condition that affects about 300,000 babies born every year.³
- Antheia, which was founded in 2015 and is based in Menlo Park, California, raised a \$73 million Series B round.⁴ Antheia uses synthetic biology, genomics, informatics, and fermentation to manufacture beneficial molecules from plants used as active pharmaceutical ingredients (APIs), such as opioids. The company is targeting disease classes ranging from cancer to neurological, cardiovascular, and infectious; to disease-related symptoms like pain, cough, depression, and addiction.
- HiFiBiO Therapeutics raised a \$75 million Series D.⁵ The French company founded in 2013 uses the human immune system to combat disease, especially targeting cancers.
- Laronde raised a \$50 million round⁶ to help develop what it calls "endless RNA (eRNA) — a new class of programmable medicines capable of expressing therapeutic proteins inside the body." The company was started by the founder of Moderna, the synbio startup responsible for developing the US's only covid vaccine.⁷ By connecting the ends of an RNA strand into a ring (hence, "end-less"), the company believes it can prevent the molecule from being broken down quickly by the body, thus prolonging its ability to crank out therapeutic proteins.
- Appia Bio raised a \$52 million Series A.⁸ The company, founded in 2020, aims to engineer allogeneic cell therapies (specifically, chimeric antigen receptor (CAR) and T-cell receptor (TCR) therapies) to treat a broad array of cancers. CAR-T therapy is one of the most promising new approaches to cancer treatments ever developed; as the Cancer Research Institute said:

Chimeric antigen receptor (CAR) T cell therapy represents an incredibly promising cellular immunotherapy approach for treating cancer that takes advantage of unique

¹ <https://www.biospace.com/article/intellia-tops-busy-period-with-600-million-ipo/>

²

<https://www.fiercebiotech.com/biotech/graphite-pulls-off-238m-ipo-to-push-gene-editing-sickle-cell-treatment-into-clinic>

³ <https://www.cdc.gov/ncbddd/sicklecell/facts.html>

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<https://synbiobeta.com/antheia-announces-73m-series-b-to-commercialize-synthetic-biology-platform-for-essential-medicines/>

⁵

<https://www.businesswire.com/news/home/20210614005184/en/HiFiBiO-Therapeutics-Closes-75-Million-Series-D-Financing-to-Accelerate-Pipeline-With-Two-Lead-Immuno-Oncology-Programs-and-Validate-Its-DIS%E2%84%A2-A-Approach-in-the-Clinic/>

⁶

<https://www.fiercebiotech.com/biotech/flagship-debuts-laronde-to-develop-rna-based-meds-could-turn-cells-into-protein-factories>

⁷ <https://www.biopharmadive.com/news/laronde-flagship-launch-endless-rna-erna/599841/>

⁸ <https://www.biospace.com/article/with-52-million-series-a-appia-bio-envisages-a-bright-future-in-cell-therapy/>

capabilities of T cells, an important part of our immune system. These T cells—hundreds of billions of which circulate through our bodies at any given time—are capable of recognizing and eliminating cells that have become damaged, infected by viruses, or have turned cancerous.⁹

- Another cell therapy company, Cellares, founded in 2019, raised a \$82 million Series B round.¹⁰ The company makes machines for processing cells – an otherwise manual and very expensive task – that could lower the cost of treatment by 70%.
- Dyno Therapeutics raised a massive \$100 million Series A.¹¹ Dyno is working on gene therapy vectors - treatments for genetic disease that work by helping "corrected" genes find their way to the places in the body where they are needed. The Cambridge-based firm was founded in 2018.
- In other series As, Engine Biosciences uses high-throughput wet lab experimentation and artificial intelligence algorithms to help discover new drugs and reprogram cells. The seven-year-old San Carlos, California-based company raised a \$43 million Series A round.¹² Strand Therapeutics \$52 million round¹³ will work towards mRNA targeting, so the location, timing, and intensity of protein expression will be more effective against disease and have fewer side effects. Finally, Outpace Bio raised \$30 million in a Series A, with the goal of creating tailored cell therapy treatments.¹⁴

⁹ <https://www.cancerresearch.org/en-us/blog/september-2019/promise-car-t-cell-therapy-2019-beyond>

¹⁰ <https://www.fiercepharma.com/manufacturing/cellares-raises-82m-to-drive-work-cell-therapy-factory-a-box>

¹¹

<https://synbiobeta.com/dyno-therapeutics-closes-100-million-series-a-financing-led-by-andreessen-horowitz-to-accelerate-ai-powered-gene-therapy-platform/>

¹²

<https://synbiobeta.com/engine-biosciences-announces-43-million-series-a-round-to-decipher-genetic-codes-for-new-medicines-through-machine-learning-and-next-generation-combinatorial-genetics/>

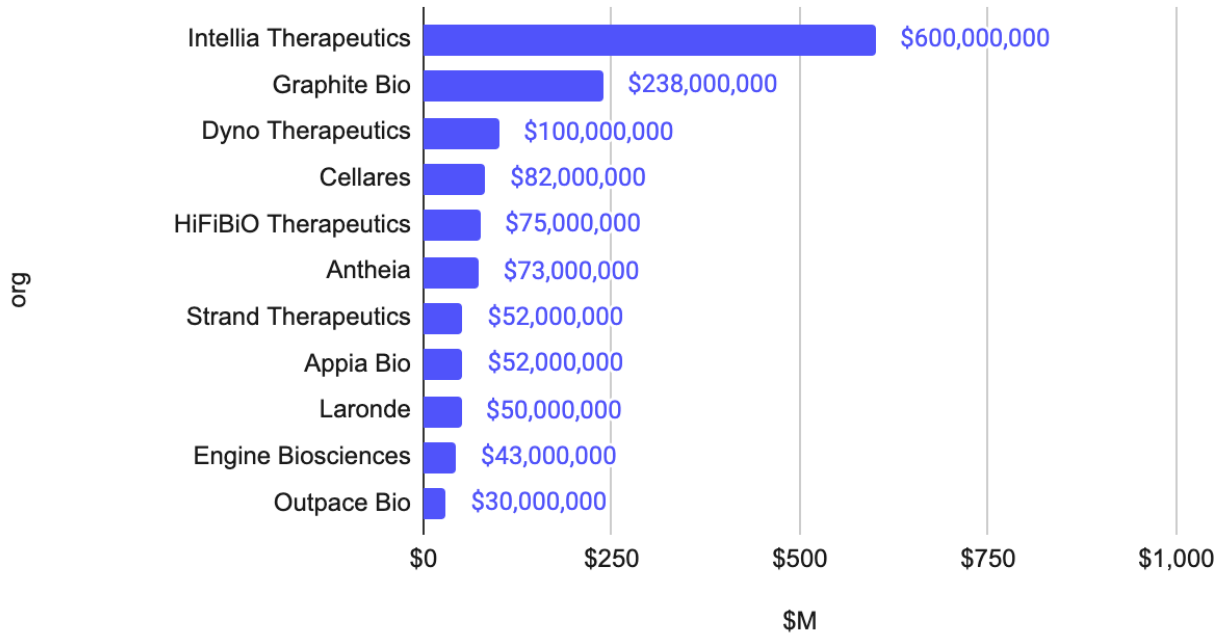
¹³

<https://www.forbes.com/sites/leahrosenbaum/2021/06/23/this-synthetic-bio-startup-raised-52-million-to-make-tumors-reveal-themselves/>

¹⁴

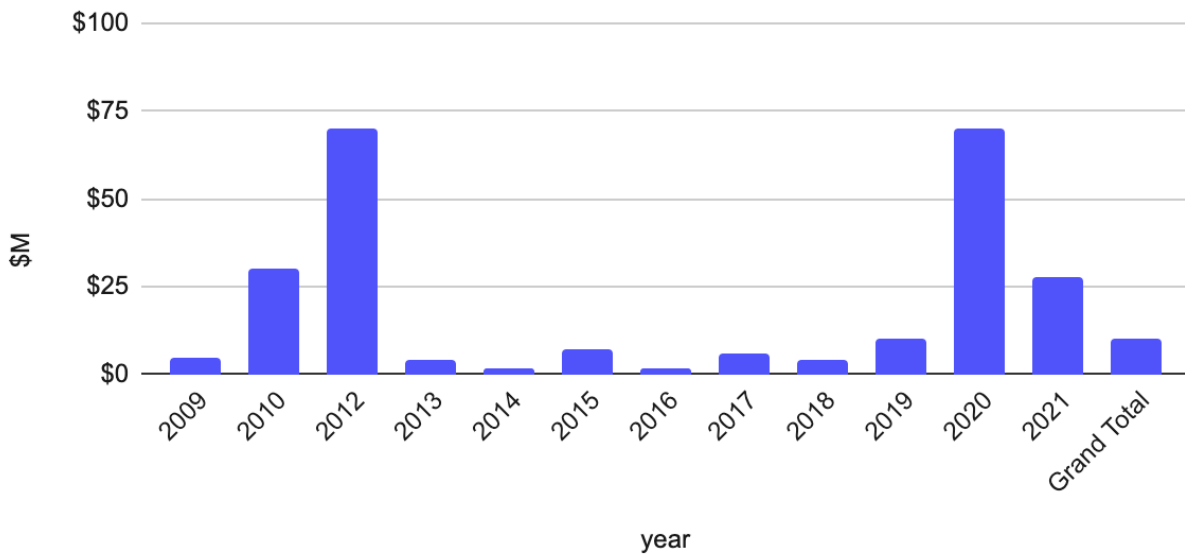
<https://www.geekwire.com/2021/seattle-biotech-startup-outpace-bio-raises-30m-fight-cancer-custom-designed-proteins/>

Top funded companies this quarter



2.2 Food and Nutrition

Median investment



Food and beverage production has a huge impact on the health of humans and the environment – and synthetic biology startups are addressing all of those needs. Especially by producing flavorful nutritious meat alternatives without killing animals, the field can reduce not only food's ecological burden, but the ethical one as well. Through 2Q 2021, the median investment in synbio Food and Nutrition startups is \$27.9 million, down to 39% of last year's sudden boom, but still 278% of the median since 2009.

- Boston-based Motif FoodWorks raised \$226 million (Series B) to make plant-based meat, dairy, and plant alternative ingredients via engineering and fermentation.¹⁵ Another series B, Enough, brought in \$51 million for its funghi-based protein manufacturing.¹⁶ And Eat Just (founded in 2011) raised \$170 million¹⁷ for its plant-based egg substitute.
- Among the A rounds, Atlast Food raised a \$40 million Series A,¹⁸ and Berkeley-based Mission Barns took in \$24 million¹⁹ - both targeting animal-based meat. Atlast makes a mycelium (fungi)-based bacon, while Mission Barns is using cell culture to grow real meat from cells without killing a cow, chicken, or pig.
- Orbillion Bio (founded in 2019) took in \$5 million for its range of lab-grown exotic meats like lamb, elk, and bison burgers.²⁰ Jellatech (2020) raised \$2 million²¹ to produce animal-free collagen and gelatin, and one-year-old MeliBio (which improves upon the molecular composition of bee-made honey) raised \$850,000.²²

¹⁵ <https://synbiobeta.com/motif-foodworks-announces-226-million-series-b-funding-round/>

¹⁶ <https://synbiobeta.com/investors-bet-big-with-fungi-alternative-protein-company-enough/>

¹⁷

<https://www.bloomberg.com/news/articles/2021-05-18/eat-just-s-cultured-meat-unit-raises-170-million-in-funding>

¹⁸

<https://www.prnewswire.com/news-releases/atlast-raises-40m-to-expand-production-of-whole-cut-plant-based-meat-301269259.html>

¹⁹

<https://www.businesswire.com/news/home/20210407005738/en/Mission-Barns-Raises-24M-Series-A-to-Scale-Up-its-Cultivated-Fat-Technology-and-Build-Pilot-Production-Facility>

²⁰

<https://techcrunch.com/2021/04/26/investors-eat-up-orbillion-bios-plans-for-lab-grown-wagyu-beef-elk-and-bison>

²¹ <https://synbiobeta.com/jellatech-announces-2m-pre-seed-round/>

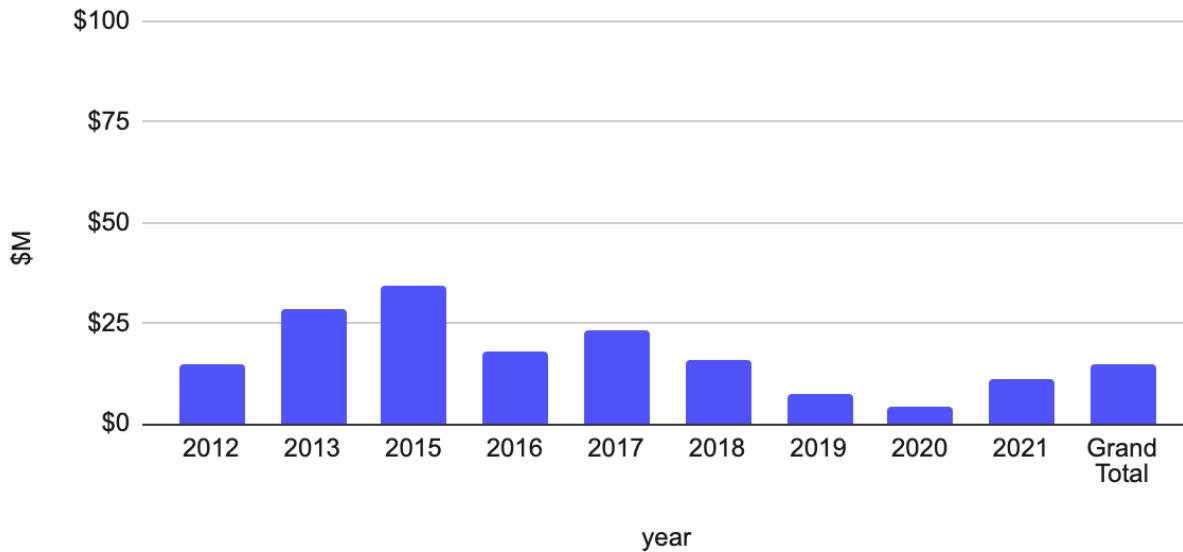
²² <https://synbiobeta.com/making-honey-without-bees-melibio-raises-850000-pre-seed-round/>

Top funded companies this quarter



2.3 Agriculture

Median investment



The median investment in synbio Agriculture startups so far in 2021 is \$11.35 million, up 252% versus last year, but just 75% of the median since we started tracking it. Despite having a large number of companies active in the space, only one raised significant funding this quarter.

- Inari raised a whopping \$208 million series D in May of 2021.²³ The decade-old Indiana (US) company uses predictive modeling and multiplex gene editing to design and produce crop seeds (such as corn and soy) that it claims can increase yield by 20%, while requiring 40% less water and 40% less nitrogen fertilizer.
- On the opposite end of the maturity scale, Pheronym landed a \$242,000 angel round.²⁴ The company uses fermentation to manufacture nematode (roundworm) pheromones for pest management. One product, NemaStim, spurs beneficial nematodes to attack insect pests. Another, PheroCoat, is applied to seeds to repel plant-parasitic nematodes away from healthy roots.

²³

<https://www.bloomberg.com/news/articles/2021-05-12/agtech-startup-inari-nabs-new-funding-at-1-2-billion-valuation>

²⁴ <https://www.pheronym.com/2021/05/11/pheronym-closes-first-seed-round-led-by-sacramento-angels>

3 Conclusions and Outlook for Q3/Q4 2021

The amount of money raised by synthetic biology startups in the second quarter proved that the remarkable performance in Q1 wasn't a one-time fluke. On the contrary, the money was spread widely over nearly every dimension, from synbio stack to stage of investment, company size, application, and geography. That's no guarantee that Q3 or the rest of the year will reach the same heights, but it bodes well for continued notable performance and a strong end to a remarkable year.

Longer term, will 2021 be seen as an exceptional peak? Here again, we believe the answer is No. What the current variety of investments proves is that synthetic biology is not a one-hit wonder – it was not just, for example, the excitement of a successful covid vaccine that attracted investor interest in Q1 and Q2. History from many other technologies and industries (ranging from software to music and more) shows that in the long run, it's the first round of successful entrepreneurs, artists, and innovators that provides not just funding, but mentorship and leadership for a vibrant and growing ecosystem for decades to come.

In the dark analogy that covid might just be a warm-up act for coming crises ranging from climate change to mass extinction to food insecurity and an epidemic of diabetes, synthetic biology has something to offer each of these existential threats – and the community has now shown that not only does it have the technical ability to solve big problems in a variety of areas, it has the business acumen to convince investors, grow a team, get products to market, and make an impact. There are even opportunities for optimism - creating exciting foods, fashions, and buildings; restoring lost habitats and species; exploring the solar system, and more breakthroughs than we can imagine.

From here on out, SynbioBeta will track these important developments on top of the technology and funding alone, highlighting startups and other organizations as they work together - with you - to build a better world with biology.