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SynBioBeta 2024 Annual Synthetic Biology Investment Report

Insights Into Synthetic Biology Investment Trends

THE GLOBAL SYNTHETIC BIOLOGY CONFERENCE | synbiobeta

May 6-9, 2024 - San Jose Convention Center, California

Meet the Synthetic Biology Industry at Our Annual Conference

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Human Health	Tools & Technology	Planetary Health	Business of Biology & Society

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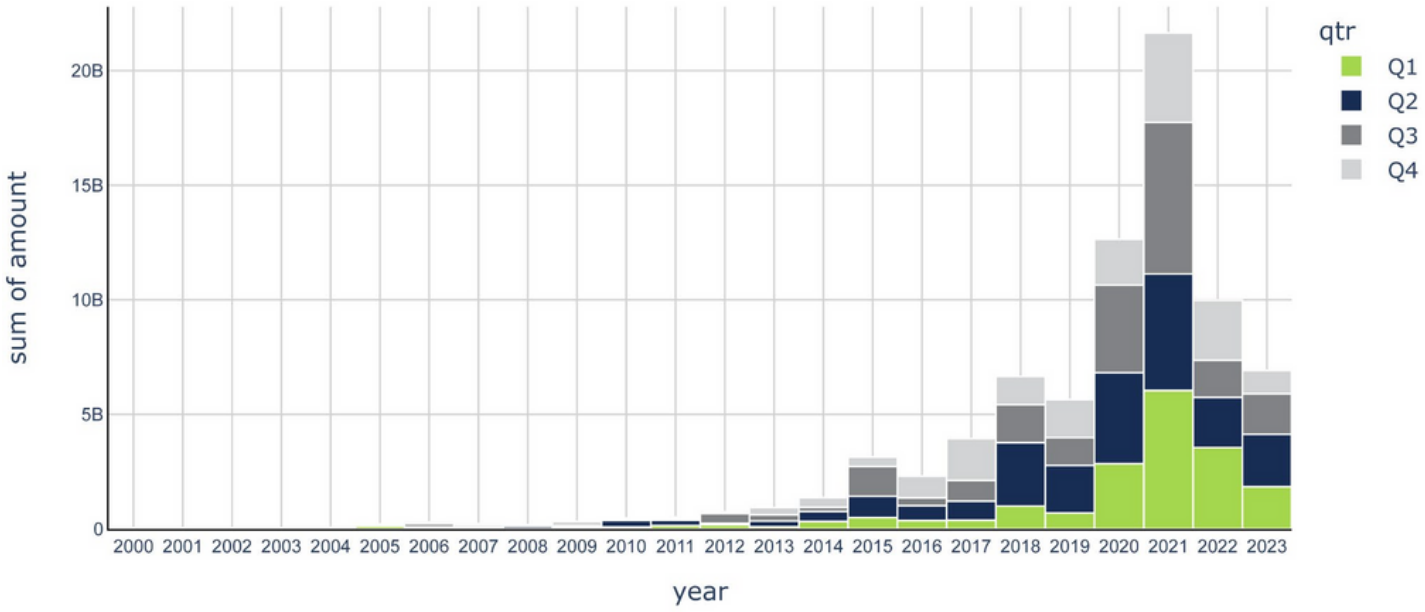
Synthetic Biology Overall Investment Trends

Venture Investment in Synthetic Biology Declined in Q4 and for 2023 Overall

During the fourth quarter of 2023, startups in the synthetic biology sector raised $1.0 billion, reflecting a decrease of $752.6 million (or 74.2%) from the previous quarter's $1.8 billion. In the same period last year, startups raised $2.6 billion, marking a decrease of $1.6 billion.

For all of 2023, synthetic biology startups have raised $6.9 billion, compared to $10.0 billion for all of 2022, representing a decrease of $3.1 billion.

Overall investment in Synthetic Biology up to 2023-4Q



Synthetic Biology Overall Investment Trends

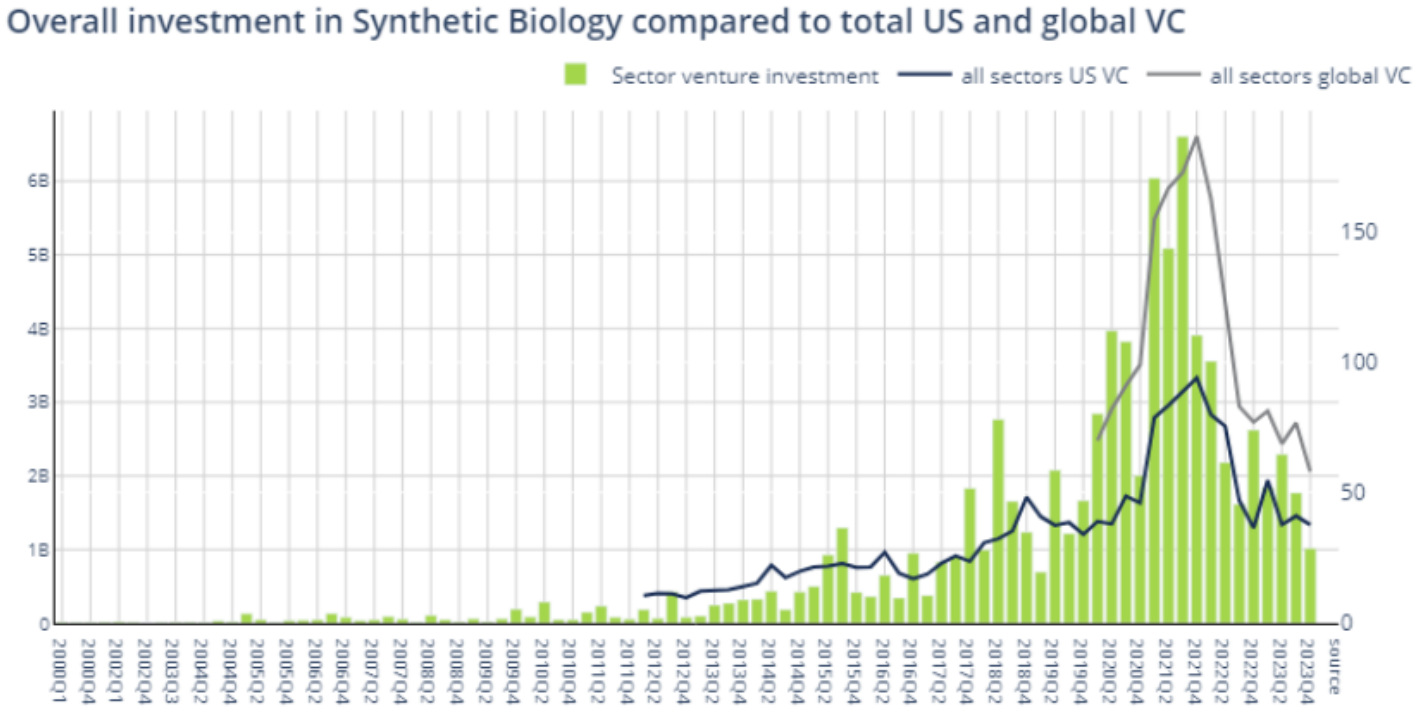
In 2023, Synthetic Biology Was Not Immune to The Overall Anemia in Venture Investment

While most of the world remembers 2020 and 2021 for the pandemic and lockdowns, they were two of the top years ever for venture investment in all sectors of technology, and all parts of the world. But neither 2022 nor 2023 approached those levels as Crunchbase wrote in their January newsletter:

We can only go up from here, right? That would be the hope as we start 2024, with last year clocking in as the lowest level for startup funding globally since 2018. Our latest data shows venture investment in 2023 was down 38% year over year and fell across every stage, from seed too late.

While the drop in funding is global, synbio seems to be faring a little better than average (Synbio is still above its 2018 level).

The chart below compares the synbio field with VC investment overall, on both the global and US levels - clearly showing a similar trend for all three categories. So, while synbio's slide paralleled that in other venture fields, it's worth remembering that 2020 and 2021 were the outliers, and the long-term trend over the last five years and farther back has remained strong.



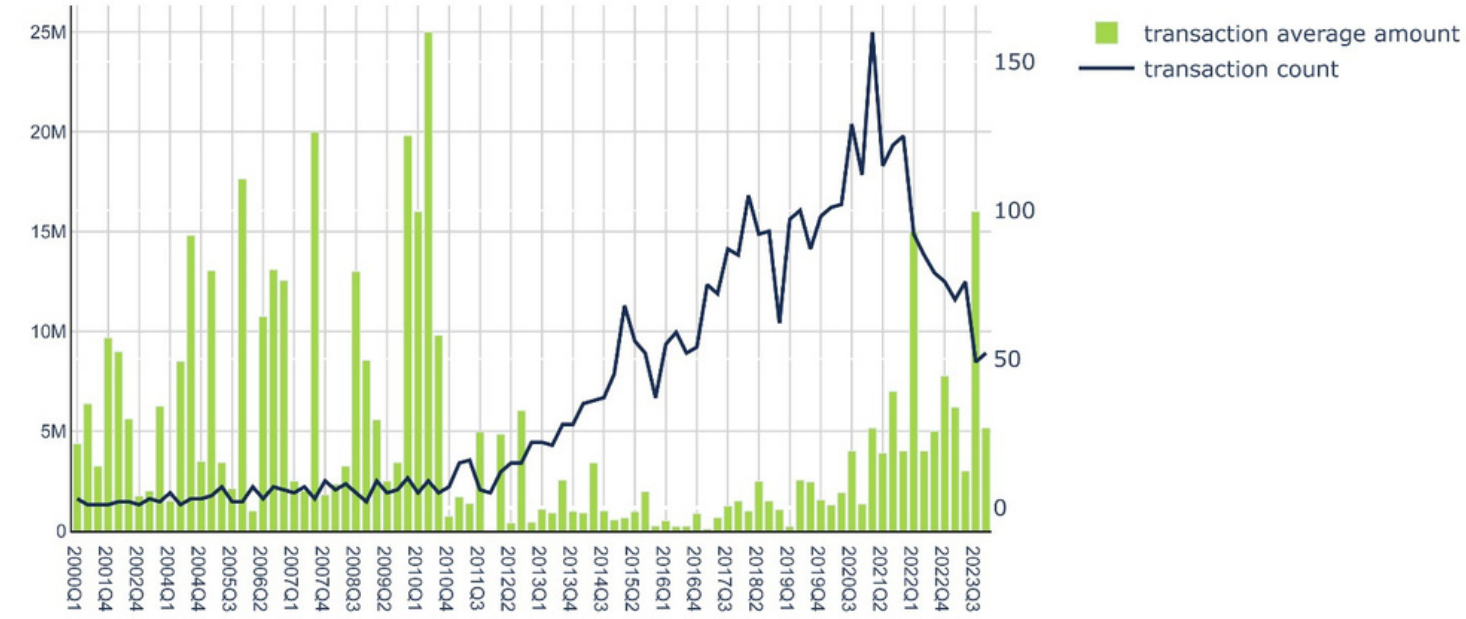
Synthetic Biology Overall Investment Trends

Average Investment Amount & Deal Count

A closer look at the average investment amount per transaction and the count of deals closed in 2023 shows that it is primarily fewer deals that are driving the total amount lower. The average investment per venture deal has stayed relatively steady at around $5 million going back to 2020, and that is a notable increase from the amounts typically seen in the decade prior.

Conversely, since 2011, the number of deals has steadily risen from less than 15 per quarter, to more than 100 almost every quarter between 2017-2022. Since 2022, those numbers have fallen sharply to fewer than 50 in the last half of 2023.

Average transaction amount and deal count in Synthetic Biology up to 2023-4Q



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Synthetic Biology Overall Investment Trends

Top Ten Transactions Overall

Organization	Amount $M
Verve Therapeutics	$143.8
Bluebird Bio	$125.0
Wave Life Sciences	$100.0
Cellectis	$80.0
Selecta Biosciences	$60.2
Parse Biosciences	$50.0
NTX	$47.5
Newleaf Symbiotics	$47.0
BlueNalu	$33.5
Eligo Bioscience	$30.0

Investment Trends by Synbio Stack

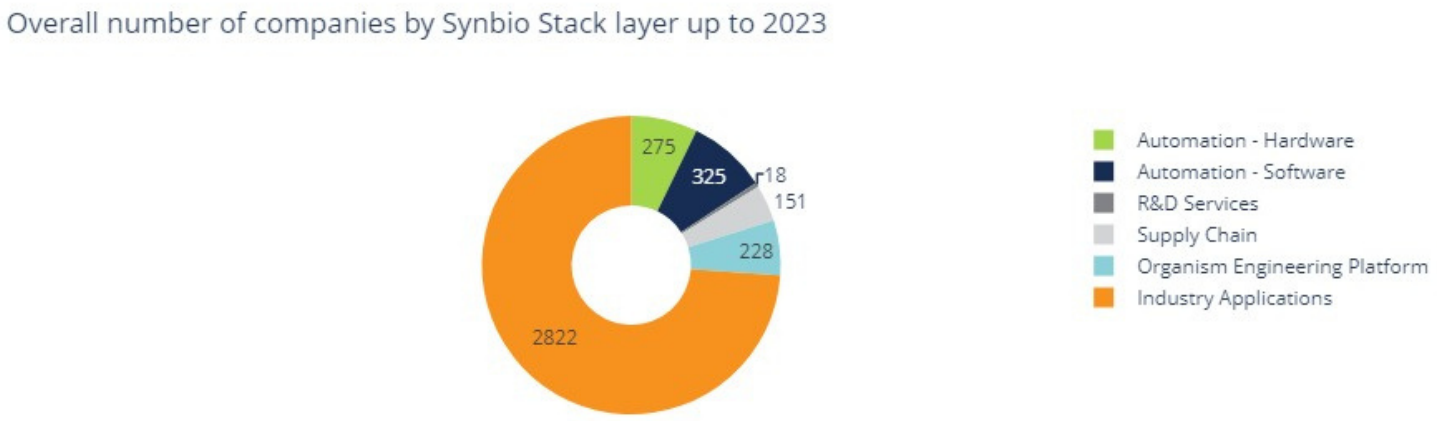
Automation-Software	Automation-Hardware	Research & Development Services	Supply Chain	Organism Engineering Platforms

Breaking down the overall numbers into segments related to technology, application, and industry, for the 2023 final analysis we revised the categories we have applied in years past.

The first dimension of segmentation is what SynBioBeta calls the "Synbio Stack." Like in computer systems where networks, data storage, and user interfaces all occupy different layers and process steps - the so-called "stack," the outputs of research and manufacturing in synthetic biology also rely on layers. The ones we have identified are:

- Automation - Hardware
- Automation - Software
- R&D Services
- Supply Chain
- Industry Applications

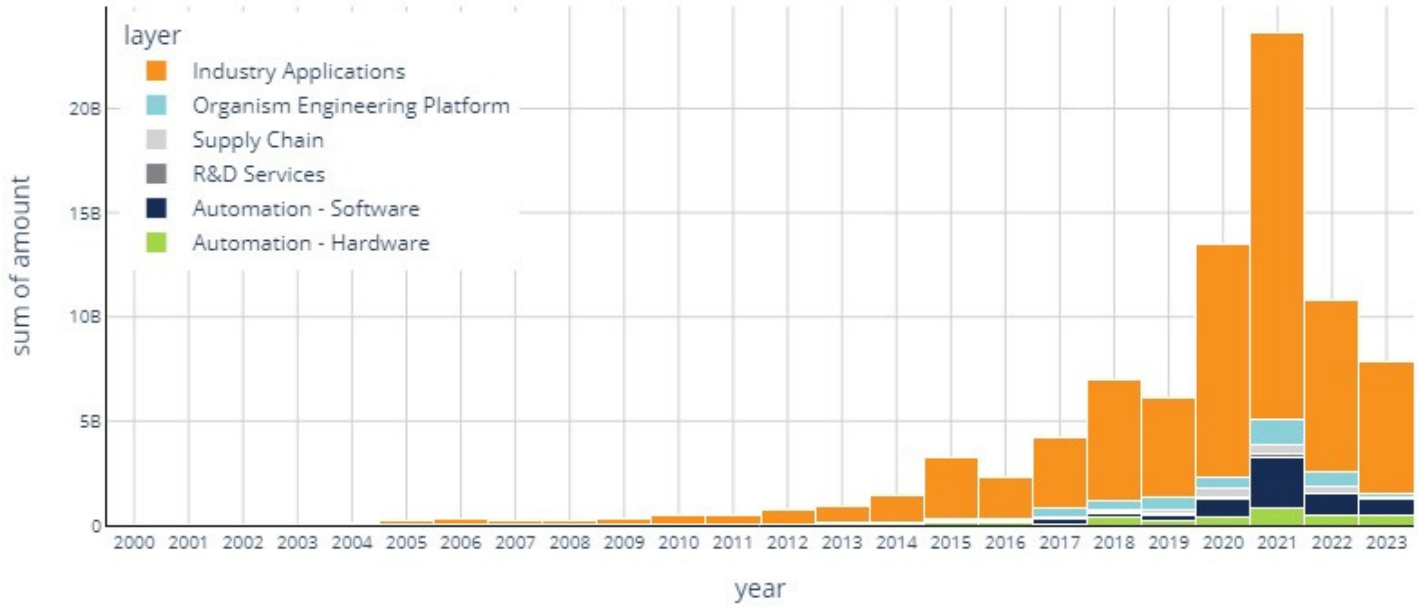
Within each of these layers are subgroups, like Artificial Intelligence / Machine Learning and BioCAD in Software, lab robots in Hardware, or Food and Nutrition in industry applications. It is instructive to see the number of companies in each layer, where, again, Industry Applications are dominant. Counting up the number of companies in each of these segments, we see:



Investment Trends by Synbio Stack

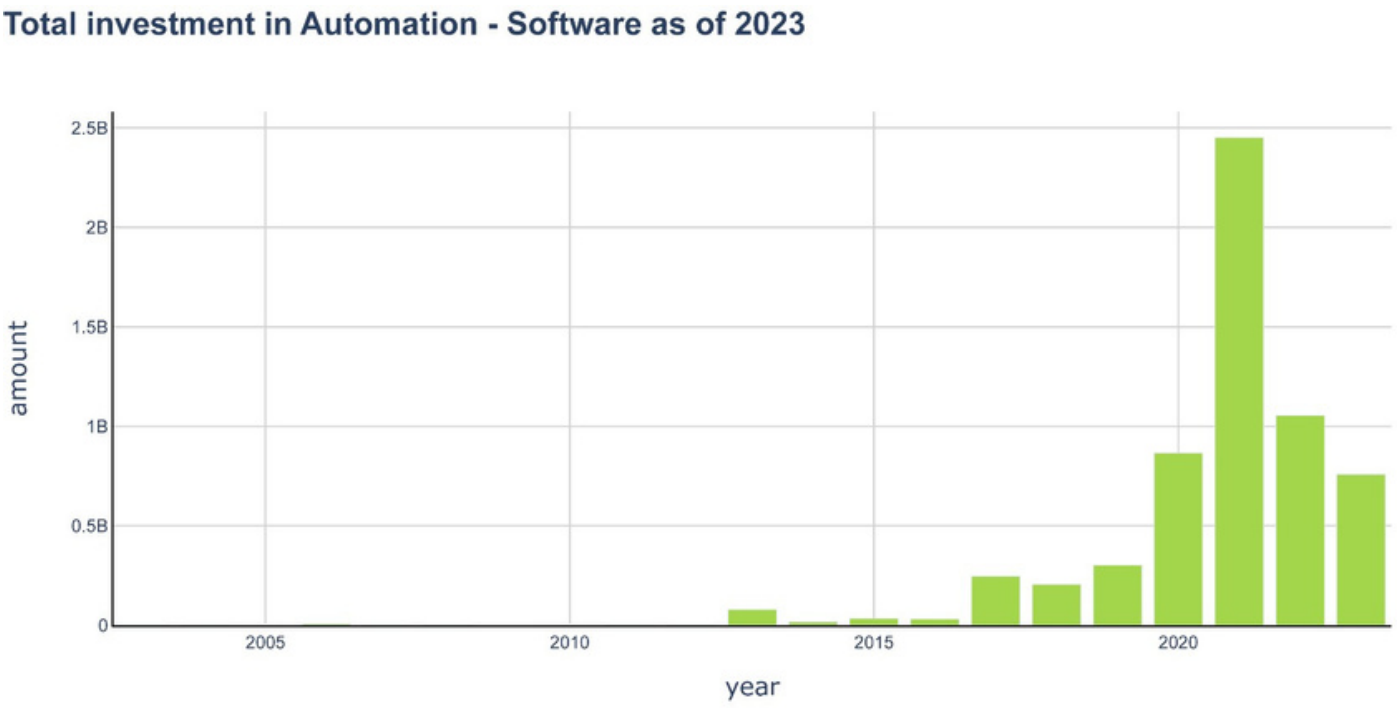
Note that the counts in this chart add up to more than the 900 companies in the field because some companies fall into more than one segment.
Looking at the investment in each layer over the years, we see that the industry applications layer remains far and away the segment that receives the most funding. Note that, as with the counts of companies, the amounts in this chart are greater than the non-segmented charts above because some companies fall into more than one segment.

Overall investment by Synbio Stack layer up to 2023



Investment Trends by Synbio Stack

Automation - Software

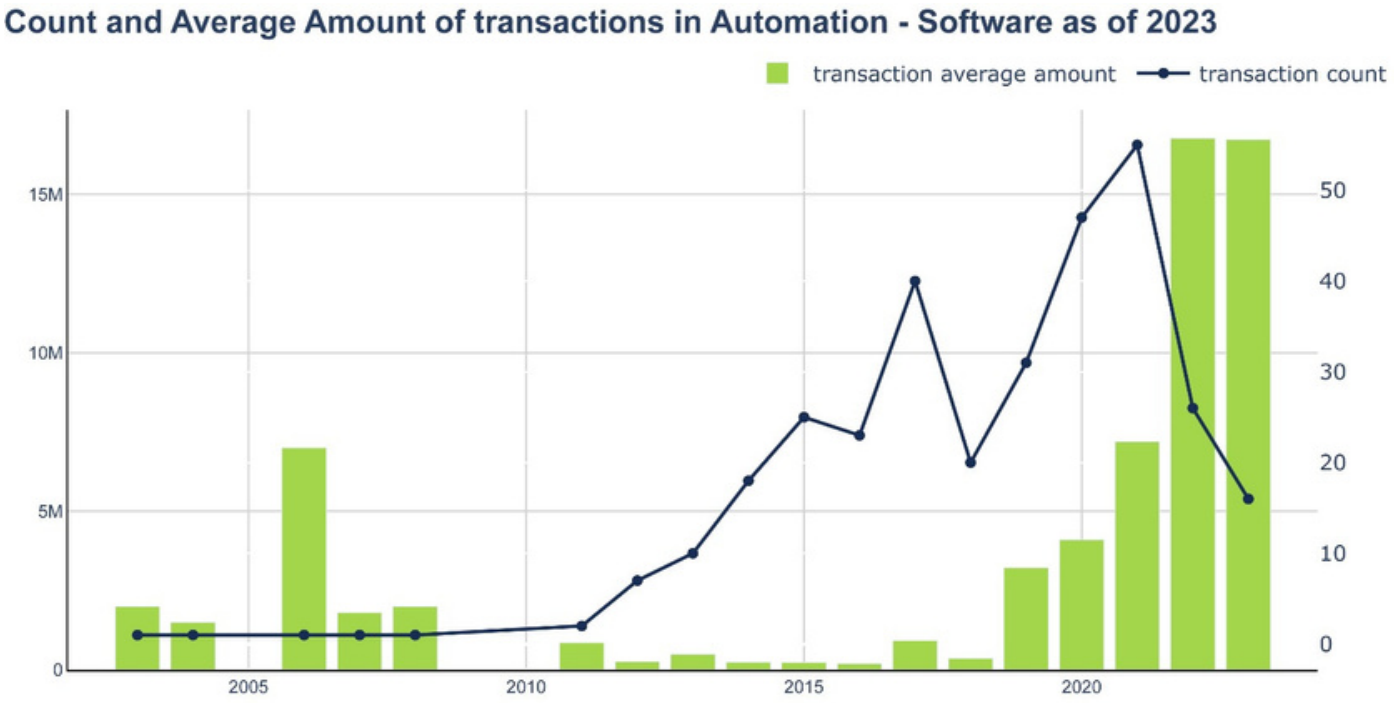


During the fourth quarter of 2023, startups in the Automation - Software industry raised a total of $3.9 million, representing a decrease of $344.2 million (8824.5%) from the previous quarter's $348.1 million. In the same period last year, startups in this industry raised $164.0 million, reflecting a decrease of $160.1 million.

Year-to-date, Automation - Software startups have raised $759.2 million compared to $1053.8 million at this point last year, marking a decrease of $294.7 million.

Investment Trends by Synbio Stack

Automation - Software



The category of Automation - Software expands on our previous category of Bio-CAD, adding Artificial Intelligence and Machine Learning (Al/ML), and Lab Operations tools:

- Bio-CAD (computer-aided design) includes software tools for bioengineering, used for design and simulation of biological tissues, metabolic pathways, gene expression, and modeling other biological processes and structures.
- Artificial Intelligence and Machine Learning is a rapidly advancing approach to modeling and predicting biological systems in silica before conducting experiments using physical biochemicals, cells, and organisms.
- Lab Operations software manages consumables, experiments, data, and other information about a ab's activities.

Investment Trends by Synbio Stack

Automation - Software

Top Ten Transactions for Automation - Software

Organization	Amount	Series	Investors	QTR
Generate Biomedicines	$273,000,000	Series C	Abu Dhabi Investment Authority and 10 other investors	Q3
Asimov	$175,000,000	Series B	Andreessen Horowitz and 6 other investors	Q1
Metagenomi	$100,000,000	Series B	Catalio Capital Management and 4 other investors	Q1
BenchSci	$69,855,812	Series D	F-Prime Capital and 4 other investors	Q2
Aether Bio	$49,000,000	Series A	Amplifier and 3 other investors	Q3
Outpace Bio	$25,000,000	Series A	Artis Ventures (AV) and 5 other investors	Q1
CHARM Therapeutics	$20,045,588	Series Unknown	NVentures	Q2
Tierra Biosciences	$17,556,003	Series A	Creative Ventures	Q3
Ten63 Therapeutics	$15,900,000	Series A	Alexandria Venture Investments and 5 other investors	Q2
Evogene	$8,500,000	Post Ipo Equity	Altium Capital and 2 other investors	Q3

Investment Trends by Synbio Stack

Automation - Software

- Generate Biomedicines raised $273.0 million in a Series C round of funding. Generate Biomedicines is a biotechnological company pioneering generative biology to create breakthrough medicines.

- Asimov raised $175.0 million in a Series B for creating tools for programming living cells. The company utilizes synthetic biology, computer aided design, and machine learning to advance the design and manufacture of biologics and gene therapies.

- Metagenomi raised $100.0 million in a Series B to revolutionize gene editing for therapeutics development. The company uses metagenomics and machine learning to discover and develop novel genome editing systems with a decreased risk of immune response.

- BenchSci raised $69.9 million in a Series D for their Al technology to accelerate drug discovery. The company empowers scientists with advanced biomedical artificial intelligence to run more successful experiments and bring medicine to patients faster.

- Aether Bio raised $49.0 million in a Series A to develop machine learning technology for enzyme re-purposing. The company uses machine learning and high-throughput robotic laboratories to create new compounds and reinvent production processes for healthcare institutes.

- Outpace Bio received a $25.0 million Series A investment to develop smart cell therapies aimed at improving efficacy and safety. The company creates custom-designed biological functions and cellular control modalities to program the right response at the right time and place for a wide range of diseases.

- CHARM Therapeutics raised $20.0 million in a Series Unknown to develop molecule therapeutics using deep learning on 3D molecular configurations. CHARM Therapeutics is a biotech company that utilizes deep learning and cutting-edge drug discovery technologies to create transformational medicines targeting previously undruggable disease targets.

- Tierra Biosciences, Inc. raised $17.6 million in a Series A to accelerate the pace of discovery and enable the next generation of bio-based materials. The company's first product, the Tierra protein platform, simplifies the ordering of custom proteins through high-throughput protein manufacturing, lowering the traditional protein synthesis barrier for scientists looking to develop novel proteins for bio-based products.

Investment Trends by Synbio Stack

Automation - Software

- Ten63 Therapeutics raised $15.9 million in a Series A for their venture-backed startup developing durable therapeutics against lethal diseases. The company combines ML-based computational chemistry and super linear search algorithms to discover optimized drug candidates using their platform, Copper, which leverages proprietary AI and physical models to explore a large chemical space and discover new therapeutics for previously undruggable targets.

- Evogene raised $8.5 million in a Post IPO Equity to further develop its ag-biotech traits. The company uses plant genomics and technology to develop seed traits that enhance crop performance and productivity through biotechnology and breeding methods.

- Exscientia received a $2.3 million grant to accelerate drug discovery using their AI platform. The company uses artificial intelligence and bigdata processing to automate drug design and discovery, speeding up the process and increasing productivity compared to traditional methods.

- Brightseed raised $1.6 million in a grant to further develop its artificial intelligence technology for discovering powerful compounds hidden in nature. Brightseed is a pioneer in biosciences and artificial intelligence, using Forager A.I. to reveal and map bioactive in nature to human health outcomes.

- Evogene raised $1.3 million in a grant for their ag-biotech trait development. The company uses plant genomics and technology to develop seed traits for crop performance and productivity through biotechnology and breeding methods.

- Aether Bio raised $0.1 million in a Series Unknown to further develop its machine learning technology for enzyme re-purposing. The company uses machine learning and high-throughput robotic laboratories to create new compounds and reinvent the production of existing compounds for healthcare institutes.

- Proteinea recently received an investment of $0.0 million in a Convertible Note. The company specializes in making biotherapeutics design more efficient by using deep-learning models and smart experimental throughput.

- TeselaGen received $0.0 million in Non-Equity Assistance for its biotechnology company that develops DNA design and assembly tools for biology.

Investment Trends by Synbio Stack

Automation - Hardware

The **Automation - Hardware** segment includes everything from complete cloud Labs and biofoundaries, to makers of lab robotics and individual instruments. These are the tools that make engineering biology less dependent on human hands and eyes, and able to evolve more rapidly.

- **Cloud Labs** are highly automated, centralized research laboratories that can be accessed remotely over the internet. Scientists can conduct experiments by issuing commands to the cloud lab through a user interface, without needing to physically be present in the lab. The experiments are then carried out using automation and robotics in the lab. The purpose of a cloud lab is to improve efficiency, reproducibility, and access to advanced research equipment for scientists conducting experiments in the field of biotechnology. Some companies offer cloud lab platforms as a service to scientists and researchers in the biotech industry.

- G**ene synthesis** refers to the process of creating or synthesizing a new DNA sequence by artificially stitching together nucleotides, the building blocks of DNA, in a specific order to match a desired genetic sequence. This can be used to create customized genes for scientific research, biotechnology, and gene therapy applications. With recent advancements in synthetic biology, gene synthesis has become a widely used method for creating new genetic sequences in a cost-effective and precise manner, with 100% sequence accuracy guaranteed by some service providers. The synthesized genes can be used for a variety of applications such as gene editing, gene therapy, and biomanufacturing.

- If synthesis is writing DNA, **gene sequencing** is reading it - determining the order of bases in a gene. Whole genome sequencing (WGS) goes beyond genes to determine the order of bases in the entire genome of an organism in one process. The first complete human genomes were sequenced 20 years ago in April 2003, at a cost of about $3 billion. Today, costs have plummeted; whole genome sequencing has become the standard method for detecting and investigating foodborne outbreaks associated with bacteria and is becoming more widespread in cancer diagnostics and other applications.

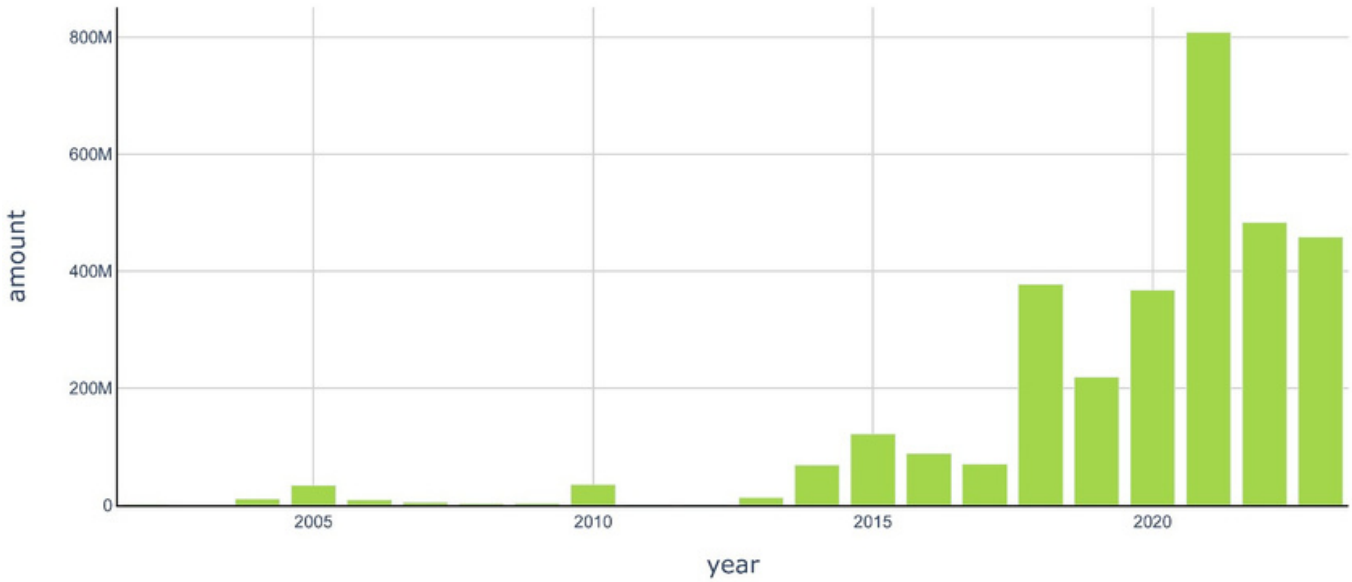
Other key categories in the space include:

- Organism Engineering Platforms
- Semi/Fully Automated R&D (Biofoundry) • Microfluidics
- Automation Equipment
- General Lab Equipment

Investment Trends by Synbio Stack

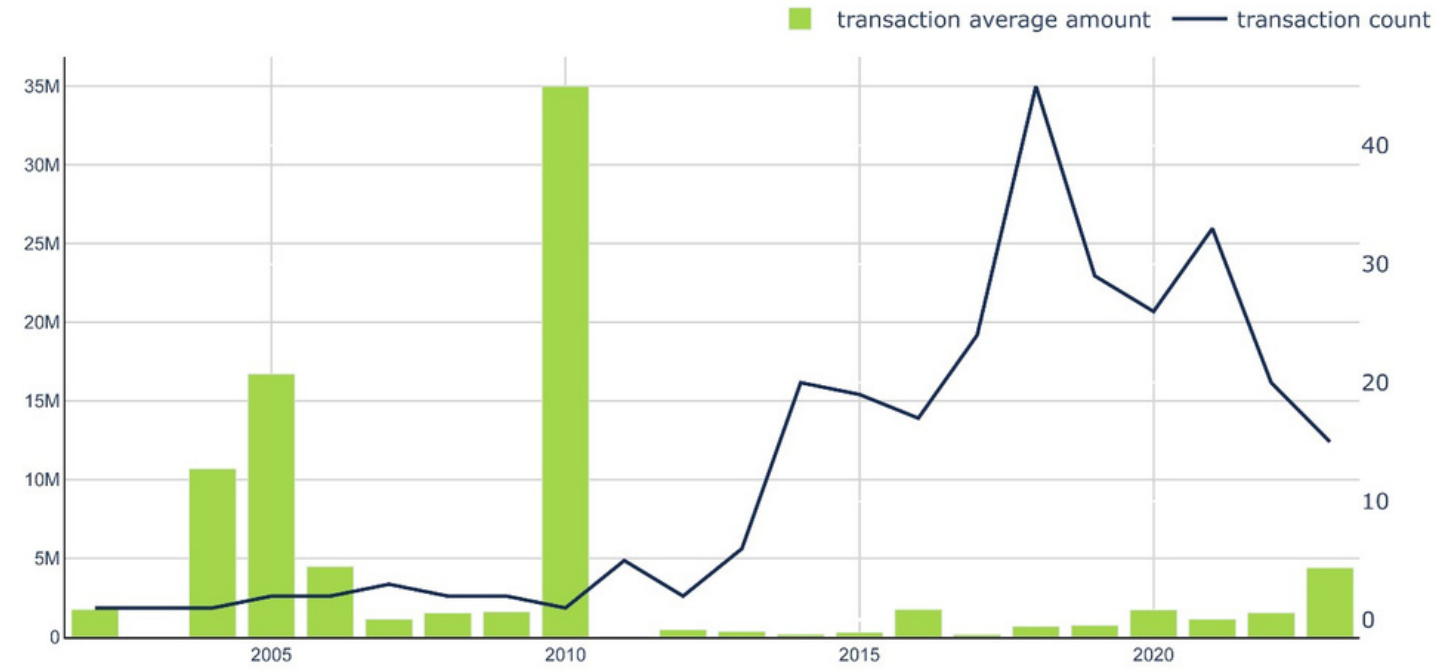
Automation - Hardware

Total investment in Automation - Hardware as of 2023



During the fourth quarter of 2023, startups in the Automation – Hardware sector secured funding amounting to $19.0 million. This represented a decrease of $-294.5 million (-1550.1%) from the previous quarter's $313.5 million. In the same period last year, startups raised $41.0 million, indicating a decrease of $-22.0 million. Year-to-date, Automation – Hardware startups have raised $457.9 million, compared to $483.1 million during the same period last year, reflecting a decrease of $-25.2 million.

Count and Average Amount of transactions in Automation - Hardware as of 2023



Investment Trends by Synbio Stack

Automation - Hardware

Top Ten Transactions for Automation - Hardware

Organization	Amount	Series	Investors	QTR
Cellares	$255,000,000	Series C	SVC and 6 other investors	Q3
Berkeley Lights	$70,000,000	Debt Financing	None	Q1
Lightcast Discovery	$48,504,011	Series B	+ND Capital and 5 other investors	Q3
Viridos	$25,000,000	Series A	Breakthrough Energy Ventures and Chevron	Q1
evonetix	$23,953,973	Series B	Cambridge Consultants and 7 other investors	Q1
Mytos	$19,000,000	Series A	Buckley Ventures and 4 other investors	Q4
Camena Bioscience	$10,014,201	Series A	Mercia Asset Management	Q3
Inscripta	$4,399,977	Series Unknown	Lakewood & Company	Q1
Viridos	$2,000,000	Grant	US Department of Energy	Q1
Stamm Biotech	$0	Series B	IndieBio and SOSV	Q2

Investment Trends by Synbio Stack

Automation - Hardware

- Cellares received $255.0 million in a Series C to further develop their cell shuttle technology for more affordable and widely available cell therapies. Cellares develops the cell shuttle, an automated and closed end-to-end manufacturing solution that increases scalability, reduces process failure rates, and lowers manufacturing costs for cell therapy treatments.

- Berkeley Lights raised $70.0 million in Debt Financing to fund their research and development services using micro-droplet technology. The company revolutionizes biological processes by enabling scientists and researchers to study cell interactions, accelerate cellular therapies, and meet demands for cell-based processes in various fields.

- Lightcast Discovery received $48.5 million in a Series B round, and the company uses a microfluidic platform to advance clinical approaches, therapies, and products. Lightcast Discovery's mission is to push the boundaries of complex cell analysis through their innovative platform that enables precise and flexible control of thousands of droplets for complex workflows without manual cell manipulation.

- Viridos received a $25.0 million Series A investment. The company develops genomic-driven solutions for global energy and environmental challenges, specializing in synthesizing and programming DNA for industrial processes and environmental applications.

- Evonetix raised $24.0 million in a Series B to develop and commercialize a new approach to DNA synthesis for synthetic biology. Evonetix is a spin-out company in Cambridge focused on advancing DNA synthesis through novel techniques and high-integrity automated systems.

- Mytos raised $19.0 million in a Series A to build a fully automated cell manufacturing platform for biotech. Mytos is a company that is focused on developing a fully automated cell manufacturing platform for the biotech industry, specifically starting with drug development.

- Camena Bioscience raised $10.0 million in a Series A to further develop its synthetic biology tools. Camena Bioscience is a company that specializes in developing nucleic acid synthesis technology to improve the quality and speed of synthesis for various applications.

- Inscripta raised $4.4 million in a Series Unknown for their benchtop platform for scalable digital genome engineering. Inscripta develops a fully automated CRISPR-based platform for trackable editing of single cells, aiming to empower scientists in gene editing research.

Investment Trends by Synbio Stack

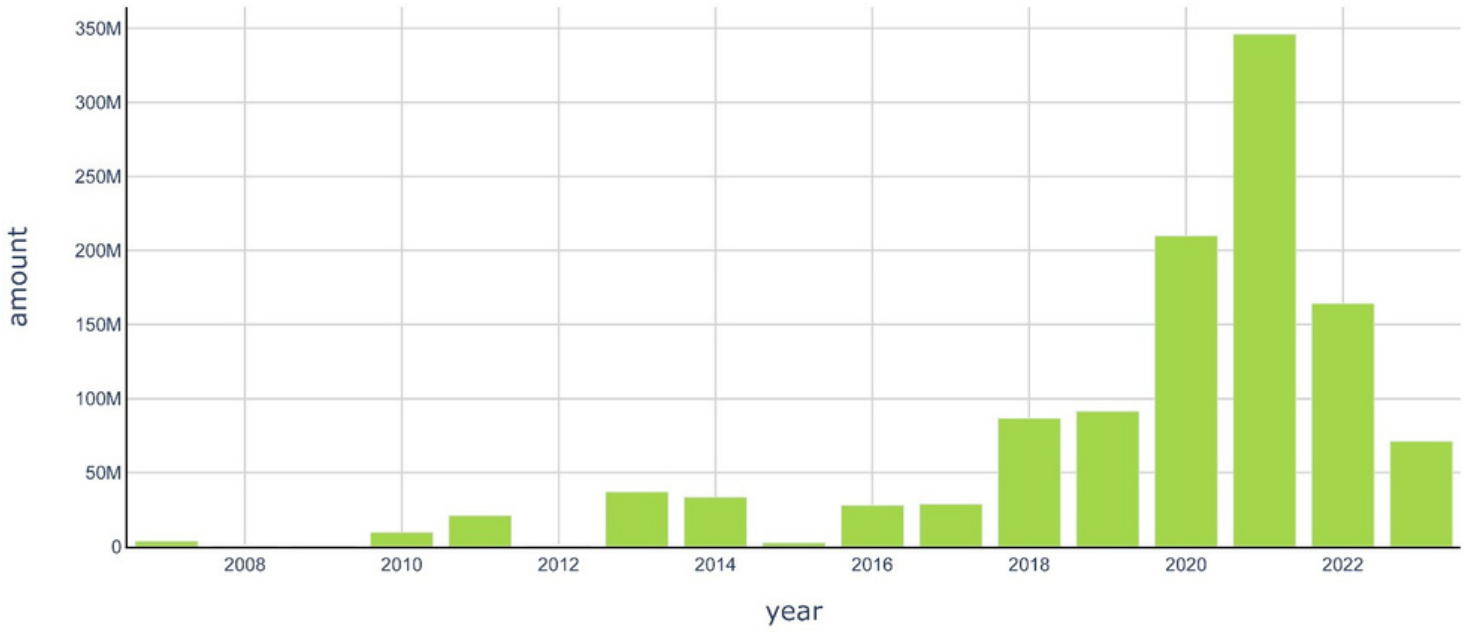
Automation - Hardware

- Viridos received a $2.0 million grant for genomic-driven solutions to global energy and environmental challenges. The company develops and commercializes DNA technologies for industrial processes, environmental applications, and advanced biofuels.
- Stamm Biotech raised an undisclosed sum in a Series B round to further develop its novel bioproduction system. The company specializes in life sciences and has designed an innovative bioprocessor that could revolutionize biomanufacturing by significantly increasing productivity compared to traditional bioreactors.
- DropGenie received an undisclosed sum investment in Non-Equity Assistance. DropGenie is developing connected hardware to automate gene editing, speeding up scientific discovery by generating standardized and compatible data.
- ClexBio received an investment of an undisclosed sum in a Series Unknown to support its growth and development. ClexBio is a company that specializes in bioengineering and developing innovative cell culture technologies for drug discovery and regenerative medicine applications.
- Indee Labs received an undisclosed sum in Non-Equity Assistance for developing hardware for gene delivery. Indee Labs specializes in developing hardware for gene delivery, particularly for gene-modified cell therapies such as chimeric antigen receptor t cells, with the help of the Australian National Fabrication Facility and various other incubators and labs.
- Linear Diagnostics received a grant of an undisclosed sum. The company, Linear Diagnostics Limited, specializes in molecular diagnostics using a novel technology that allows for rapid detection of multiple targets with a simple optical system.
- Allozymes raised an undisclosed sum in a Series A to apply ultrahigh-throughput microfluidics technology to enzyme evolution and development. The company, Allozymes, pte. ltd., specializes in developing assays for enzymatic reactions and proprietary microfluidic chips to advance enzyme development.

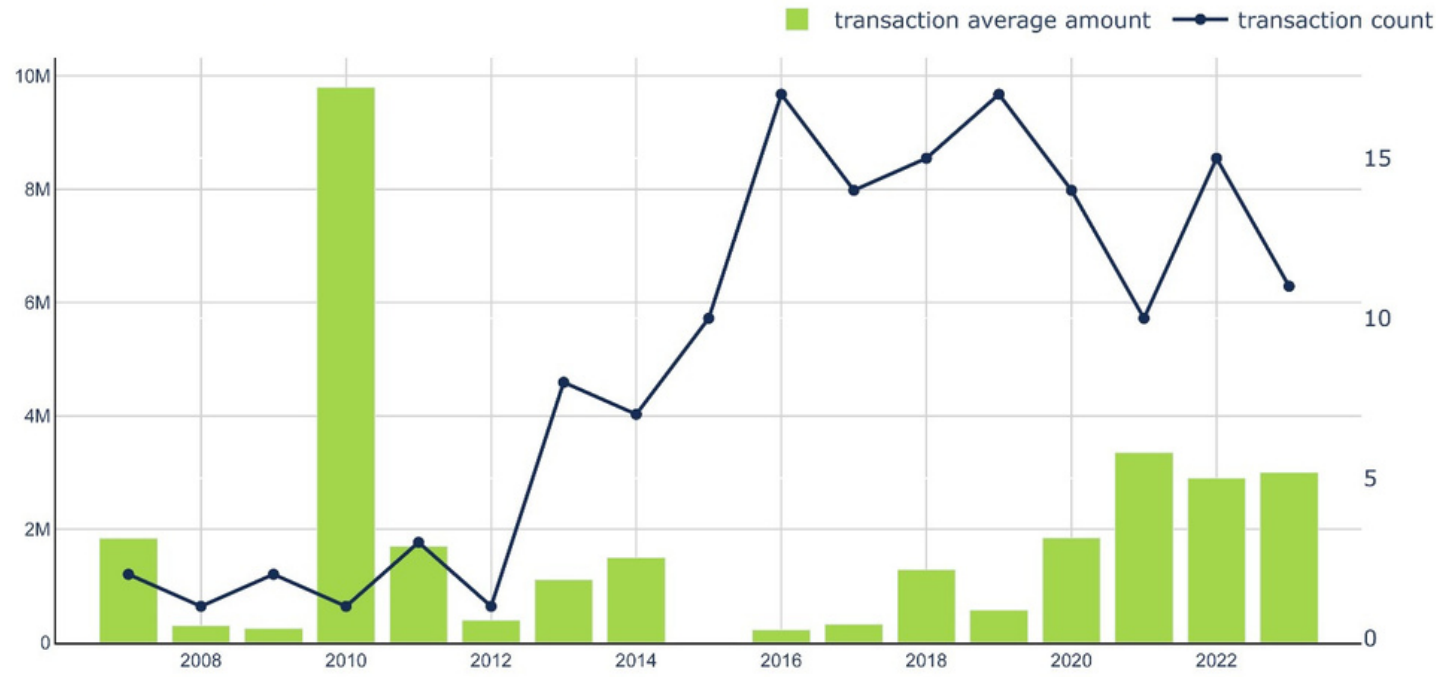
Investment Trends by Synbio Stack

Research and Development Services

Total investment in Research and Development Services as of 2023



Count and Average Amount of transactions in Research and Development Services as of 2023



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Investment Trends by Synbio Stack

Research and Development Services

Top Ten Transactions for Research and Development Services

Organization	Amount	Series	Investors	QTR
Parse Biosciences	$50,000,000	Series C	Bioeconomy Capital and 5 other investors	Q4
EV Biotech	$4,895,550	Seed	Andrew Nutter and 12 other investors	Q1
MicroBio Engineering	$4,559,673	Grant	US Department of Energy	Q1
Eagle Genomics	$3,641,055	Series Unknown	Abrdn and 2 other investors	Q3
seqWell	$3,400,000	Series Unknown	None	Q3
Eremid Genomic Services	$3,000,000	Series Unknown	Coddle Creek Capital	Q2
Quantitative BioSciences	$1,650,000	Grant	US Department of Energy	Q1
Moirai Biodesign	$0	Seed	SOSV	Q1
Parse Biosciences	$0	Debt Financing	Horizon Technology Finance	Q4
LenioBio	$0	Grand	EIT Food	Q3

Investment Trends by Synbio Stack

Research and Development Services

- Parse Biosciences received a $50.0 million investment in a Series C round. They are a biotechnology startup company developing single-cell sequencing kit solutions for researchers that eliminate the need for complex microfluidic instruments and allow for sample fixation, freezing, and storage.

- EV Biotech raised $4.9 million in a Seed round to revolutionize microbial cell factory strain engineering for a bio-based economy. The company aims to shift the chemical market from petrochemical-based to biological-based production for a more sustainable world.

- MicroBio Engineering raised $4.6 million in a grant for their consulting and engineering services in designing and constructing algae ponds for various applications. The company specializes in designing and constructing algae ponds for wastewater reclamation, biofuel production, microalgae feeds, and specialty products.

- Eagle Genomics raised $3.6 million in a Series Unknown, and they provide enterprise software solutions for managing, orchestrating, and exploiting life sciences data. Their products help life science companies maximize value from their research and improve productivity by reducing cost and time.

- SeqWell raised $3.4 million in a Series Unknown. The company specializes in gene sequencing and laboratory services, with a technology platform allowing for simple, scalable multiplexing of hundreds to thousands of samples without normalization.

- Eremid Genomic Services raised $3.0 million in a Series Unknown for its genomics contract research organization services. The company provides genomics contract research services for various clients in the industry.

- Quantitative Biosciences raised $1.6 million in a grant for their operations. Quantitative Biosciences is a company specializing in using data analytics and technology to improve the efficiency of biological research and drug discovery.

- Moirai Biodesign received an undisclosed sum of Seed investment. The company develops RNA-based technologies for cancer-related diagnostics and therapeutics.

Investment Trends by Synbio Stack

Research and Development Services

- Parse Biosciences raised an undisclosed sum in Debt Financing to further develop their single-cell sequencing kit solutions for researchers. The company eliminates the need for complex microfluidic instruments by using combinatorial cDNA barcoding within cells and allows for fixed, frozen, and stored samples to be easily separated and processed.

- LenioBio received a grant of an undisclosed sum for their rapid plant-based, cell-free protein expression technology. The company develops scalable solutions for protein expression in research, development, and production.

- Eagle Genomics received a Series Unknown investment of an undisclosed sum. They are an enterprise software solutions company specializing in managing, orchestrating, and exploiting genomics and other life sciences data to help companies maximize the value of their research and improve productivity.

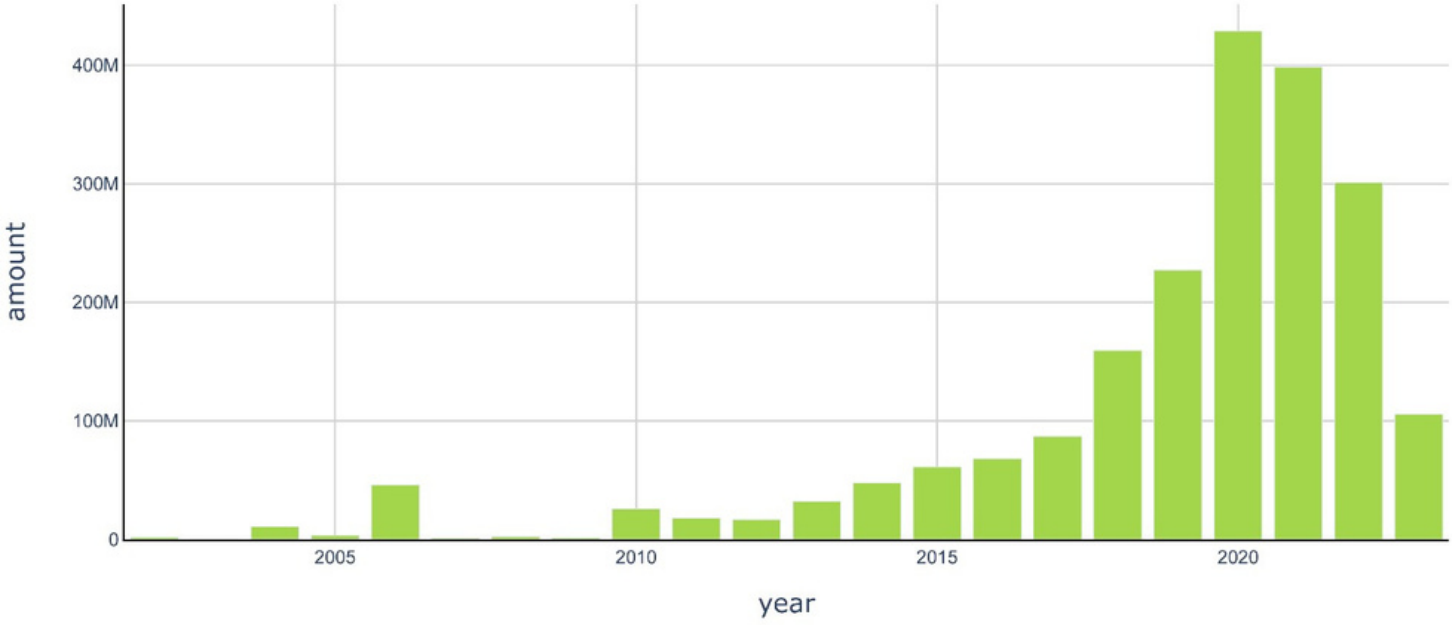
Investment Trends by Synbio Stack

Supply Chain

The synbio supply chain includes companies upstream and downstream that provide services such as:

- Contract Manufacturing and Research Organizations (CMOs / CROs)
- DNA providers
- Enzymes & Reagents providers
- Genetic Tools companies

Total investment in Supply Chain as of 2023

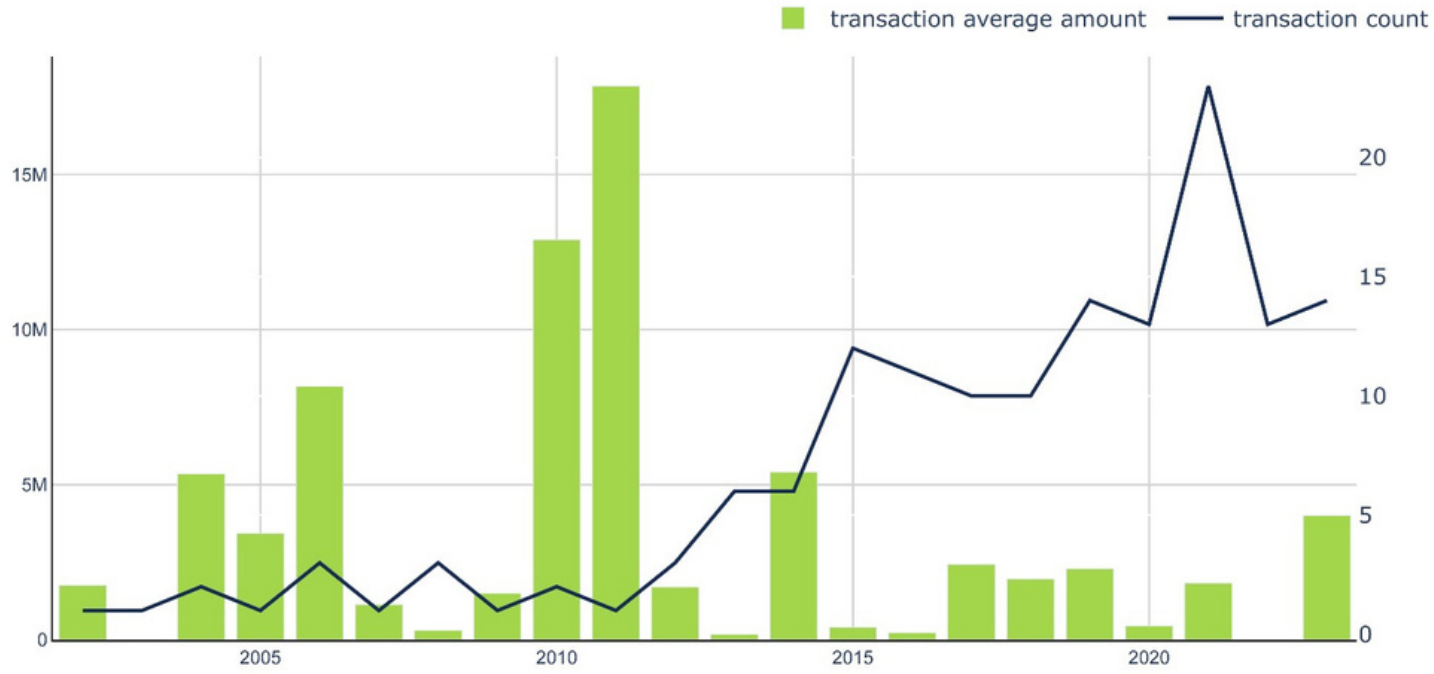


Investment Trends by Synbio Stack

Supply Chain

In the fourth quarter of 2023, startups in the Supply Chain industry raised $2.5 million, representing a decrease of $38.0 million (1546.0%) from the previous quarter's $40.5 million. In the same quarter last year, startups raised $4.1 million, a decrease of $1.6 million. Year-to-date, Supply Chain startups have raised $105.5 million, compared to $300.9 million at the same time last year, reflecting a decrease of $195.4 million.

Count and Average Amount of transactions in Supply Chain as of 2023



Supply Chain

Top Ten Transactions for Supply Chain

Organization	Amount	Series	Investors	QTR
Teknova	$22,900,000	Post Ipo Equity	None	Q3
Vernal Biosciences	$20,000,000	Series A	Ampersand Capital Partners and 3 other investors	Q2
Tierra Biosciences, Inc.	$17,556,003	Series A	Creative Ventures	Q3
Future Fields	$11,158,402	Series A	AgFunder and 8 other investors	Q1
Multus	$9,623,335	Series A	Asahi Kasei and 5 other investors	Q1
Mantra Bio	$9,000,000	Series A	SVC and 5 other investors	Q1
Future Fields	$5,000,000	Grant	Sustainable Development Technology Canada	Q1
Eremid Genomic Services	$3,000,000	Series Unknown	Coddle Creek Capital	Q2
Multus	$2,619,009	Grant	Innovate UK	Q1
VALANX Biotech	$2,457,780	Seed	SkyGene and 3 other investors	Q4

Investment Trends by Synbio Stack

Supply Chain

- Teknova received $22.9 million in a Post IPO Equity investment. They provide critical reagents for bioprocessing, bioproduction, and molecular diagnostics, supporting customers in research, clinical, and applied markets with standard catalog offerings and custom GMP products.

- Vernal Biosciences raised $20.0 million in a Series A to expand its operations. Vernal Biosciences is an mRNA manufacturing company that offers high purity mRNA services for research and clinical trials on a transactional basis.

- Tierra Biosciences, Inc. raised $17.6 million in a Series A to accelerate the pace of discovery and enable the next generation of bio-based materials. The company's first product, the tierra protein platform, makes ordering custom proteins easier than ever before, serving scientists looking to change the world with novel proteins.

- Future Fields raised $11.2 million in a Series A to develop cellular growth media for lab-grown meat. The company is committed to producing sustainable components for science through insect biotechnology, using their EntoEngine™ platform to harness the genetic prowess of fruit flies.

- Multus raised $9.6 million in a Series A to help cultivated meat companies scale affordably and profitably. They provide animal-free growth media solutions for the cultivated meat industry, allowing customers to focus on bringing sustainable meat to the world.

- Mantra Bio raised $9.0 million in a Series A to develop targeted therapeutics using exosome vehicles. The company develops novel therapeutics by engineering targeted exosome vehicles through its proprietary platform that integrates computational and wet biology, automation, and scalable biomanufacturing processes.

- Future Fields raised $5.0 million in a grant to develop cellular growth media for lab-grown meat at a lower cost. The company, founded in 2018 and headquartered in Edmonton, Canada, is focused on producing sustainable components for science through insect biotechnology, specifically using fruit flies to create environmentally and economically sustainable biomolecules.

Supply Chain

- Eremid Genomic Services raised $3.0 million in a Series Unknown for their genomics contract research services. The company specializes in providing genomic services for research purposes.
- Multus received a $2.6 million grant to help cultivated meat companies scale affordably and profitably by providing tailored animal-free growth media. They take care of the growth media for cultivated meat companies, allowing them to focus on bringing sustainable meat to the world.
- VALANX Biotech raised $2.5 million in a Seed round to further develop its site-specific protein conjugation platform. The company specializes in enabling fast and cost-efficient development of protein-drug conjugates.
- Zymvol Biomodeling just received a $1.4 million Seed investment. The company uses computer simulations to speed up the process of discovering and developing new industrial enzymes.
- Aanika Biosciences raised $0.8 million in a grant for its operations. The company specializes in developing innovative biotechnology solutions for various industries.
- Allozymes raised a Series A investment of an undisclosed sum. Allozymes is a deep technology company that uses ultrahigh-throughput microfluidics technology to accelerate enzyme evolution and development.
- VALANX Biotech raised an undisclosed sum in a Seed investment round. The company specializes in site-specific protein conjugation for the development of protein-drug-conjugates in a fast and cost-efficient manner.

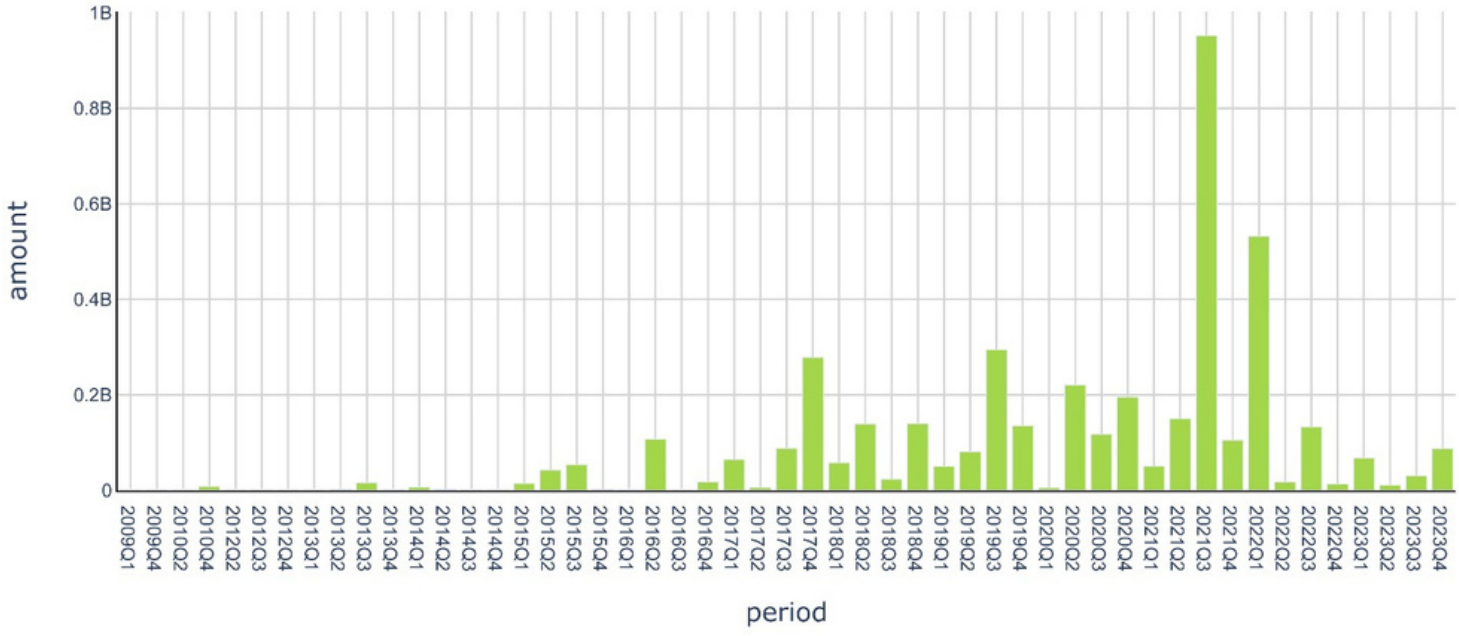
Organism Engineering Platforms

Organism engineering platforms refer to tools and techniques used in synthetic biology to engineer organisms for a variety of applications, such as biomanufacturing, environmental remediation, and healthcare. These platforms leverage advances in DNA synthesis, gene editing, and genetic engineering to modify the genetic code of an organism in a precise and targeted way. For example, organism engineering platforms can be used to create custom yeasts for brewing beer, or to engineer bacteria to produce specialized chemicals or enzymes. These platforms are a key aspect of synthetic biology and are constantly evolving as new tools and techniques are developed.

Some other examples of engineered organisms include:

- Enzyme-producing bacteria used in industrial processes, such as the production of biofuels and chemicals
- Bacteria engineered to consume oil spills or other environmental pollutants
- Algae engineered to produce biofuels or pharmaceutical products
- Mosquitoes engineered to be resistant to diseases such as malaria
- Plants engineered to produce higher yields or to be resistant to pests and diseases
- Yeast designed to produce specific flavors in beer and wine
- Animals engineered for medical research purposes, such as mice with specific disease mutations

Total investment in Organism Engineering Platform as of 2023-4Q

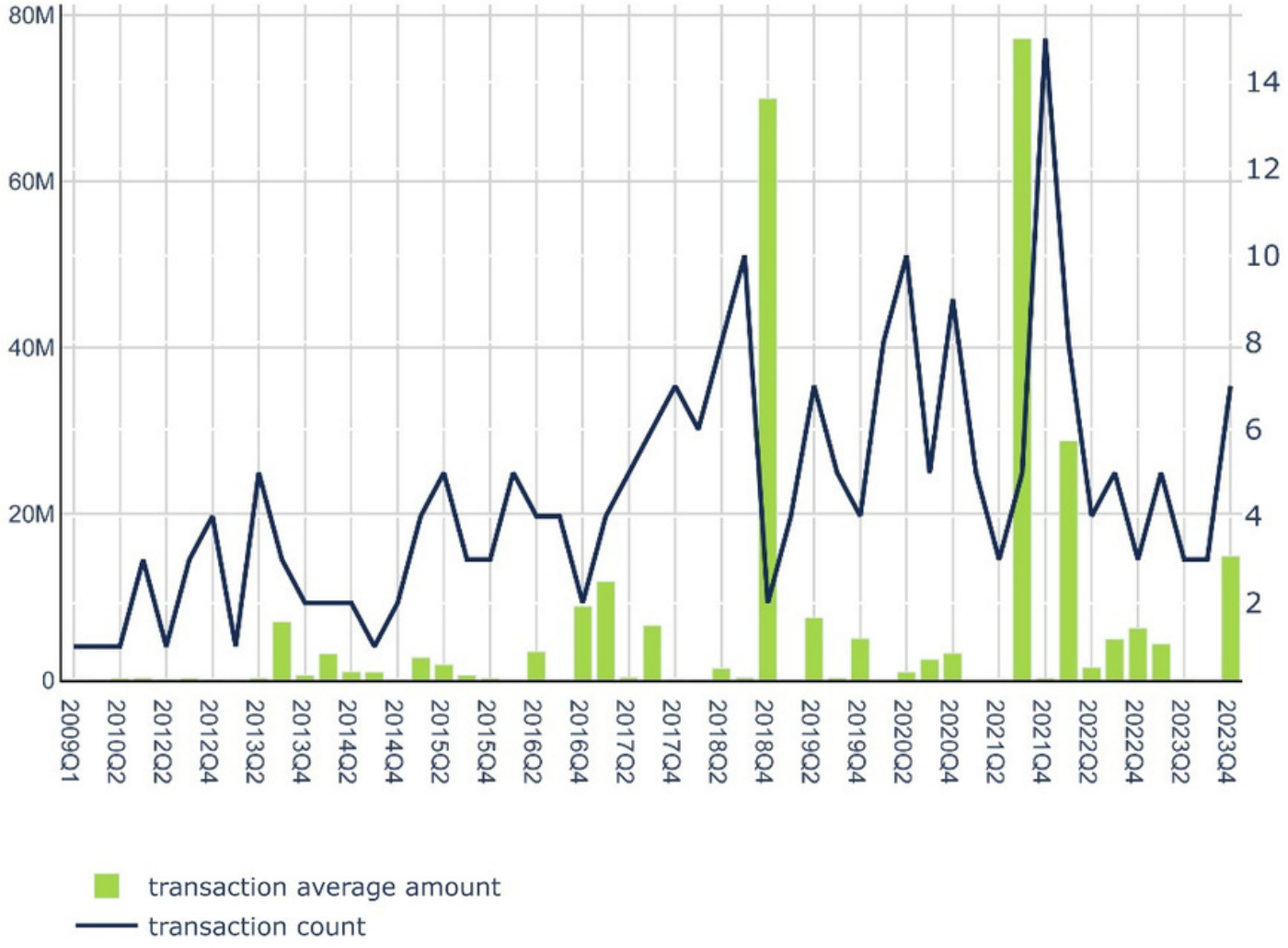


Investment Trends by Synbio Stack

Organism Engineering Platforms

During the fourth quarter of 2023, startups in the Organism Engineering Platform sector secured funding amounting to $87.7 million, reflecting an increase of $57.7 million (65.8%) from the previous quarter's $30.0 million. In the same quarter last year, startups raised $13.7 million, resulting in a change of $74.1 million. Year-to-date, Organism Engineering Platform startups have raised $196.4 million, a decrease of $499.8 million compared to the $696.2 million raised by this time last year.

Count and Average Amount of transactions in Organism Engineering Platform as of 2023-4Q



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Investment Trends by Synbio Stack

Organism Engineering Platforms

Top Ten Transactions for Organism Engineering Platforms

Organization	Amount	Series	Investors	QTR
Bluepha	$58,700,930	Series B	Huanghai Financial Holdings and Zhongping Capital	Q1
Allonnia	$30,000,000	Series A	Battelle and 7 other investors	Q3
Zafrens	$23,000,000	Series A	Alix Ventures and 8 other investors	Q4
Cibus	$20,300,000	Post Ipo Equity	None	Q4
Triplebar	$20,000,000	Series Unknown	Essential Capital and 4 other investors	Q4
Arzeda	$14,935,945	Series Unknown	None	Q4
Berkeley Yeast	$10,474,999	Series A	Anterra Capital and Finistere Ventures	Q2
Pow.bio	$9,500,000	Series A	Bee Partners and 11 other investors	Q4
EV Biotech	$4,895,550	Seed	Andrew Nutter and 12 other investors	Q1
Inscripta	$4,399,977	Series Unknown	Lakewood & Company	Q1

Investment Trends by Synbio Stack

Organism Engineering Platforms

- Bluepha raised $58.7 million in a Series B funding round. The company integrates bioengineering and data science to design and commercialize bio-based products for various industries.
- Allonnia raised $30.0 million in a Series A for their bioremediation waste management solutions. The company specializes in developing innovative bioremediation technologies to help manage waste.
- Zafrens raised $23.0 million in a Series A to further develop their tools and insights at the intersection of biology, chemistry, and engineering. Zafrens is a company founded in 2021 that specializes in developing tools and generating insights at the interface of biology, chemistry, and engineering, and is headquartered in San Diego, California.
- Cibus raised $20.3 million in a Post IPO Equity to further develop their precision gene editing technology for agriculture. The company offers advanced breeding technologies that allow for precise and stable genetic changes in plants and other organisms without the use of foreign genetic material.
- Triplebar, a company that specializes in designing high-end bar equipment, raised $20.0 million in a Series Unknown investment round. Triplebar creates and sells premium bar equipment for commercial and residential use.
- Arzeda raised $14.9 million in a private transaction. The company develops enzyme design technology to revolutionize biocatalysis.
- Berkeley Yeast received a $10.5 million investment in a Series A round. The company engineers yeast strains to help brewers create delicious and sustainable beers, as well as other fermented products like bread, cheese, and vinegar.
- Pow.bio received $9.5 million in a Series A to provide intelligent fermentation services for industrial and synthetic biology. The company combines continuous fermentation with advanced control methodology to optimize fermentation processes and deliver high yields at low costs for bacteria, yeast, and filamentous fungi.
- EV Biotech raised $4.9 million in a Seed round to revolutionize microbial cell factory strain engineering and shift the chemical market towards biological-based production. The company is working towards creating a bio-based economy by evolving the chemical feedstock market.
- Inscripta raised $4.4 million in a Series Unknown to develop the first benchtop platform for scalable digital genome engineering. The company's advanced crispr-based platform offers a fully automated workflow for massively parallel, trackable editing of single cells, aiming to empower scientists restricted by current technical and licensing limitations.

Organism Engineering Platforms

- Chi Botanic received a $0.2 million grant investment. The company creates plant stem cells that can be grown into plant products and ingredients at an industrial scale, using plant cell cultures to generate specific parts or components without the limitations of traditional plant growth.
- Provectus Algae raised an undisclosed sum in a Corporate Round to further develop its biotech solutions using algae. The company specializes in optimizing algae to produce valuable compounds for various industries.
- Ardra Bio received a grant of an undisclosed sum for their technology developed at the University of Toronto. The company uses model-guided metabolic engineering and synthetic biology to develop biocatalysts for producing specialty chemicals from renewable resources, with a current focus on the cosmetics industry.
- LenioBio received a grant of an undisclosed sum for their plant-based, cell-free protein expression technology. The company specializes in developing scalable solutions for protein expression in research, development, and production.
- CB Therapeutics raised a Series A of an undisclosed sum for their biotech company specializing in the biosynthetic production of cannabinoids from sugar, producing pure cannabinoids like CBD and THC using yeast and sugar, without the need for plants.
- Ginkgo Bioworks raised an undisclosed sum in a Grant for its biotechnology firm specializing in biological engineering products and custom microbes across various markets. The company designs, engineers, and tests organisms to develop molecules in flavors, sweeteners, cosmetics, crop treatments, pharmaceuticals, probiotics, and natural product discovery markets.
- Ginkgo Bioworks raised an undisclosed sum in a grant, supporting its work in developing biological engineering products and custom microbes across various markets. The company designs, engineers, and tests organisms to create molecules for flavors, sweeteners, cosmetics, crop treatments, pharmaceuticals, probiotics, and more.
- Ginkgo Bioworks received an undisclosed sum grant investment. The company is a biotechnology firm that designs and engineers custom organisms for various markets, including flavors, sweeteners, cosmetics, crop treatments, pharmaceuticals, and probiotics.

Synbio Industry Applications

Agriculture	Healthcare and BioPharma	Chemicals and Materials	Food and Nutrition	Energy and Environment

Scientists and engineers use the tools in the Synbio Stack to develop **applications,** such as medicines, diagnostics, bioenergy, and consumer goods. As synthetic biology has matured, more and more of the early experiments are becoming market- ready products, so this category has become dominant in its ability to raise venture capital.

By far, synbio's biggest impact so far is in **Healthcare and BioPharma,** specifically in **Drugs and Therapeutics.** Other subcategories within that industry include:

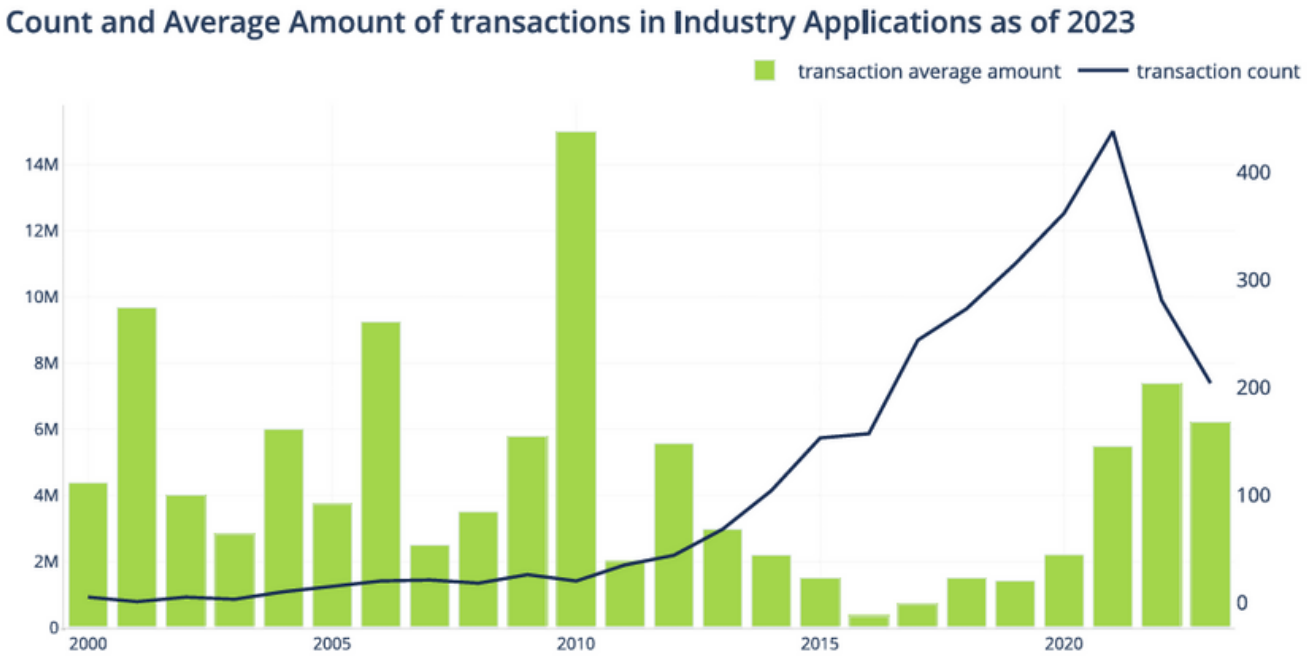
- Diagnostics
- Vaccines
- Gene Therapy
- Microbiome
- Personal Care and Skincare

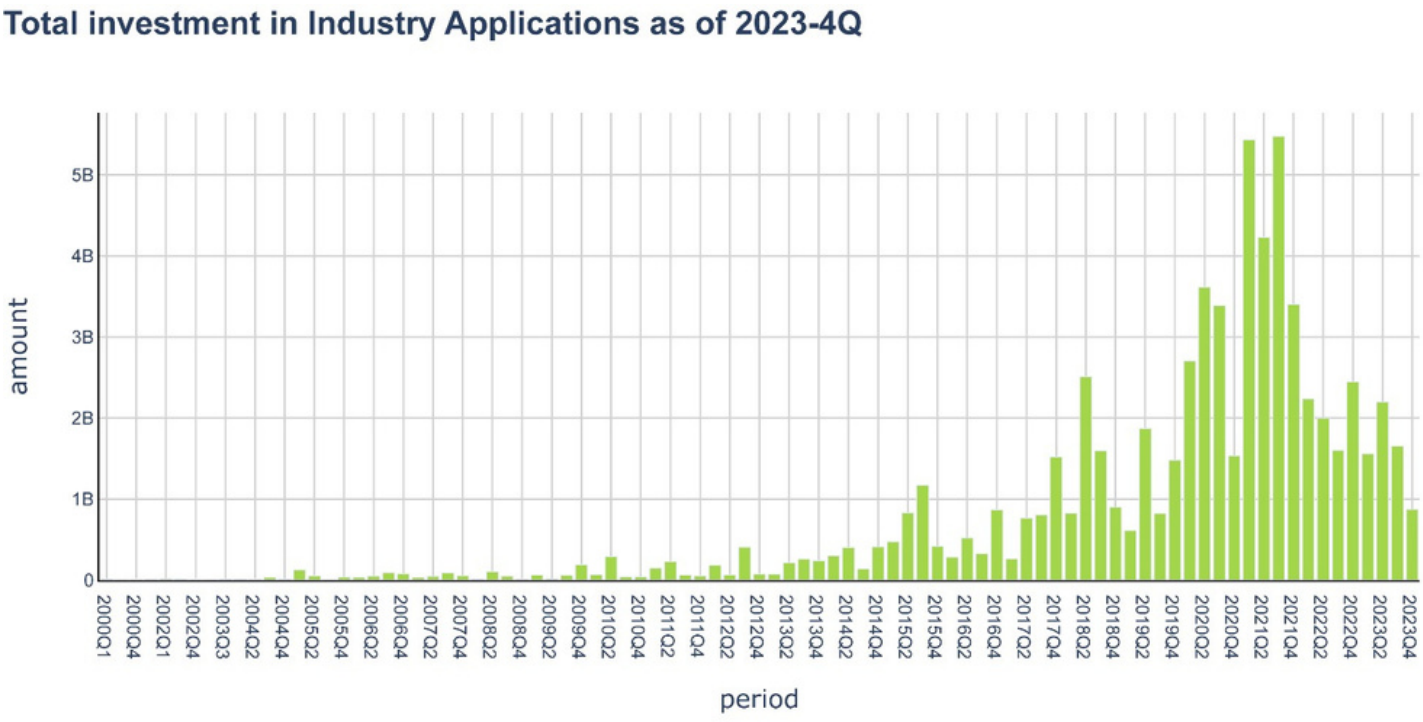
Overall, synthetic biology has the potential to revolutionize the way that industrial and consumer goods are produced and to create new sustainable solutions for a wide range of products, in industries like:

- Agriculture and AgTech Chemicals and Materials Energy and Environment
- Engineering
- Food and Nutrition
- Healthcare and BioPharma
- IT (such as Data Storage)
- NeuroTech

For example, Synbio applications in **consumer goods** include the development of biodegradable plastics, bio-based chemicals and materials, and sustainable textiles like leather and silk. For example, some companies are using synthetic biology to produce plant-based alternatives to animal leather or to develop biodegradable packaging materials made from renewable resources. Other applications include the development of cosmetics and personal care products with enhanced properties and the use of synbio in the production of food ingredients and flavors.

Synbio Industry Applications





During the fourth quarter of 2023, startups in the Industry Applications sector raised a total of $873.4 million, representing a decrease of $778.8 million (89.2%) from the previous quarter's $1652.2 million. In the same quarter last year, startups in this sector raised $2443.2 million, reflecting a decrease of $1569.8 million. Year-to-date, Industry Applications startups have raised $6284.6 million, compared to $8283.9 million at the same point in time last year, showing a decrease of $1999.2 million.

Synbio Industry Applications

Top Ten Transactions for Industry Applications

Organization	Amount	Series	Investors	QTR
AbCellera	$517,827,740	Grant	Government of British Columbia and Government of Canada	Q2
ElevateBio	$401,000,000	Series D	EcoR1 Capital and 16 other investors	Q2
Generate Biomedicines	$273,000,000	Series C	Abu Dhabi Investment Authority and 10 other investors	Q3
Cellares	$255,000,000	Series C	SVC and 6 other investors	Q3
CureVac	$250,000,000	Post Ipo Equity	None	Q1
Inhibrx	$200,000,000	Post Ipo Equity	Perceptive Advisors and 3 other investors	Q3
LanzaTech	$185,000,000	Post Ipo Equity	ArcelorMittal and 9 other investors	Q1
Asimov	$175,000,000	Series B	Andreessen Horowitz and 6 other investors	Q1
Verve Therapeutics	$143,800,000	Post Ipo Equity	None	Q4
Sutro Biopharma	$140,000,000	Post Ipo Debt	Blackstone Life Sciences	Q2

Synbio Industry Applications

- AbCellera received a $517.8 million grant for its antibody discovery and development engine. The company partners with biotechs and pharmaceutical companies to quickly find effective clinical candidates using its integrated platform and data science tools.

- ElevateBio raised $401.0 million in a Series D to further develop its portfolio of cell and gene therapy companies. ElevateBio is an operator of a portfolio of cell and gene therapy companies that develop, manufacture, and commercialize life-transforming medicines through partnerships with innovative scientists and inventors, and a centralized facility for efficient translation of R&D into therapies for severe diseases.

- Generate Biomedicines raised $273.0 million in a Series C to continue pioneering generative biology in drug development. The company focuses on creating breakthrough medicines using protein-based modalities.

- Cellares raised $255.0 million in a Series C to develop the cell shuttle, an automated manufacturing solution for cell therapy that aims to make life-saving therapies more affordable and widely available to patients in need.

- CureVac received $250.0 million in a Post IPO Equity investment. The company is a clinical-stage biopharmaceutical company that develops drugs based on messenger RNA to instruct the human body to produce proteins to fight diseases.

- Inhibrx raised $200.0 million in a Post IPO Equity investment. The company is a clinical- stage biotechnology company focused on developing novel biologic therapeutic candidates using diverse methods of protein engineering, with a pipeline focused on oncology, orphan diseases, and infectious diseases.

- LanzaTech raised $185.0 million in a Post IPO Equity to further develop its carbon recycling technology. LanzaTech is a company that recycles carbon from industrial off-gases and biomass resources to reduce global CO2 emissions and create new products for a circular carbon economy.

- Asimov raised $175.0 million in a Series B to advance the design and manufacture of biologics and gene therapies using their tools for programming living cells. The company, established in 2017, creates tools for programming living cells and is based in Boston, Massachusetts.

- Verve Therapeutics received a $143.8 million investment in Post IPO Equity for their genetic medicines approach to cardiovascular disease treatment. The company focuses on transforming cardiovascular disease treatment with single-course gene editing medicines, utilizing a team of experts in various fields related to healthcare and genetics.

Synbio Industry Applications

- Sutro Biopharma raised $140.0 million in Post IPO Debt to support its drug development programs. Sutro Biopharma is a clinical-stage drug discovery, development, and manufacturing company specializing in next-generation protein therapeutics for cancer and autoimmune disorders.

- Newlight Technologies raised $125.0 million in a private transaction for their biotechnology company producing advanced sustainable materials. The company's mission is to replace oil-based plastics with aircarbon on a global scale, using carbon that would otherwise go into the air to reduce the amount of carbon in the air on a market-driven basis.

- Editas Medicine has received a $125.0 million investment in Post IPO Equity. The company is engaged in discovering and developing genome-editing therapeutics to treat a broad range of diseases at the genetic level.

- Bluebird Bio received a $125.0 million investment in Post IPO Equity. The company is a clinical-stage biotechnology company that develops gene therapies for severe genetic and rare diseases by genetically modifying a patient's cells to correct the genetic basis underlying a disease.

- Caribou Biosciences received $125.0 million in a Post IPO Equity investment. The company operates a medical technology company specializing in cellular engineering and analysis using the crispr-cas9 technology platform for developing therapeutics in various fields.

- Vera Therapeutics received $115.0 million in a Post IPO Equity investment. The biotechnology company develops biologic therapeutics using gene-editing technology to potentially cure genetic disorders like sickle cell disease and cystic fibrosis.

- Bluebird Bio received $113.6 million in a Post IPO Equity investment to further develop gene therapies for severe genetic and rare diseases. Bluebird Bio is a clinical-stage biotechnology company that focuses on developing gene therapies to genetically modify a patient's cells in order to address the genetic basis of diseases.

- Vedanta Biosciences raised $106.5 million in a Series E to further develop its immunotherapies for immune-mediated and infectious diseases. Vedanta Biosciences is a biotech company that develops immunotherapies using proprietary assays and datasets to treat autoimmune and inflammatory diseases.

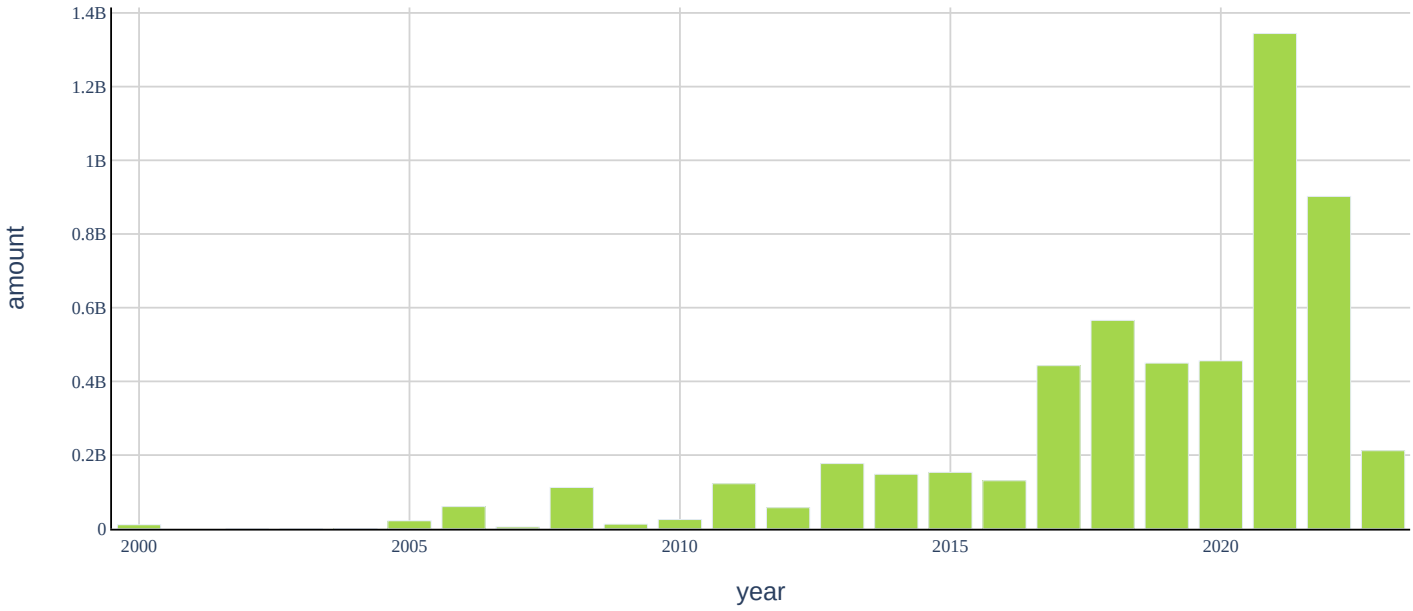
- Wave Life Sciences raised $100.0 million in Post IPO Equity to develop life-changing treatments for devastating diseases using their proprietary discovery and drug development platform. Wave Life Sciences is a clinical-stage genetic medicines company focused on developing best-in class medicines for a broad range of genetically defined diseases using stereo pure oligonucleotides.

- Evozyne raised $81.0 million in a Series B to revolutionize protein design. Evozyne is a biotechnology company focused on unlocking the potential of novel proteins to solve complex challenges through molecular scale protein design.

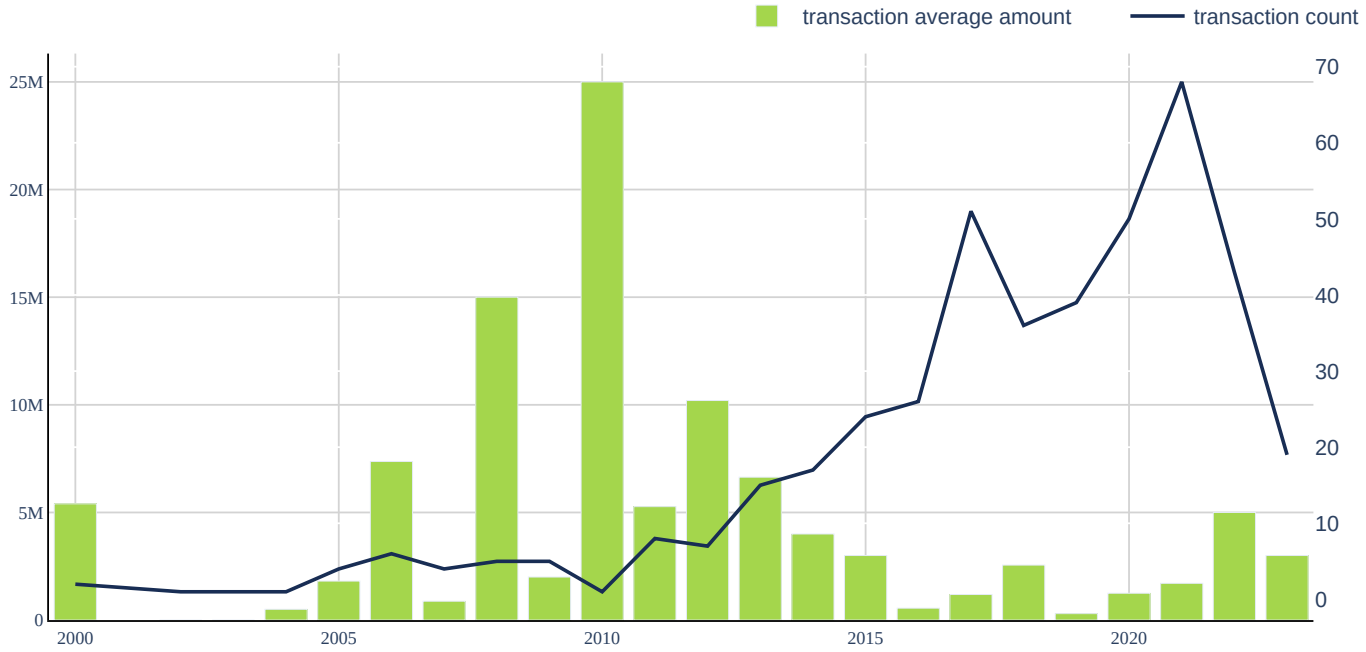
- Cellectis raised $80.0 million in a Post IPO Equity to develop adoptive immunotherapies for cancer. The company develops engineered T-cell products targeting individual cancers, with a focus on CD19 expressing hematologic malignancies.

Agriculture

Total investment in AgTech as of 2023



Count and Average Amount of transactions in AgTech as of 2023



During the fourth quarter of 2023, startups in the AgTech industry secured funding amounting to $70.3 million. This represented a decrease of $-21.4 million (30.5%) from the previous quarter's $91.7 million. In the same period last year, startups raised $268.5 million, reflecting a decrease of $-198.1 million. Year-to-date, AgTech startups have raised $211.8 million, compared to $902.0 million at the same point last year, marking a decrease of $-690.1 million.

Synbio Industry Applications

Agriculture

Top Ten Transactions for Agriculture

Organization	Amount	Series	Investors	QTR
Aphea.Bio	$76,923,000	Series C	Agri Investment Fund and 7 other investors	Q3
Newleaf Symbiotics	$47,006,248	Series D	Gullspang Re:food and 3 other investors	Q4
Cibus	$20,300,000	Post Ipo Equity	None	Q4
Andes	$15,000,000	Series A	Accelr8 and 7 other investors	Q1
BioConsortia	$15,000,000	Series Unknown	Otter Capital	Q2
Brevel	$10,100,000	Seed	EiC Accelerator and Nevateam Partners	Q3
Robigo	$6,850,000	Seed	Aera VC and 4 other investors	Q1
Arcadia Biosciences	$6,000,000	Post Ipo Equity	None	Q1
Yield10 Bioscience	$3,700,000	Post Ipo Equity	None	Q3
NovoNutrients	$3,000,000	Corporate Round	Woodside Energy	Q2

Synbio Industry Applications

Agriculture

- Aphea.Bio raised $76.9 million in a Series C round to develop biopesticides and biostimulants as alternatives to chemical pesticides and promote crop growth through natural microorganisms.

- Newleaf Symbiotics raised $47.0 million in a Series D to develop and commercialize bacteria found in Pink Pigmented Facultative Methylotrophs. The company develops and commercializes bacteria found in Pink Pigmented Facultative Methylotrophs, while also filing related patents and actively developing new technologies in the field.

- Cibus raised $20.3 million in a Post IPO Equity round. The company offers precision gene editing in agriculture to make farming more environmentally friendly, sustainable, and profitable through advanced breeding technologies.

- Andes raised $15.0 million in a Series A to further develop its integrated microbial technology for crop growth. Andes is a company that combines microbial technology and artificial intelligence to develop seeds that help farmers boost agricultural output while reducing costs and environmental impact.

- BioConsortia received a $15.0 million investment in a Series Unknown for developing highly effective microbial consortia for increasing agricultural yields. The company uses an Advanced Microbial Selection process to develop commercial seed treatments, drenches, or granule products that enhance crop traits through plant-microbe interactions.

- Brevel received a $10.1 million Seed investment for their disruptive cultivation technology for sustainable microalgae production. Brevel specializes in developing high-tech indoor, sterile, and fully automated systems that result in significant cost reduction and higher yields for microalgae production, allowing them to enter various markets where microalgae- derived products are in demand.

- Robigo raised $6.8 million in a Seed round to fund their biopesticide technology. The company engineers the plant microbiome to reduce disease in crops.

- Arcadia Biosciences received a $6.0 million investment in Post IPO Equity. The company is an agricultural technology company that focuses on developing products to benefit the environment and human health using advanced screening, breeding, and biotechnology techniques.

- Yield10 Bioscience raised $3.7 million in a Post IPO Equity to develop new technologies for improving crop yield. The company focuses on optimizing the flow of carbon in plants to produce higher yields with lower inputs of land, water, or fertilizer.

Synbio Industry Applications

Agriculture

- NovoNutrients raised $3.0 million in a Corporate Round for their work in converting waste CO2 into proteins and oils for aquaculture. NovoNutrients develops proprietary microbes and gas fermentation systems to create high-value, low-cost proteins and additives for food and feed.

- Eremid Genomic Services raised $3.0 million in a Series Unknown to support its operations. Eremid Genomic Services is a genomics contract research organization.

- AgroSpheres raised $3.0 million in a Series B to further develop their novel technologies for bio-based delivery of active ingredients. AgroSpheres is a company that specializes in encapsulation and delivery technology for crop protection solutions and other industrial applications.

- Pheronym received a $1.0 million grant for creating an all-natural insect control for agriculture. The company utilizes pheromone spray to enhance nematode's effectiveness as an organic insecticide, providing a safer alternative to chemical pesticides.

- Aanika Biosciences raised $0.8 million in a grant to further develop their biosciences technology. Aanika Biosciences is a company that specializes in biosciences technology development and research.

- Ceragen raised $0.2 million in a Grant to further develop its precision microbiome engineering technology for plant growth. The company is a biotechnology pioneer in plant microbiome engineering, providing farmers with tailor-made inoculant products to increase crop yields in controlled environment agriculture, ultimately reducing land usage for food production.

- Roslin Technologies received an undisclosed amount in funding to improve protein production through disruptive technologies. The company specializes in animal stem cells and has developed perpetually self-renewing, pluripotent stem cells for animals to accelerate the development of cultivated meat for the consumer market.

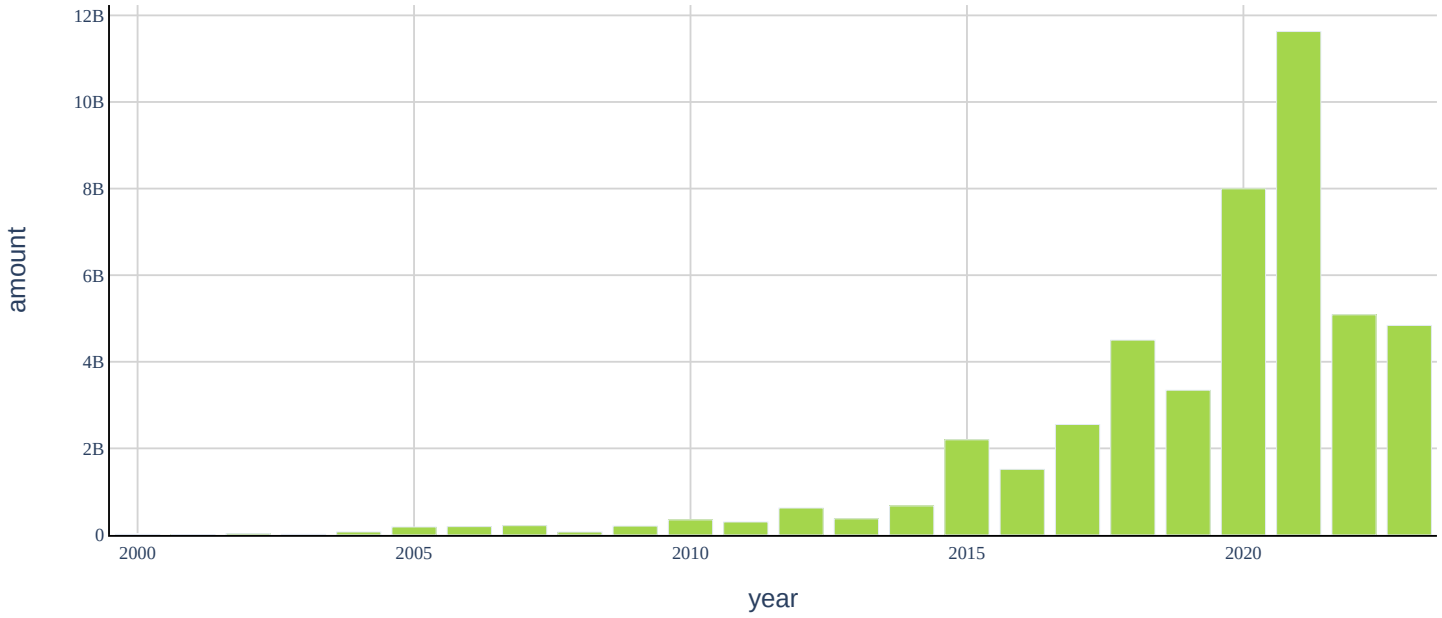
- Haelixa raised funding of an undisclosed amount in a Series Unknown. The company provides in-product traceability solutions for supply chain transparency and integrity.

- CroBio raised an undisclosed sum in a Seed investment round. The company specializes in microbiology and engineering and aims to create environmentally sustainable solutions for managing agricultural drought using genetically engineered root-associated bacteria.

- CroBio raised an undisclosed sum in a Convertible Note for their environmentally sustainable solution to managing global agricultural drought. The company specializes in microbiology and engineering, utilizing genetically engineered root-associated bacteria to improve water retention in crops.

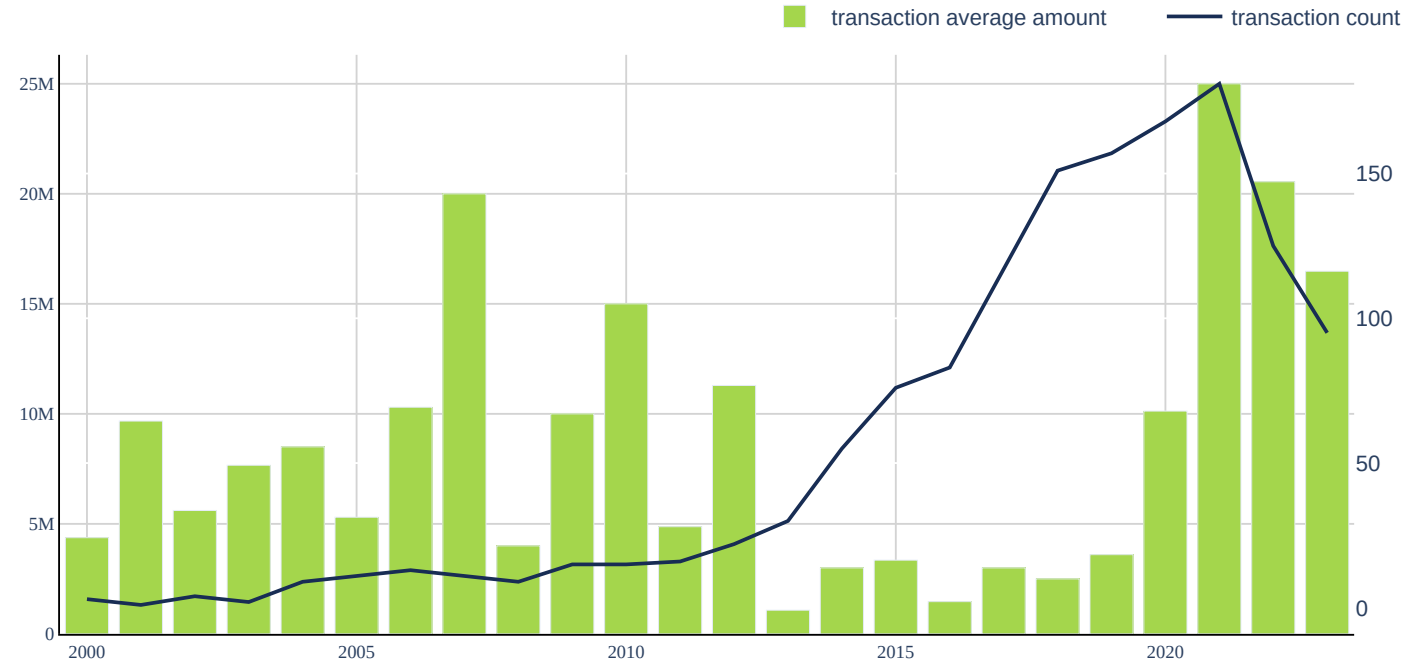
Healthcare and BioPharma

Total investment in Healthcare and BioPharma as of 2023



During the fourth quarter of 2023, startups in the Healthcare and BioPharma sector raised $617.8 million, representing a decrease of $691.6 million (-111.9%) from the previous quarter's $1309.4 million. In the same quarter last year, startups raised $1195.8 million, a decrease of $577.9 million. Year-to-date, Healthcare and BioPharma startups have raised $4838.5 million, compared to $5085.0 million at the same time last year, reflecting a decrease of $246.5 million.

Count and Average Amount of transactions in Healthcare and BioPharma as of 2023



Healthcare and BioPharma

Top Ten Transactions for Healthcare and BioPharma

Organization	Amount	Series	Investors	QTR
AbCellera	$517,827,740	Grant	Government of British Columbia and Government of Canada	Q2
ElevateBio	$401,000,000	Series D	EcoR1 Capital and 16 other investors	Q2
Generate Biomedicines	$273,000,000	Series C	Abu Dhabi Investment Authority and 10 other investors	Q3
Cellares	$255,000,000	Series C	SVC and 6 other investors	Q3
CureVac	$250,000,000	Post Ipo Equity	None	Q1
Inhibrx	$200,000,000	Post Ipo Equity	Perceptive Advisors and 3 other investors	Q3
Asimov	$175,000,000	Series B	Andreessen Horowitz and 6 other investors	Q1
Verve Therapeutics	$143,800,000	Post Ipo Equity	None	Q4
Sutro Biopharma	$140,000,000	Post Ipo Debt	Blackstone Life Sciences	Q2
Editas Medicine	$125,000,000	Post Ipo Equity	None	Q2

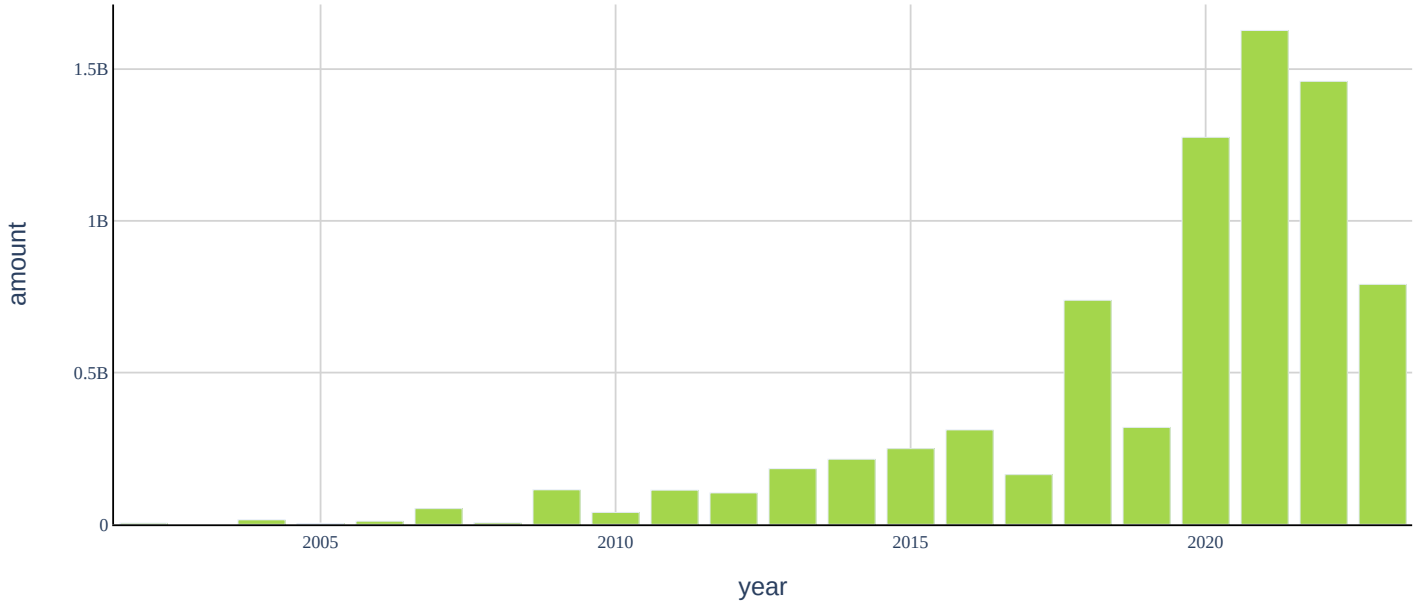
Synbio Industry Applications

Healthcare and BioPharma

- AbCellera received a $517.8 million grant for its antibody discovery and development platform. The company uses its integrated platform to quickly discover and develop optimal clinical candidates for partners in the biotech and pharmaceutical industries.
- ElevateBio received $401.0 million in a Series D investment round to support its portfolio of cell and gene therapy companies. ElevateBio is a company that develops, manufactures, and commercializes life-transforming medicines through partnerships with innovative scientists and inventors in a centralized facility.
- Generate Biomedicines raised $273.0 million in a Series C to further their breakthrough drug development. The company pioneer's generative biology to program protein-based modalities for innovative medicines.
- Cellares raised $255.0 million in a Series C round to further develop their cell shuttle technology. Cellares develops the cell shuttle, an automated and closed end-to-end manufacturing solution that allows for scalable and cost-effective production of cell therapies to make them more widely available to patients in need.
- CureVac received a $250.0 million investment in a Post IPO Equity. CureVac is a clinical- stage biopharmaceutical company that utilizes messenger RNA to develop drugs for a wide range of diseases, including cancer immunotherapies and prophylactic vaccines.
- Inhibrx received $200.0 million in Post IPO Equity. The company is a biotechnology company focused on developing novel biologic therapeutic candidates, utilizing diverse methods of protein engineering to address complex target and disease biology in areas such as oncology, orphan diseases, and infectious diseases.
- Asimov raised $175.0 million in a Series B for creating tools for programming living cells. The company integrates mammalian synthetic biology, computer-aided design, and machine learning to advance the design and manufacture of biologics and gene therapies.
- Verve Therapeutics raised $143.8 million in a Post IPO Equity to further develop its genetic medicines for cardiovascular disease. The company specializes in transforming treatment for cardiovascular disease from chronic management to single-course gene editing medicines.
- Sutro Biopharma received $140.0 million in Post IPO Debt. The company is a clinical stage drug discovery, development, and manufacturing company specializing in next-generation protein therapeutics for cancer and autoimmune disorders.
- Editas Medicine received a $125.0 million investment in Post IPO Equity. The company is focused on discovering and developing genome editing therapeutics to treat a broad range of diseases at the genetic level.

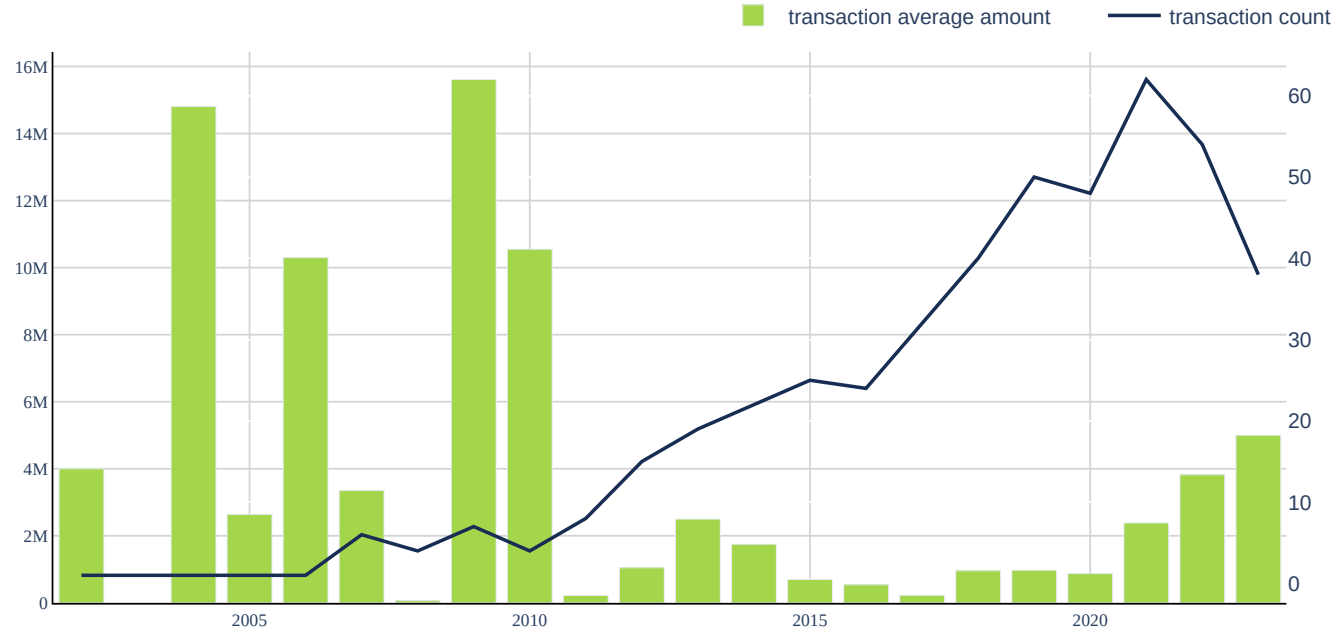
Chemicals and Materials

Total investment in Chemicals and Materials as of 2023



During the fourth quarter of 2023, startups in the Chemicals and Materials industry raised $62.6 million, representing a decrease of $92.9 million (148.3%) from the previous quarter's $155.5 million. In the same period last year, startups raised $743.7 million, reflecting a decrease of $681.1 million. Year-to-date, Chemicals and Materials startups have raised $790.7 million, compared to $1459.6 million at this point last year, a decrease of $668.9 million.

Count and Average Amount of transactions in Chemicals and Materials as of 2023



Chemicals and Materials

Top Ten Transactions for Chemicals and Materials

Organization	Amount	Series	Investors	QTR
LanzaTech	$185,000,000	Post Ipo Equity	ArcelorMittal and 9 other investors	Q1
Asimov	$175,000,000	Series B	Andreessen Horowitz and 6 other investors	Q1
Newlight Technologies	$125,000,000	Series Unknown	Charter Next Generation and 2 other investors	Q3
Checkers pot	$55,000,000	Series C	ArrowMark Partners and Cox Enterprises	Q1
Woodoo	$31,000,000	Series Unknown	Alexandre Yazdi and 4 other investors	Q2
Ecovative Design	$30,000,000	Series E	Alpha Impact Investment Management Partners and 3 other investors	Q2
Allonnia	$30,000,000	Series A	Battelle and 7 other investors	Q3
AMSilk	$27,252,500	Series C	Athos Group and 3 other investors	Q2
Cambium	$19,000,000	Series A	8VC and 7 other investors	Q4
Pili	$15,800,000	Series A	Bpifrance and 4 other investors	Q1

Synbio Industry Applications

Chemicals and Materials

- LanzaTech received $185.0 million in Post IPO Equity. The company recycles carbon from industrial off-gases and biomass resources to reduce emissions and create products for a circular carbon economy.

- Asimov raised $175.0 million in a Series B for creating tools for programming living cells. The company's multidisciplinary team integrates mammalian synthetic biology, computer-aided design, and machine learning to advance the design and manufacture of biologics and gene therapies.

- Newlight Technologies raised $125.0 million in funding to further develop its biotechnology for sustainable materials. The company produces aircarbon to replace oil-based plastics and reduce carbon emissions on a global scale.

- Checkerspot raised $55.0 million in a Series C to continue developing sustainable materials through biotechnology. The company designs high-performance materials at a molecular level to expand the range of building blocks available for sustainable products.

- Woodoo raised $31.0 million in a Series Unknown to develop patented materials combining synthetic biology and organic chemistry. The company transforms native wood into innovative, tactile, translucent HMI interfaces for connected car interiors, revolutionizing passenger experience.

- Ecovative Design received $30.0 million in a Series E investment round, and the company creates eco-friendly materials using mycelium as a resin to replace unsustainable plastics and foams.

- Allonnia raised $30.0 million in a Series A to further develop its bioremediation technology for waste management. The company specializes in using bioremediation techniques to manage waste effectively.

- AMSilk raised $27.3 million in a Series C to expand their production of silk biopolymers. The company produces and distributes silk biopolymers for use in textiles, medical devices, and cosmetics.

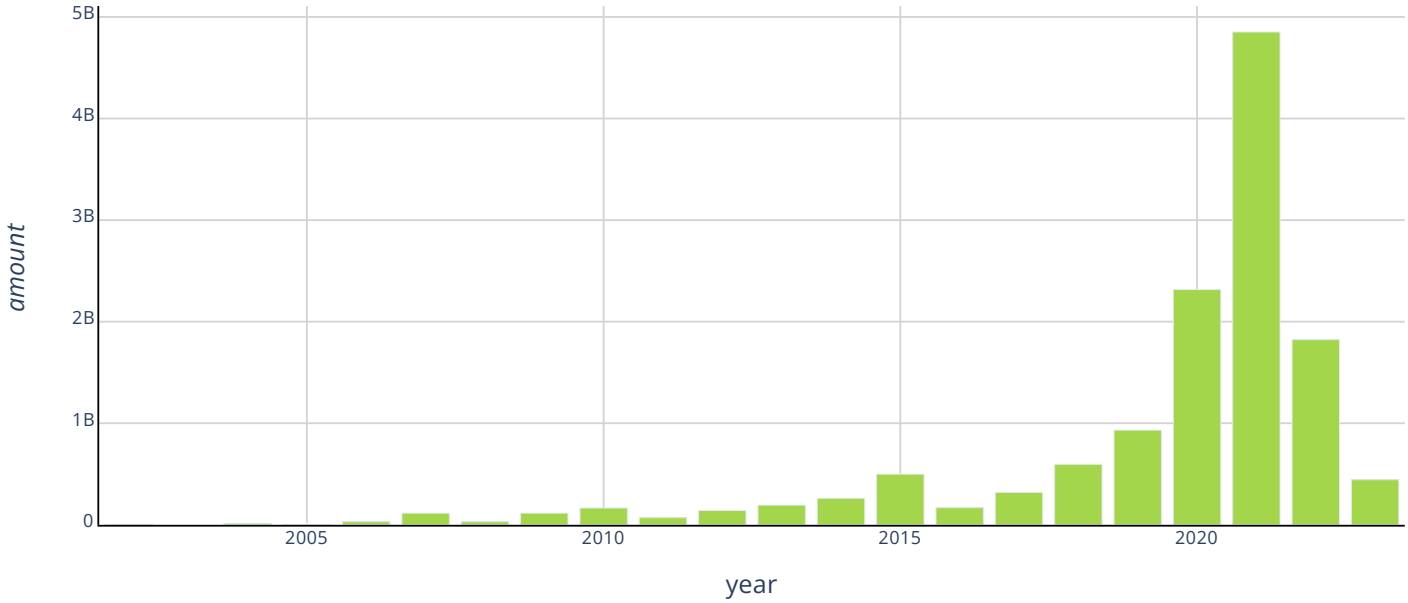
- Cambium raised $19.0 million in a Series A to further develop their biomaterials for various industries. The company specializes in developing advanced materials through a combination of synthetic biology, materials science, computation, and automation to improve product performance and sustainability.

- Pili raised $15.8 million in a Series A to further develop their sustainable biofabricated inks. The company biofabricates renewable inks using microorganisms as an alternative to toxic, non-biological, and non-recyclable versions.

Synbio Industry Applications

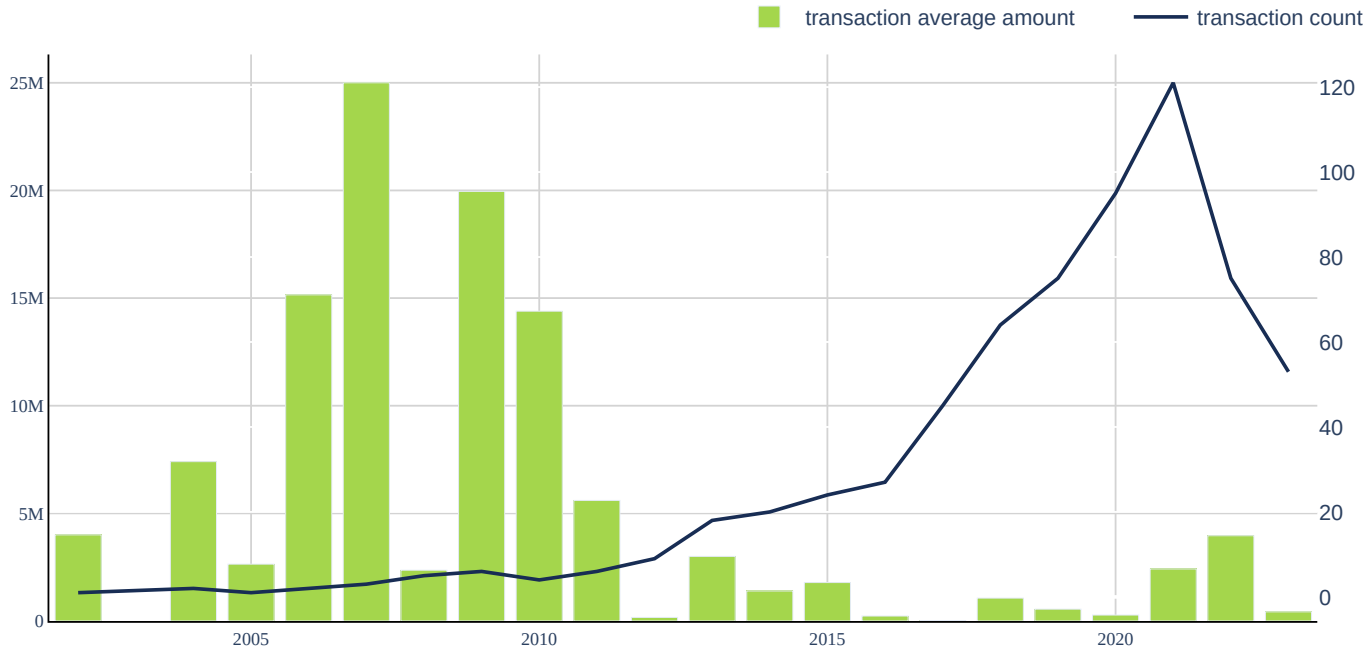
Food and Nutrition

Total investment in Food and Nutrition as of 2023



During the fourth quarter of 2023, startups in the Food and Nutrition industry raised a total of $57.2 million, representing a decrease of $41.6 million (72.8%) from the previous quarter's $98.8 million. In the same quarter last year, startups in this sector raised $276.4 million, reflecting a decrease of $219.3 million. Year-to-date, Food and Nutrition startups have raised $443.8 million, compared to $1822.9 million at the same point last year, indicating a decrease of $1379.0 million.

Count and Average Amount of transactions in Food and Nutrition as of 2023



Synbio Industry Applications

Food and Nutrition

Top Ten Transactions for Food and Nutrition

Organization	Amount	Series	Investors	QTR
LanzaTech	$185,000,000	Post Ipo Equity	ArcelorMittal and 9 other investors	Q1
Asimov	$175,000,000	Series B	Andreessen Horowitz and 6 other investors	Q1
Newlight Technologies	$125,000,000	Series Unknown	Charter Next Generation and 2 other investors	Q3
Checkers pot	$55,000,000	Series C	ArrowMark Partners and Cox Enterprises	Q1
Woodoo	$31,000,000	Series Unknown	Alexandre Yazdi and 4 other investors	Q2
Ecovative Design	$30,000,000	Series E	Alpha Impact Investment Management Partners and 3 other investors	Q2
Allonnia	$30,000,000	Series A	Battelle and 7 other investors	Q3
AMSilk	$27,252,500	Series C	Athos Group and 3 other investors	Q2
Cambium	$19,000,000	Series A	8VC and 7 other investors	Q4
Pili	$15,800,000	Series A	Bpifrance and 4 other investors	Q1

Synbio Industry Applications

Food and Nutrition

- Air Protein raised $75.0 million in an private transaction to develop sustainable protein made from thin air. Air Protein, developed by Kiverdi, is a startup that uses a proprietary probiotic process to create protein-enriched food from CO2, which can be used in a variety of meat-free products.

- Moolec Science raised $50.0 million in a Post IPO Equity to fund its growth and expansion. The company specializes in developing sustainable and alternative protein sources through molecular farming techniques.

- ENOUGH received $43.6 million in a Series C to further develop its technology for producing protein through fermenting fungi. ENOUGH is a foodtech startup that produces protein through fermenting fungi using renewable feedstocks, with a focus on integrating production within existing bio-refinery operations.

- Meatable raised $34.1 million in a Series B to revolutionize the meat industry with their cell-based meat production. Meatable is a Dutch food production company that produces real and guilt-free meat while aiming to satisfy the world's appetite for meat without harming people, animals, and the planet.

- BlueNalu raised $33.5 million in a Series B to support its mission of providing sustainable and humane seafood through cellular aquaculture. BlueNalu is a company that produces seafood products using cellular aquaculture to offer consumers a fresh, sustainable, and humane alternative to traditional fishing practices.

- Prime Roots raised $30.0 million in a Series B to further develop their plant-based meat and seafood alternatives using natural koji proteins. Prime Roots is a company that produces plant-based food products as meat and seafood alternatives, reducing carbon-intensive dependency on animals.

- Ela Life Systems raised $24.5 million in a Series A to improve human health and wellness through food. The company is a biotechnology company that focuses on bridging the gap between food, agriculture, and health to improve human health and wellness.

Synbio Industry Applications

Food and Nutrition

- Moolec Science received a $21.0 million investment in post IPO debt financing. Moolec Science is a biotechnology company focused on developing sustainable alternative proteins through a combination of plant and cell-based technologies.

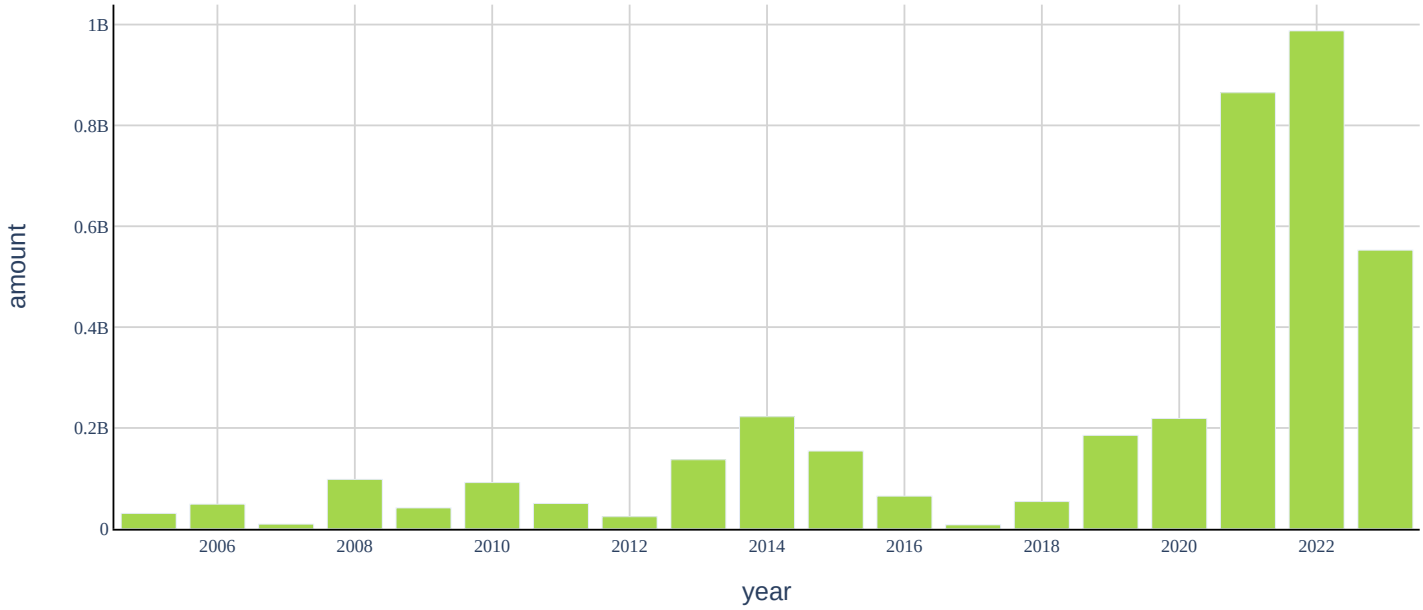
- Rebellyous Foods raised $20.3 million in a Series B to advance their goal of making plant- based meat more affordable. The company specializes in food manufacturing technology and production, focusing on creating low-cost plant-based meat products at high volumes through innovative manufacturing processes and equipment.

- Bluu Seafood raised $17.5 million in a Series A to further develop their fish cell-based seafood products. The company specializes in producing healthier and more sustainable seafood products made from fish cells.

Synbio Industry Applications

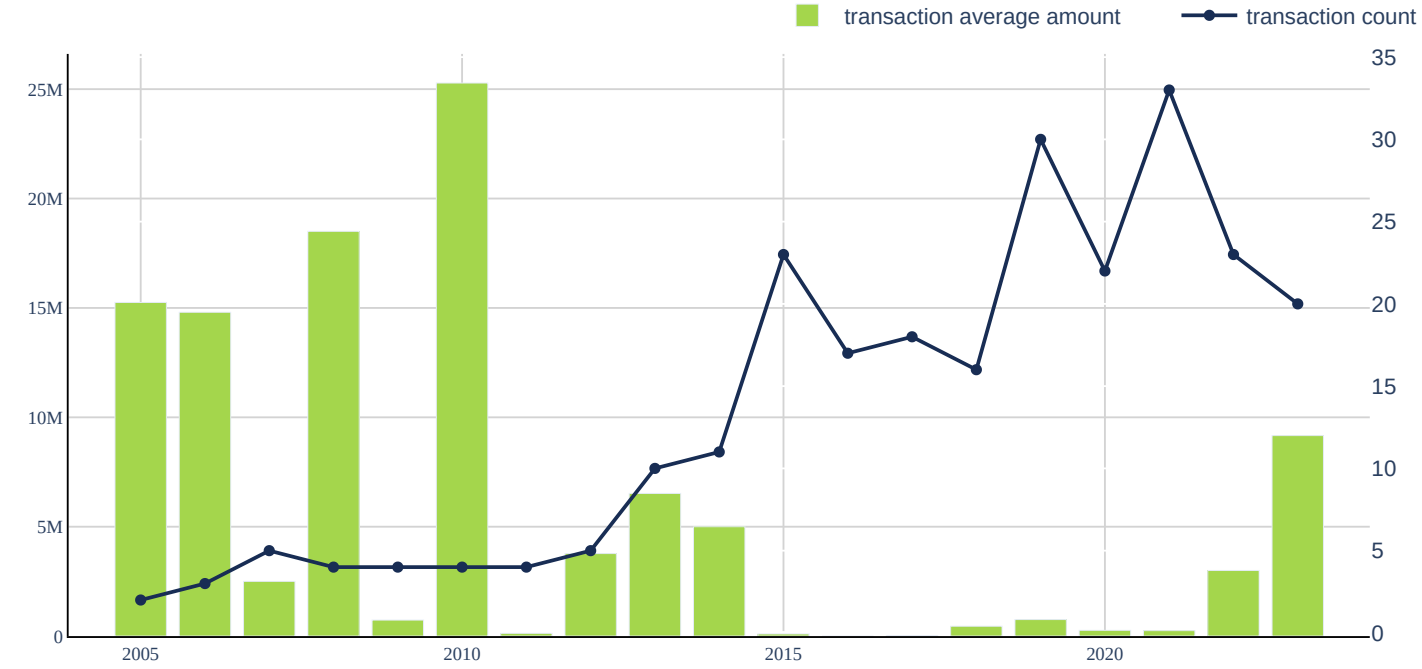
Energy and Environment

Total investment in Energy and Environment as of 2023



During the fourth quarter of 2023, startups in the Energy and Environment sector raised $35.2 million, marking a decrease of $214.7 million (609.6%) from the previous quarter's total of $249.9 million. In the same quarter last year, startups in this sector raised $752.1 million, reflecting a decrease of $716.9 million. Year-to-date, Energy and Environment startups have raised $552.6 million, compared to $987.5 million at this point last year, representing a decrease of $434.9 million.

Count and Average Amount of transactions in Energy and Environment as of 2023



synbiobeta

Synbio Industry Applications

Energy and Environment

Top Ten Transactions for Energy and Environment

Organization	Amount	Series	Investors	QTR
LanzaTech	$185,000,000	Post Ipo Equity	ArcelorMittal and 9 other investors	Q1
Newlight Technologies	$125,000,000	Series Unknown	Charter Next Generation and 2 other investors	Q3
Evozyne	$81,000,000	Series B	Fidelity and 4 other investors	Q3
Allonnia	$30,000,000	Series A	Battelle and 7 other investors	Q3
Viridos	$25,000,000	Series A	Breakthrough Energy Ventures and Chevron	Q1
Carbo Culture	$18,000,000	Series A	GenZero and 3 other investors	Q4
Pluton Biosciences	$16,500,000	Series A	Fall Line Capital and 7 other investors	Q2
Pili	$15,800,000	Series A	Bpifrance and 4 other investors	Q1
Puraffinity	$13,900,000	Series A	Acequia Capital (AceCap) and 4 other investors	Q3
Global Bioenergies	$10,329,048	Grant	Bpifrance	Q4

Synbio Industry Applications

Energy and Environment

- LanzaTech received $185.0 million in a Post lpo Equity investment. They are a company that turns global carbon emissions into a feedstock opportunity, reducing global CO2 emissions and potentially displacing 30% of crude oil use.
- Newlight Technologies received $125.0 million in funding. The company produces sustainable materials to replace oil-based plastics by using carbon that would otherwise go into the air.
- Evozyne raised $81.0 million in a Series B round to further its mission of revolutionizing protein design. Evozyne is a biotechnology company based in Chicago that specializes in protein design and molecular scale, aiming to use novel proteins to solve complex human and societal challenges.
- Allonnia received a $30.0 million investment in its Series A round. The company specializes in bioremediation and waste management solutions.
- Viridos received a $25.0 million Series A investment. The company develops and commercializes genomic-driven solutions for global energy and environmental challenges by designing and developing microbes for industrial processes and environmental applications, as well as creating advanced biofuels and harnessing photosynthetic organisms for value-added products.
- Carbo Culture received $18.0 million in a Series A investment round. The company transforms waste biomass into high-quality biochar for agricultural and construction applications, generating renewable energy and carbon credits.
- Pluton Biosciences raised $16.5 million in a Series A to discover miniscule organisms with global impact. The company quickly and inexpensively taps into the diverse world of bacteria, fungi, and viruses to discover next-generation products for various industries.
- Pili raised $15.8 million in a Series A to fund their sustainable biofabricated ink technology. Pili is a company that biofabricates sustainable inks using micro-organisms as an alternative to toxic and non-recyclable versions.
- Puraffinity raised $13.9 million in a Series A to develop sustainable materials for removing pollutants from water. They specialize in precision materials design for water and wastewater treatment, using advanced supramolecular chemistry methods.
- Global Bioenergies received a $10.3 million grant for their process of converting renewable resources into hydrocarbons through fermentation. The company focuses on producing isobutene, propylene, and butadiene for use in fuels, plastics, and other petrochemical products.

About SynBioBeta








SynBioBeta is the premier innovation network for biological engineers, innovators, entrepreneurs, and investors who share a passion for using biology to build a better, more sustainable planet. We provide our community members with personal and professional development support, as well as valuable opportunities for networking, partnership, collaboration, and education.

Every year we host **The Global Synthetic Biology Conference** which showcases the cutting-edge developments in biology that are transforming how we fuel, heal, and feed the world. In addition, we stage a variety of other conferences, thought leader retreats, and local meet-ups throughout the year, in both the United States and around the world.

The **SynBioBeta Digest** is your source for industry news, insightful original content, and updates on all things biotech. Featuring concise, easy-to-understand articles and original content, all designed to keep you abreast of the hottest trends and technologies, as well as interviews with leading entrepreneurs, investors, and industry thought leaders. We're always looking to partner with dynamic organizations, and to strengthen partnerships between academia, industry, and investors. To read the current Digest, or to access previously published versions thereof, please click here.

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