



Xcelerating Life Sciences San Francisco

The AI, Big Data and R&D Boom

An Xconomy
SPECIAL REPORT

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INTRODUCTION

SAN FRANCISCO: IMPLEMENTING THE 'TECH' IN BIOTECH

The fourth Xcelerating 2020 webinar series jumped over to the West Coast and put San Francisco directly in the spotlight. The region has long established itself as a major life sciences hub and is now embracing the area's rich heritage in tech to augment the drug discovery and development process.

Through the use of artificial intelligence and concepts including machine and deep learning, the life sciences sector is seeing unprecedented levels of speed and efficiency in finding new drug candidates and pushing them towards commercialization. Yet integrating the complexity of AI and big data into healthcare still presents problems and challenges whether from a financing point of view or operationally.

Our panelists brought their experience of the sector and the Bay Area to the table, along with tips and case studies, during the three-hour-long event, and this special report showcases some of the highlights along with recent articles from our news website Xconomy.com focused on the San Francisco startup space.

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Thanks for reading,

Dan Stanton
Managing editor of Xconomy

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Data Quantity, Complexity Drives AI Adoption in Drug Discovery & Testing

By Frank Vinulan

The quantity of data about medicines, diseases, and biology is growing. So too, are the number of companies that employ artificial intelligence in drug discovery. Most of the low-hanging fruit in drug research has already been picked, and the industry is clamoring to make sense of the new data, according to Jeffrey Lu, CEO and co-founder of Engine Biosciences.

"There's only one way to do that – use machines to process the complexity," Lu said.

Lu was one of the speakers featured during Xconomy's recent Xcelerating Life Sciences San Francisco event. His startup's technology platform uses AI to uncover gene interactions underlying diseases. The company also uses AI to test therapies that target these interactions, an approach it contends is faster, less expensive, and more precise than conventional drug discovery techniques. The company is discovering drugs for its own internal R&D, as well as for the pipelines of its pharmaceutical partners.

AI and machine learning techniques are also finding applications in clinical trials. San Francisco-based startup Unlearn.AI is [developing technology that uses historical clinical trial data to create a virtual version of real patients, called "digital twins."](#) The digital version of a patient predicts what would happen if the patient had received a placebo. This approach is intended to reduce the number of patients

needed to test an experimental drug in a clinical trial, while at the same time increasing its statistical power, according to co-founder and CEO Charles Fisher.

Speaking on the panel, Fisher said that the duration and expense of clinical development cries out for new approaches that will save on both fronts. He added that new technologies can also reduce the risks faced by patient volunteers.

"We really owe it not only to those patient volunteers, but [also] to all of the patients that are waiting for new treatments, to do this more efficiently," Fisher said.

[Atomwise has been applying its AI technology for drug discovery research since 2012.](#) Excitement about AI is driven in part by the potential to address hard to reach drug targets—the notion of drugging the "undruggable," said Abraham Heifets, the startup's CEO and another speaker on the panel. AI is offering a way to unlock biology in ways scientists couldn't do before, he said.

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“We still live in a world of garbage in, garbage out,”

– Abraham Heifets,
CEO, Atomwise

AI technologies are helping the pharmaceutical industry create a billion molecules a month that can be tested in three to six weeks, Heifets said. But those molecules are useful only if scientists have sophisticated, powerful tools to evaluate them. Tied to all these new molecules are vast amounts of data points, which Heifets characterized as both good and bad. Publicly available datasets house an estimated 240 million data points, Heifets said. Of those, 98 percent of them fail quality control filters. But there are still pitfalls to working the millions of quality data points. A mistyped term or a misplaced decimal point is enough to ruin good data.

“We still live in a world of garbage in, garbage out,” Heifets said.

Atomwise puts a great amount of effort into data cleaning and data care. Those efforts ensure that a prediction will be borne out by the experiment, Heifets said. At Unlearn, the heavy regulation of the pharmaceutical industry means that the company’s data processing must be done in a way such that every step can be traced back. Those measures ensure transparency about the data, Fisher said.

The growing use of AI and machine learning in drug research is leading to a blending of technologies, that in turn requires a blending of worker skills. Lu said that a candidate who brings computational biology chops and wet lab experience has less of a learning curve. But that combination isn’t a requirement, and in some cases, a candidate brings particular expertise in one field along with the commitment to learn more.

“We all realize that we have to come together somehow, and that none of them—no single one—is probably bringing that deep kind of experience at this intersection, because it’s generally pretty new,” Lu said. “We have found that there’s a ton of talent that, whether it’s starting within the domain

or coming from the outside. I think increasingly folks from the outside are recognizing that what we’re doing is truly important, and they want to do something really, really meaningful.”

Unlearn.AI does no lab work as its research is entirely software-based. That means the startup’s recruitment leans toward the tech side of the workforce spectrum where workers have experience with AI, machine learning, and software engineering. That focus means Unlearn.AI is recruiting for the same kinds of workers that big tech companies are hiring. Fisher wins them over with the promise of doing machine learning research that’s different than what they would do at a big tech company.

“People are tired of selling ads,” he said. “Instead of selling ads, you can try to create medicines that will help people and I think that’s something that is attractive to a lot of people who have technical backgrounds.”

Heifets said that tech investors and biotech investors are both looking for technologies that improve outcomes, and they’re largely indifferent whether those improvements come from AI, high-throughput screening, or some other approach. “If it works, it works right and so the black box can be opaque,” he said.

The differences come in the comfort level that investors have in evaluating a technology. A biotech investor might know what to look for in a new molecule but not what to ask about an algorithm, Heifets explained. Tech investors could be just the opposite. The convergence of biology with IT is leading to a

“I’ve seen a lot of companies having investors who either have a foot in both worlds or bring in the broader team of investors that represent both sides of the equation,”

– Abraham Heifets,
CEO, Atomwise

blending of competencies at startups, and a mix of investors that spans both tech and biotech.

"I've seen a lot of companies having investors who either have a foot in both worlds or bring in the broader team of investors that represent both sides of the equation," Heifets said.

Fisher said he knows Heifets and Lu because the three companies have investors in common. He estimates that there are a dozen investment firms pumping money into the intersection of tech and biotech and bringing expertise and experience from both fields.

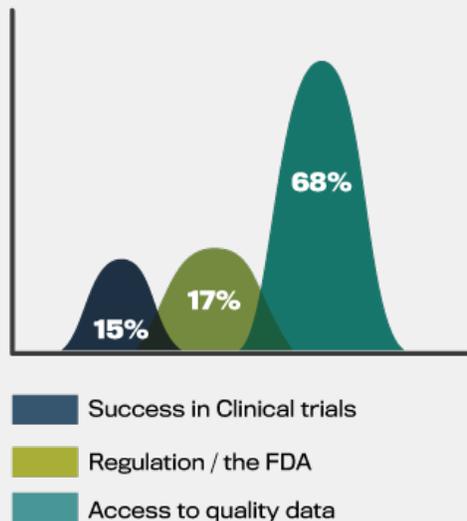
"When we started Unlearn three years ago, that group of investors was smaller, and it has been noticeably growing over the last few years," Fisher said.

ASKING THE INDUSTRY

Outside of drug discovery, what is the best opportunity for AI in the pharmaceutical industry?



As AI finds greater traction in drug discovery work, what do you see as the biggest obstacle to the technology's success?





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The Fine Balance Between Biology and Tech in the San Francisco Startup Scene

An illustration depicting a biotech startup scene. It features several figures in white lab coats and blue scrubs interacting with various elements. One figure is pointing at a large digital screen displaying a DNA helix and a human figure. Another figure is holding a tablet. A third figure is pointing at a screen showing a molecular structure. A fourth figure is holding a red first aid kit. A drone is flying in the upper right corner. The background is filled with hexagonal patterns, some containing icons like a stethoscope, a pill, and a microscope. The overall theme is the integration of biology and technology.

By Dan Stanton

The Bay Area has grown into a unique life sciences hub, perhaps more than anywhere else combining pure science with pure tech to deliver biotech success. But challenges still exist both operationally and financially in bringing these two elements together.

The second panel at Xcelerating Life Sciences San Francisco saw Michael Chui – Partner, McKinsey Global Institute – question the relationship between technology and biology when it comes to building a biotech in the Bay Area. He began by asking about funding, and how investors get their heads around the distinct elements – biology and tech – which have come to characterize the region.

Ashley Zehnder, CEO, Fauna Bio said the problem is finding good hybrid models between tech focused and life sciences focused investors.

“We started raising our seed round toward the end of 2018. And we ended up coming out looking for funding maybe at the end of a large wave of investment, and folks like [digital biology company] [Recursion](#) and [Atomwise](#), and some big companies that are doing a lot in terms of AI and ML and drug discovery. A lot of those tech investors are sort of waiting to see how those investments pan out.”

She added: “The tech firms are a little bit watching and waiting to see where the field is going to go. And I think there's a little bit of work to be done in terms of how you transition companies that really do have a life science, a therapeutic focus and are not say, commercial services software, tech life science company. So a therapeutics focus company is going to have

to eventually transition to more of a biotech investment circle, and try to find a graceful way to hand off companies that maybe were very technology and platform heavy in the beginning in terms of their discovery efforts, and they're transitioning more toward an asset driven therapeutics focus.”

Brandon Allgood, senior vice president of data & AI at Integral Health, has been working in the Bay Area since 2003. “Back in the early 2000s, there was a shift away from the Bay Area towards Boston, and then we kind of saw this wave back into South City that you're still seeing today.”

He added it “kind of goes back and forth, and at this point things have washed back in and South San Francisco is now packed. Forget it, trying to get anything near UCSF or Mission Bay, and rents are through the roof. You see these shifts there, but you also see it in investment.”

Integral Health took investment in 2007, but Allgood said it was hard to find anybody who could understand the messaging between the tech and the biology. “We took investment from a large tech VC and about a year-and-a-half in I realized that maybe we didn't spell it out completely the way we should have in our pitch deck. But now since the AI hype wave hit, I think there's been these new sets of VCs and some of the older VCs sets are rethinking the way the way to do investment.

“ my hope and dream is that the term ‘data science’ dies at some point because all science should be driven by data. ”

– Brandon Allgood,
Senior Vice President of Data
& AI at Integral Health

So we're starting to see now a lot of venture capitalists kind of understanding the message and how to set it up.”

As far as business models go, he said firms are now dividing the tech and the assets. “You have one C corp, which is the technology and then you spin out your assets into individual C corps and get more traditional biotech investment in those and that seems to be a way in which you can keep your tech platform from being diluted, and also allow you to continue to work on the technology and the platform without having everything get focused on the clinic.”

Aldo Carrascoso, CEO of InterVenn Biosciences, said that in his experience pitching the idea of glycoproteomics and mass spectrometry in 2016 was difficult given the biases against these areas. Artificial intelligence itself, he said, was a much easier sell but “the core science was actually probably one of the hardest things I've ever had to get venture [funding] for.”

Some venture capital companies, he said, are “very curious about what life science folks are doing. They're seeing the billion-dollar acquisitions, the billion-dollar exits, the billion-dollar partnerships, but then they follow the lead of a larger organization. There are many others that are crossover and very serious, that have said in their LP agreements that ‘we will be focusing not just on our tech, but also life sciences.’ And then, of course, there are the hardcore life sciences [focused funders].”

DUAL ATHLETES

The clash between tech and biology goes beyond the investor, thus Chui asked how important it is to have staffers who are experts on both sides of the conundrum – or “dual sport athletes” – when operating a life sciences firm with a technology focus business.

Allgood said those dual sport athletes are rare. “We're starting to see more of them. But my hope and dream is that the term ‘data science’ dies at some point because all science should be driven by data. The fact that we have the term data scientist means that it's a fill in, and the point is that term and that job title should disappear naturally.”

He continued: “Finding those people with the machine learning and the data science background as well as the deep knowledge in whatever subfield pharmacology, biology, chemistry, clinical etc., is really hard... I would say 50 percent of the effort beyond writing code and doing good science is making sure that you can get those two cultures to begin to talk to each other, to have a common dialogue, to make sure that they're working hand in hand. It's often sometimes as simple as having a document that people can refer to for definitions.”

Zehnder agreed, adding that it is extremely hard to find people who stretch across the two disciplines. “I think you end up with the problem of a jack-of-all trades problem. Do you really want people that claim they're experts in both of those things? Or do you want people that really understand biology and really understand computation, and then build a way for those people to interact?”

“ Finding those people with the machine learning and the data science background as well as the deep knowledge in whatever subfield pharmacology, biology, chemistry, clinical etc., is really hard ”

– Brandon Allgood,
Senior Vice President of Data
& AI at Integral Health

WHAT MAKES SAN FRANCISCO SO SPECIAL?

RAFAEL ROSENGARTEN, CEO, Genialis, has moved back and forth from the Bay Area as his career progressed. Around 10 years ago, he returned to the region to grow his firm, Genialis, a data science and drug discovery company that uses computational biology and AI-based methods to treat disease. A driving factor in his return to San Francisco was access to capital, “but also access to the kind of interdisciplinary talent that you need to do the kind of work that all of us on this panel try to do,” he explained.

The difference in coming back to the Bay Area this time, he said, is the tech has gotten more advanced with AI and machine learning taking a more center-space in drug development. “The data are bigger, the algorithms are mature, and I think there’s a real belief among practitioners and spectators alike that we can really move the needle this time.”

BRANDON ALLGOOD, SVP of Data & AI, Integral Health, also spoke of the people in the region. “The Bay Area has always been fairly dynamic. One of the really interesting things is you can go anywhere in the Bay Area and have very interesting interactions. Boston is kind of the same way but San Francisco and the Bay Area, I think, got even more diversity here. I’m a big motorcycle rider and I’m often up at *Alice’s Cafe* and I’ve had two BD deals start as someone overhearing my conversation with someone else up at *Alice’s Cafe*. That kind of environment I’ve not seen

in other places. I was talking about machine learning, I didn’t mention anything about biotech and someone next to me goes ‘hey, I’m starting this lipidomics company, I’ve got some data, we should talk.’ That doesn’t happen in other places.”

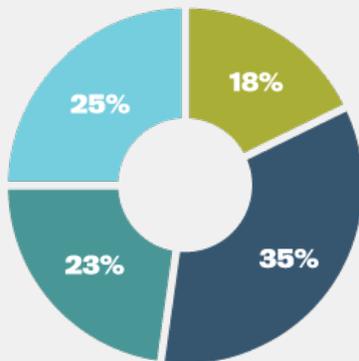
ALDO CARRASCOSO is CEO of InterVenn Biosciences, a biotech with an AI-driven mass spectrometry platform located in the Bay Area but with locations in the Philippines, Malaysia, and Australia. “Our entire data science, artificial intelligence and computational biology team is really based here, but our entire software team is actually based in the Philippines.”

Speaking from his South San Francisco laboratory, he said “there is a tremendous amount of next-generation biostatisticians, computation biologists, even just pure scientists coming up from the Bay Area. What we’ve really done over the past couple of years is to disseminate that around the world.”

ASHLEY ZEHNDER, CEO, Fauna Bio, originally came to the Bay Area for her PhD. When setting up Fauna Bio – a biotech that identifies genes in animals that are responsible for disease protection while having strong connections to related human genes in order to pinpoint genetic targets with large effects on human disease – she thought about relocating somewhere outside the Bay Area but changed her mind due to the region’s talent.

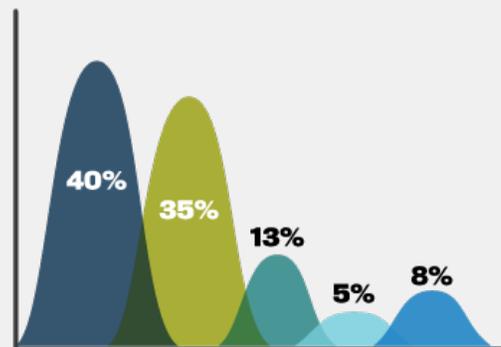
ASKING THE INDUSTRY

Digital tools are a part of the fabric of the current crop of biotech startups. In what area do you see technological advances making the biggest difference in the life sciences industry?



- Medical Devices
- Drug Discovery
- Drug Development / Clinical Trials
- Diagnostics

Both the tech and life sciences industries have poor track records when it comes to diversity and inclusion. What’s most likely to make a near-term difference?



- Rethinking recruitment and hiring processes
- Incorporation of inclusion strategies
- Executive-level leadership speaking-out
- Establishment and tracking DI metrics
- None of the above

MAKING THE LEAP FROM LAB TO CLINIC

Cell and gene therapies hold tremendous potential to advance patient care – but developing these therapies is complex and arduous. In a new whitepaper, cell and gene therapy experts across Medpace’s medical, operational, and regulatory groups come together to give insights from past trials. With extensive and recent hands-on experience, this team shares important lessons-learned and best practices that can help pave the way for future development.



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Code for Cures: Life Sciences Thrives on San Francisco's Software Heritage

By Sarah de Crescenzo

A growing population of people with software experience plus an interest in life sciences is boosting drug development in the San Francisco Bay Area.

Innovation in the San Francisco Bay Area may first bring to mind tech behemoths like Facebook and Google. But some drug development companies in the region say its openness to new ideas and the combination of software experience and life sciences expertise are boosting their prospects.

"For us inside the company, having that kind of 'wet' and 'dry' – what Daphne Koller, our founder and CEO, calls that 'bilingual' – perspective is critically important," said Mary Rozenman, chief financial officer and chief business officer at South San Francisco drug discovery and development company Insitro. "We find that many people who are attracted to the company, if they're on the computational side, they're really excited to learn about biology. They don't want to code for clicks, they want to code for cures, as we sometimes say."

Rozenman was among the executives who shared their insights during an Xconomy panel held online June 25 as part of the Xcelerating Life Sciences San Francisco event.

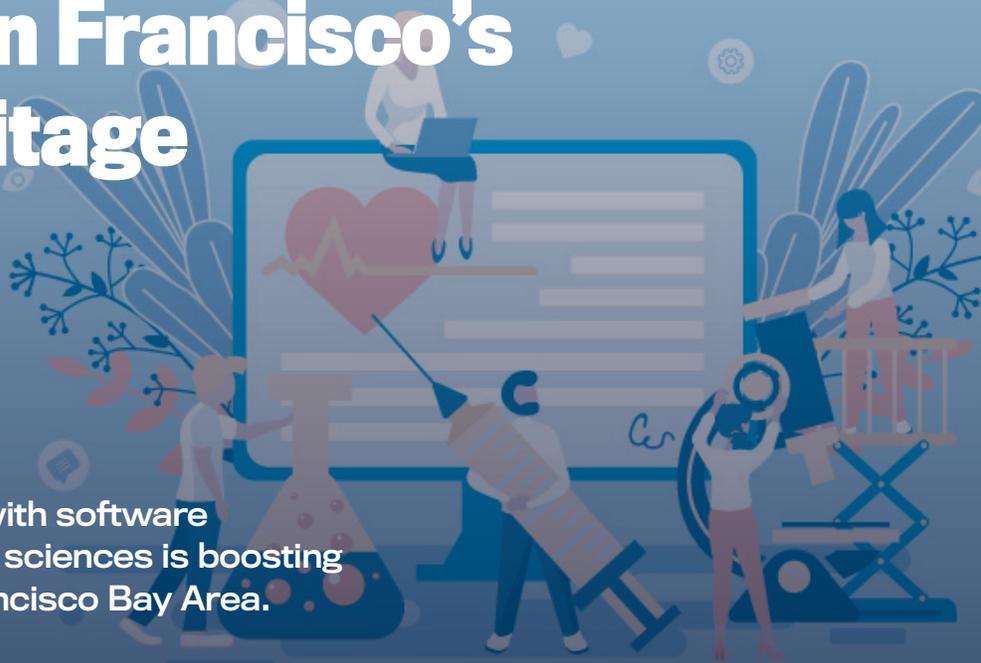
Andrew Radin, co-founder and CEO of TwoXAR Pharmaceuticals, which deploys artificial intelligence tools to speed up the discovery and development of small molecules, said finding those "bilingual" people is essential during fundraising as well as hiring.

"When we were starting the company, in the very early days, before we had clinical evidence and certainly before we had the therapeutic programs we have today, what we had was computational methods and computational evidence we were on to something," he said. "Part, I think, of getting momentum started behind the company was finding people who understood that and understood it well. ... We've got these tech crossover [venture capitalists] who have deep expertise in computational methodologies and can sort of understand some of the rationale behind the methodologies that can lead to advancements, in our case, in drug discovery and development."

Radin also suggested that cultural acceptance of out-of-the-box ideas, compared to some other cities with big life sciences communities, made TwoXAR's launch more likely to find success in the Bay Area than elsewhere.

"I think here in the Valley crazy ideas are kind of romanticized ... and because of that you have a better opportunity for trying out very unique approaches that in other locations is more of a challenge to get some momentum behind," he said.

While the Bay Area's expansive geography can make it trickier to meet others in the entrepreneurial and investment communities than in smaller metro areas, Rozenman said it clearly **hasn't**



stifled the formation of the connections needed to create and launch innovative companies.

"Here things are definitely a little more spread out, but I think community and networks and relationships are still incredibly powerful," she said. "I think we have a wonderful community in the Bay Area of entrepreneurs and investors who accompany executives at various stages, a lot of whom know each other, and there's a lot of connectivity that happens, and a lot of trust and a lot of people kind of following each other's activities and supporting each other in different ways."

Michael Henderson, chief business officer at Palo Alto, CA-based BridgeBio Pharma, says the region attracts people who thrive in its "coming together of a lot of different worlds" and merging of different industries.

"You go to those cafes in Boston and everyone's writing term sheets on napkins, but they're all for the same platform and the same ideas ... dueling VCs with different platform ideas going after similar technologies, whereas here I feel like there's so many unique twists and takes off of innovation that is just fueled by the different worlds coming together," he said. "What I like as well is that ... you can always learn about someone new and then go forge new partnerships in the Bay Area when you least expect it, which is nice."

For Radin, the range of types of companies doing innovative work in their respective sectors is another facet that contributes to the region's level of entrepreneurial activity and success.

"We have Tesla, this amazing automotive company here ... the titans of large consumer internet companies, some exciting life sciences companies as well, and I think part of what makes your community work and your social interactions is there's a lot of synergies to be had from those different sort of technology applications here, and I think that does give us a very unique perspective," he said.

Biocom CEO Joe Panetta, who emceed the panel, said after the San Diego-based industry group opened an office in the Bay Area it began hosting events to which it invited people from both the tech and life sciences sectors, who found common ground notwithstanding their disparate professional backgrounds.

"It's been amazing, once the conversations get going, how we almost have to turn the lights off ourselves in the restaurant at 10 p.m. at night to get people to go home because one thing leads to the next and we find out that there really is this amazing connectivity," he said.

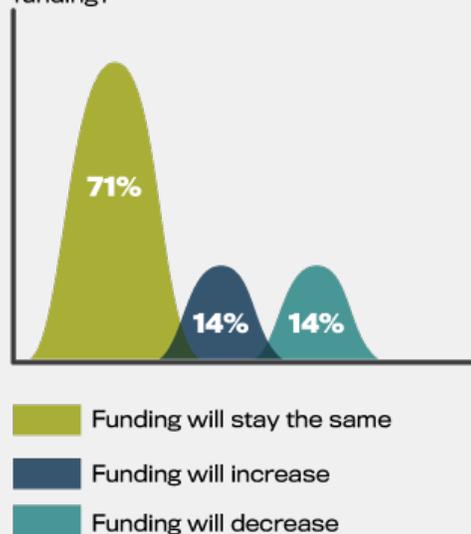
When it comes to finding backers for companies that combine the Bay Area's tech know-how and its life sciences efforts, Rozenman said investors once considered pure tech financiers have added industry experts with extensive scientific knowledge to facilitate the evaluation of such opportunities.

"Even the tech groups that we have around the table, specifically Andreessen Horowitz, who are represented on our board by Vijay Pande, and Google Ventures, where Krishna Yeshwant has been a board observer from the beginning ... those are, I guess, to some extent, tech-type groups, but it's actually Andreessen Horowitz's Bio Fund, and Vijay Pande is one of the world's experts on the application of [machine learning] to problems in biology, and Krishna Yeshwant is an extremely experienced and completely brilliant therapeutics investor, despite being at GV, which is part of Google," she said.

"So for us, having that clarity that we are a drug discovery and development company and making sure that everybody who's investing in Insitro understands the risk profile and the timelines that are associated with that kind of enterprise has been critical."

ASKING THE INDUSTRY

How do you anticipate the recent increase in remote working, which has promoted some people to consider moving out of cities with a high cost of living, will impact the total level of funding?



Insitro Adds \$143M to Fuel Machine Learning-Driven Drug Development

By Sarah de Crescenzo

(first published in Xconomy on 26 May 2020)

A stem cell biologist, a gene editing expert, and a data engineer walk into a room...and that's just a few of the people Daphne Koller has recruited in the past two years to Insitro. The South San Francisco-based startup has grand plans to reevaluate and, potentially, reinvent the drug discovery and development process using the latest tools in the cell biology, bioengineering, and data science armamentariums.

On Tuesday the company announced a syndicate of investors added \$143 million to its coffers in a Series B financing led by Andreessen Horowitz (a16z). Those funds more than double the total the company previously raised to fuel its ambitious plans: Its Series A financing was upwards of \$100 million.

Koller, its CEO and founder, was an “n of 1” back in May 2018, when the company launched. Since then, bringing together the right group of people with the various areas of expertise needed to create a platform that combines leading-edge technologies at production scale has been a “major focus” for the former Stanford University professor, longtime machine learning researcher, and entrepreneur.

“They each bring their own unique perspective into what we’re doing because of the breadth of the goal that we have,” she said in an interview. “What I’ve found is that they don’t just come up with better solutions; they do, in fact, come up with problems that are not the ones you would have thought about, and it’s really been an incredible well of creativity for what the company does.”

The Insitro team now totals about 65 people, including Ajamete Kaykas, who formerly led an early target discovery team focused on neuroscience at Novartis, as chief technology officer; Mary Rozenman, previously senior vice president of corporate development and strategy at Aimmune Therapeutics, as chief business and financial officer; and Serafim Batzoglou, most recently vice president of applied and computational biology at Illumina, as chief data officer.

By year’s end Koller says more hires are slated to bring the Insitro workforce to about 95. (The company’s name is a mashup of *in vitro* and *in silico*, referencing, respectively, the biological experiments done in the lab and those done on computers.)

Today the company, in response to the engineering challenge it has set for itself of creating the right amount and quality of biological data to feed robust predictive disease models at scale, is finalizing what Koller describes as version 1.0 of its technology platform.

“We’re starting to look at how we can take even the capabilities that we have and build some of those disease model systems for a certain category of diseases so that we can start to identify targets that we believe in,” she said. “We already have some of those, but it’s very early stage, and we don’t yet have the confidence or the conviction to start turning those into drugs, [but] that’s something we’ll be considering over the next few months.”

Koller says she is being careful to focus on therapeutic areas where—for the time being, at least—the tools the company is creating can be most useful.

“We’re very cognizant of the fact that this isn’t a silver bullet that will work for every single disease,” she said. “The ones that our particular approach that we’ve employed so far has been, we think, especially useful for are diseases that have a strong genetic basis, so you can see some level of how the disease burden that comes in from the genetics can align, potentially, with what we see in terms of the outcomes for patients, and where the cellular systems are tractable, because not every cell type can be differentiated from [induced pluripotent stem] cells; and, furthermore, some diseases are so complex and systemic that it might require 30 different cell types working together all in exactly the right way to get something that looks like the disease, and we’re nowhere close to being able to engineer something like that.”

Insitro has focused its initial energies on liver diseases, prompted by [a partnership it struck about a year ago](#) with Gilead Sciences, and disorders of the central nervous system.

These starting points aren’t exactly low-hanging fruit. Just this year companies working on late-stage treatments for the liver condition Gilead and Insitro have teamed up to tackle, nonalcoholic steatohepatitis (NASH), have reported [failures](#) and [delays](#) in their efforts to develop an FDA-approved therapy.

And developing treatments that work in the field of neuroscience has proven [perhaps even more challenging](#), with scientists struggling to understand the relationship between disease and pathophysiology as well as to conduct clinical trials that reach statistical significance given the variable and subjective nature of the endpoints established.

Koller says Insitro’s cellular models may help ameliorate some of those obstacles.

“What is a depressed mouse? What is a mouse with ADHD?” she said. “This is an area where animal models don’t work very well ... There’s a real opportunity to create a different and, hopefully,

more translatable disease model for some of these indications.”

In keeping with its strategy since its launch, Koller says she plans to build Insitro into a company that develops internal drug candidates, rather than one that solely works with biopharmas to advance their programs.

That’s a tall and expensive order, and she says it was essential to find financial backers with a long-term view of what the firm is trying to accomplish.

“There are many investors, especially in this kind of growth phase, who are looking for a quick exit: you make an investment, 12 to 18 months later the company goes public, they achieve liquidity, they sell the stock and they’re happy,” she said. “This is exactly not the kind of investor that we were looking for, and we’re happy to be able to attract a group that is looking for something completely different. They’re looking for investments that might take a longer amount of time, but, hopefully, for a very high reward, because they’re looking to build transformative companies.”

Insitro added some new investors as part of its Series B round, including the Canada Pension Plan Investment Board (CPP Investments), funds and accounts advised by T. Rowe Price Associates, funds managed by BlackRock, Casdin Capital, HOF Capital, WuXi AppTec’s Corporate Venture Fund, and other undisclosed investors. Earlier investors ARCH Venture Partners, Foresite Capital, GV (formerly Google Ventures), Third Rock Ventures, Two Sigma Ventures, and Alexandria Venture Investments also participated in the financing.

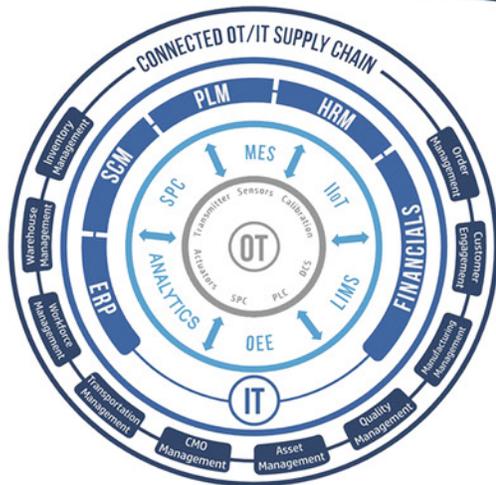
As part of the deal a16z’s Vijay Pande, a general partner and founding investor of the firm’s Bio Fund, joins Insitro’s board of directors.



What is a depressed mouse? What is a mouse with ADHD?” she said. “This is an area where animal models don’t work very well ... There’s a real opportunity to create a different and, hopefully, more translatable disease model for some of these indications. ”

– Daphne Koller,
CEO and founder

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Let me tell you how grateful I am that Jim is part of the JuMP HA project. Things get done and resolved, and I know they are resolved in the best possible manner because I totally trust Jim's expertise and judgement, not to mention his reliability. All in all – we lucked out having Jim!

- Galina, Project Manager



Unlearn Adds \$12M for “Digital Twins” That Accelerate Clinical Trials Milestones of 2019

By Sarah de Crescenzo

(first published in Xconomy on 20 April 2020)

Speeding up and bringing down the cost of clinical trials would be a huge boon to pharma companies and patients alike.

San Francisco-based startup Unlearn.AI says it has developed proprietary technology that may help accomplish just that. On Monday the company announced it raised \$12 million from investors who believe it stands out among the crowded field of tech outfits looking to tap into the huge amount of money spent conducting such studies.

Companies across industries are taking advantage of improvements in machine learning tools and the increasing availability of computational power to analyze huge amounts of data. The process that Unlearn has developed, dubbed DiGenesis, crunches through historical clinical trials datasets and uses that information to create what the company calls refers to as “digital twins”—virtual versions of thousands of real patients.

The term is borrowed from another industry: manufacturing. When building a jet engine, for example, engineers create a virtual representation of the product, too, to optimize its design and enable better performance.

People, of course, are much more complex than planes. But machine learning tools are especially useful in parsing complicated systems and Unlearn has built disease-specific models that generate a control group of patient data by using demographic information and observations of the same variables over time, such as common lab tests and biomarkers, to generate virtual medical records.

This approach to is intended to shrink the number of patients needed to kick off a trial. It also could make it easier to determine whether the drug works. That’s because measuring a drug’s performance is more straightforward the closer the patient serving as a control—the one in the trial given a placebo—is to the patient who receives the treatment.

“The problem is ... I can’t simultaneously give a person a treatment and not give them a treatment,” said Unlearn founder and CEO Charles Fisher in a phone interview. But with digital twins, Unlearn’s pitch proposes, scientists can, to a degree, circumvent that limitation.



Fisher, who launched the company in 2017, was formerly a computational biologist at Pfizer, where he worked to develop machine learning approaches to improve clinical trials. He likened the distinct approach Unlearn has developed to research done by Nvidia, which used a type of neural network—the name for a class of machine learning algorithms modeled after the human brain—to generate endless portraits of fake faces from a huge dataset of real images.

“Most machine learning has been done on images and some on language, but we’re working with medical records,” he said. “We have a generative model that’s trained on previous clinical records, and so then we can generate new clinical records that aren’t exactly the same as any particular person that’s in our database, but which have the same general properties of patients from the control arms of clinical trials.”

Unlearn’s initial focus is on Alzheimer’s disease and multiple sclerosis, neurological indications for which studying potential new treatments is especially expensive and time consuming.

In addition to pharma companies, Unlearn will also have to convince regulators that its approach is effective.

Fisher says the company has had a “lot of good conversations with regulators,” including a Critical Path Innovation Meeting with the FDA in March. The agency [describes such meetings](#) as a “forum for FDA and stakeholders to discuss potential scientific advancements in drug development,” but they are not a substitute for regulatory meetings.

“The best way to get [regulators] on board is to present a lot of data that demonstrates what you’re doing works well,” Fisher said. The money Unlearn has raised will go toward continuing its partnering efforts with pharma companies to generate supporting efficacy data for its approach, he said. Other startups are also in hot pursuit of a cut of the clinical trial enablement market.

[Pasadena, CA-based Deep 6 AI](#) raised \$17 million in December to move ahead its software, which uses advanced algorithms to process patient data with the aim of finding prospective participants who fit the qualification criteria for certain clinical trials.

Unlearn’s Series A round was led by 8VC, a San Francisco-based venture capital firm that closed a \$640 million fund, its second, two years ago. Francisco Gimenez, a principal at 8VC, said in a phone interview that most clinical trial enablement platforms, many of which employ widely available data science tools, aim to make it easier to find the right patients and to streamline enrollment.

But he says Unlearn’s platform could do more—if the company can convince regulators its methodology is sound.

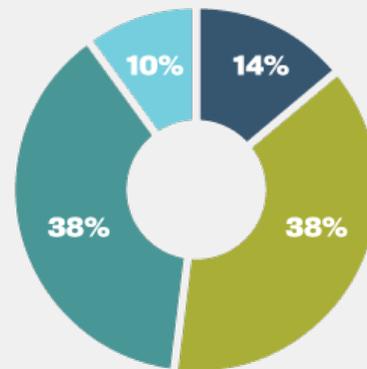
At the end of the day, we could find all the patients we could want, but ... there are a huge amount of human needs and issues with getting someone to join a trial that you can’t AI your way out of,” said Gimenez, who earned a PhD in biomedical informatics at Stanford University.

“In a sense, Unlearn virtually found a way to do that by virtue of allowing people to enter these trials specifically to receive treatment or significantly reduce the possibility of receiving placebo, which is a huge barrier, but also, statistically, because we can have these paired experiments, improve the power dramatically. ... It’s a rare case of having your cake and eating it too, and so that was really exciting [and] a true differentiator to us.”

As part of the deal, Gimenez joins the Unlearn board of directors. The company’s earlier investors, including DCVC, DCVC Bio, and Mubadala Capital Ventures, also participated in the latest financing.

ASKING THE INDUSTRY

What element of infrastructure first adopted by the tech industry is playing the most significant role in reducing the cost and time needed to get a biotech startup off the ground



- Remote / shared work applications
- Co-work / Lab spaces
- Cloud computing
- None of the above

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