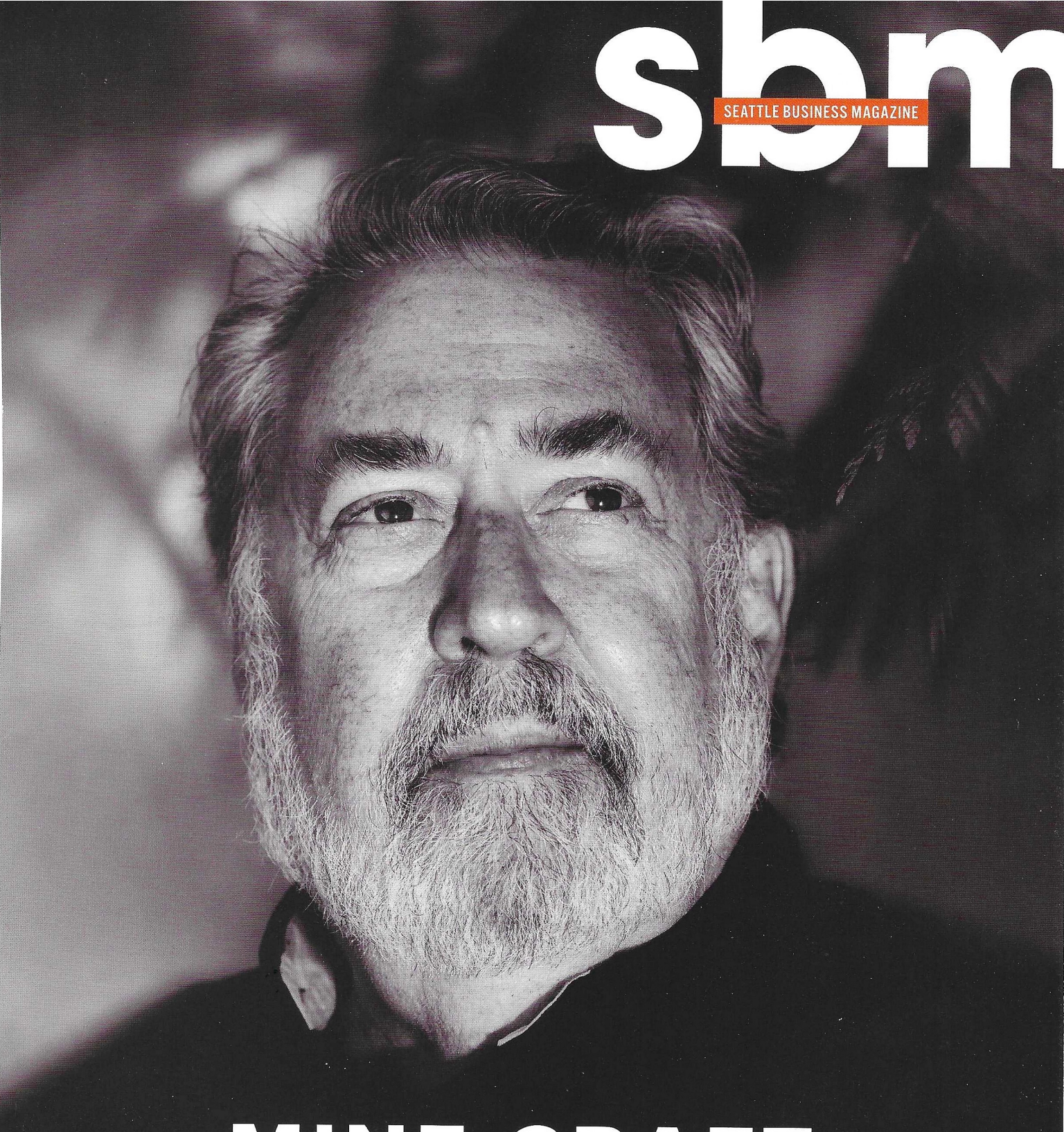
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SEATTLE BUSINESS MAGAZINE



MINE CRAFT

MARK ANDERSON'S PATTERN COMPUTER INC. IS SCOURING BIG DATA TO FIGHT CANCER

PHOTOGRAPH BY IAN ALLEN

SEATTLEBUSINESSMAG.COM

CHAOS TO CURE

PATTERN COMPUTER IS ON THE PRECIPICE OF DISCOVERING NEW TREATMENTS FOR CANCER AND OTHER DISEASES

BY M. SHARON BAKER
ILLUSTRATIONS BY RICHARD HOGG

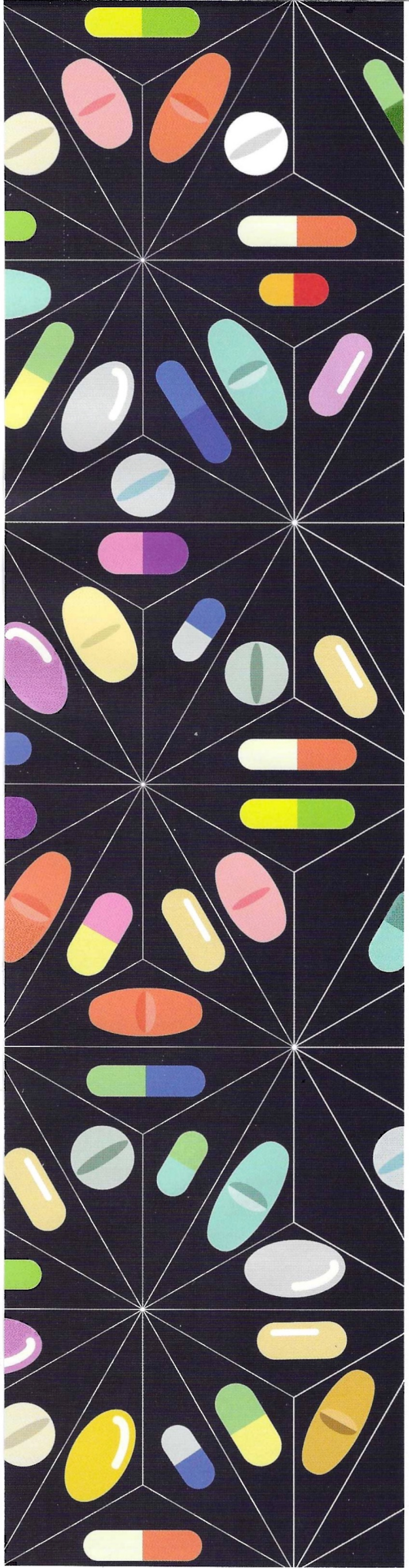


In less than three years, Pattern Computer Inc. (PCI) has discovered a pair of two-drug candidates for triple-negative breast cancer, the hardest cancer to treat. The 5-year-old startup has entered mice trials and is shopping its triple-negative breast cancer discoveries to big pharmaceutical companies, which will conduct human trials and perhaps commercialize Pattern's discoveries.

The Redmond-based company isn't developing its own drugs. It is testing existing drugs through a sophisticated, proprietary "pattern computer" that parses enormous amounts of data looking for patterns to quickly identify new treatments. According to the FDA, "drugs that have not been previously developed ... to be used in combination to treat disease or condition ... are referred to as new investigational drugs."

It traditionally takes at least 10 to 12 years to discover a single new cancer drug and then bring it to market. Pattern Computer's discoveries are impressive because its new drug applications were discovered in only a few years.





"Finding new indications for existing drugs is going to be a big, big thing," says Matthew Trunnell, former CIO at Seattle's Fred Hutchinson Cancer Center. "There are a lot of opportunities to access larger data sets to not just accelerate the discovery process, but to accelerate it in a way that you can take advantage of (drugs) already out there."

Mining medical data to produce meaningful results is difficult. Computing companies attempting to cure cancer using data techniques — most notably IBM's Watson Health — have failed dramatically. Although everyone wants to cure cancer, simply gaining access to medical data is a huge challenge for corporations.

The magnitude of Pattern Computer's work is considerably large. It uses its proprietary computer system on four other cancers as well. In the past two to three years, Pattern Computer has:

- Identified two combo drug candidates for ovarian serous cancer.
- Boosted predictability outcomes of colorectal cancer by 5% using proprietary new math for analyzing clusters with Fred Hutch. More important, the team developed new mathematics for analyzing clusters, resulting in predictability outcomes in select groups of 70%, 80% and 100%.
- Found new and consistent gene correlations on metastatic prostate cancer with Fred Hutch.
- Begun running data to find new diagnostics and treatments for lung cancer. It has already discovered new correlations in gene expressions.

In addition to "Moving the needle on the top five cancer killers nationwide," as cofounder and CEO Mark Anderson likes to say, Pattern Computer seeks FDA approval in five countries on a Covid testing device. It uses spit to diagnose Covid in three seconds or less and has started manufacturing the device. (See related story on page 135.)

Pattern Computer also uses its technology to solve non-health-related problems for clients in aerospace, mining and other industries.

"It will take some time to develop, test and monetize these (cancer discoveries), but I cannot overstate how proud we are to have come this far, this fast," says Anderson, who is also CEO of Friday Harbor-based "Strategic News Service," publisher of a weekly technology newsletter, and host of the Future in Review annual conference, which discusses the intersection of technology and the economy.

Applying the company's new mathematical system to cancer was a chance to solve something big and help others while proving the new system and new math works. PCI isn't a biotech, but a computing firm partnering with other companies in numerous industries that want to make sense of their data. It's not artificial intelligence but uses some of those techniques, Anderson adds, saying its technology is next-generation machine learning

"Health orgs are very risk averse to sharing data even if it's de-identified."

— MATTHEW TRUNNELL, FORMER CIO AT FRED HUTCHINSON CANCER CENTER.

PCI sells "discovery" as a service for a fee and could charge a subscription model for further data runs. It may seek a royalty cut from discoveries in manufacturing, aerospace, medicine and other industry sectors. PCI will not sell its computer system, nor will Anderson reveal its specific components, which the business considers trade secrets. It has filed for several patents.

What Anderson will say is that the

system analyzes and finds new patterns in high dimensional, complex data sets using new mathematical techniques that PCI cofounder Mike Riddle, who 40 years ago cofounded software company Autodesk, and others are pioneering.

The company does not program its system to "recognize" patterns based on a hypothesis or an idea someone dreams up, normally the first step of the scientific method learned in elementary school and practiced by scientists today. Nor does the company train the computer system what to look for, an important distinction.

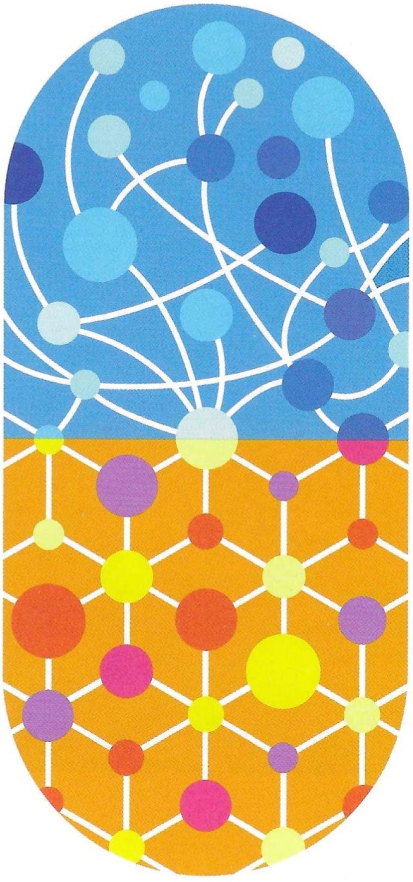
"Thousands of companies are doing pattern recognition," Anderson says. "What we are doing is pattern discovery. When you hear about AI, or biotech AI, 99.5% of the time they are using deep neural networks (simply defined as a series of algorithms that analyze and connect data) to do their job. We use (neural networks) but it's a sidebar for us, not the whole show. There's a huge difference in our tools."

One example: PCI recently revealed the first explainable AI for neural networks.

The company has filed patents on 17 two-drug combinations. It tested its drug candidates in two prominent laboratories with positive results.

Anderson says the company was the 2 millionth team to go through Lawrence Berkeley National Laboratory's public data on triple-negative breast cancer. Instead of discovering just one or two gene expressions, which is common, Pattern's system identified "50 to 100. Instead of one star in the heavens, we saw the whole sky," he adds.

Omid Moghadam, CEO of Namida Lab Inc., is one of PCI's first customers. His Fayetteville, Arkansas, firm is creating affordable diagnostic cancer tests using tears. Running the Pattern Discovery Engine on Namida's data significantly increased the predictive accuracy of its diagnostic test for breast cancer, accelerating its development by several years.



Without Pattern's technology, his team may not have found the links discovered between different data points, and "might have completely missed the relevance of one of those 1,800 markers," Moghadam says. "One of the targets they gave us adds more markers to the assay we have with very good results."

Namida Lab now works with PCI on diagnostic tests for prostate, skin and ovarian cancers. Moghadam, who has joined Pattern's advisory board, predicts PCI could slash years from Namida's research and potentially save it millions of dollars.

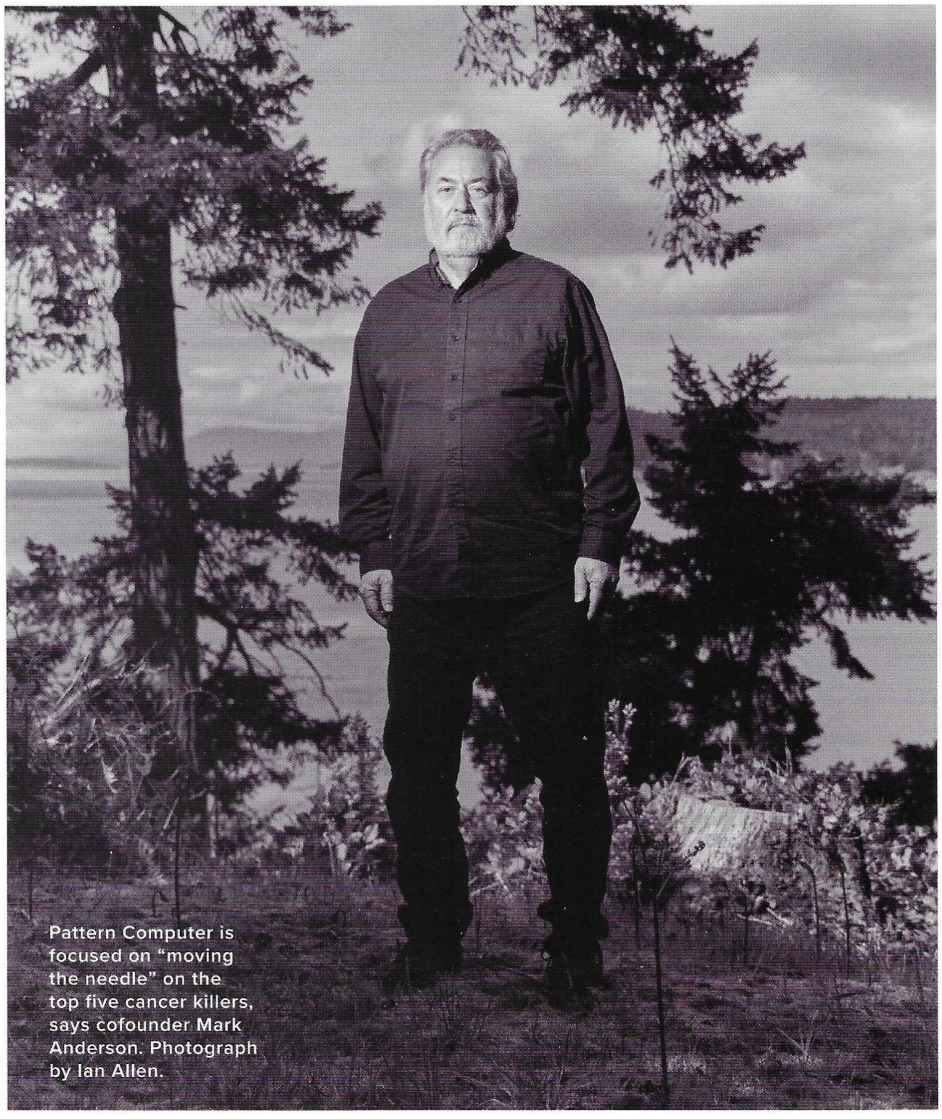
One of PCI's larger challenges will be in gaining access to medical data if it chooses to tackle more cancers. It's a huge problem that Trunnell, the former Fred Hutch CIO who now works to increase data sharing, knows all too well. Recruited to help Fred Hutch build its connections to technology companies in 2015, Trunnell was surprised to learn he was the first Fred Hutch CIO to meet with Microsoft Corp., even though the two were founded at the same time 47 years ago.

"Big data and transformation have been really slow to impact biomedical research and health care," he says. "There are a couple of reasons for that. We actually don't have a lot of data."

To get access to medical data, even for researchers, requires crystal clear requests specifying what you want and what you are going to do with it. Even then, "Health orgs are very risk averse to sharing data even if it's de-identified, and it's not a priority for attorneys," Trunnell says.

Pattern Computer ran into that problem. That's one of the reasons it used publicly available data for its breast cancer work and why it is behind on its goals for working on prostate cancer.

"We went to what's probably the most famous center in America for prostate cancer and they said they aren't talking to corporations at all. Go away," Anderson says. "I couldn't believe it."



Pattern Computer is focused on "moving the needle" on the top five cancer killers, says cofounder Mark Anderson. Photograph by Ian Allen.

Health care data has two access points. "There's the noncommercial, open source, academia world where you are prohibited from using data for commercial purposes, which doesn't help us since we are a business," Anderson says.

The other avenue is through government agencies, universities and other institutions where "you'd think there would be some shared access to data," he says. "But I don't think so. The more money involved, the more people get excited for their own careers. I get that people want to monetize their data, but when it comes to trying to save lives, and in a pandemic, stop it. Don't get greedy."

"Here we are with a system that as fast as we can get the data, we can run it, and as fast as we can run it, we can find treatments."

— PATTERN COMPUTER COFOUNDER MARK ANDERSON

Pattern's revenue last year was about $100,000, a figure Anderson estimates could jump to between $3 million to $5 million this year.

The company has raised $30 million from individual investors, which is nowhere near the billions big pharma companies such as Merck or Abbott Labs spend on a single drug. PCI is not profitable, but investors have pushed the valuation for the latest round underway to $1.2 billion, Anderson says.

PCI has been approached by a number of SPACs (special purpose acquisition companies), he says, but that's not a funding route it is considering.

In addition to Fred Hutch, the Berkeley Lab and Namida Lab, PCI's partners include The University of California (both San Diego and Riverside); California Institute for Telecommunications & Information Technology; Institute for Systems Biology, a Seattle-based nonprofit; and Los Alamos National Laboratory, among others. These partners may help commercialize PCI discoveries.

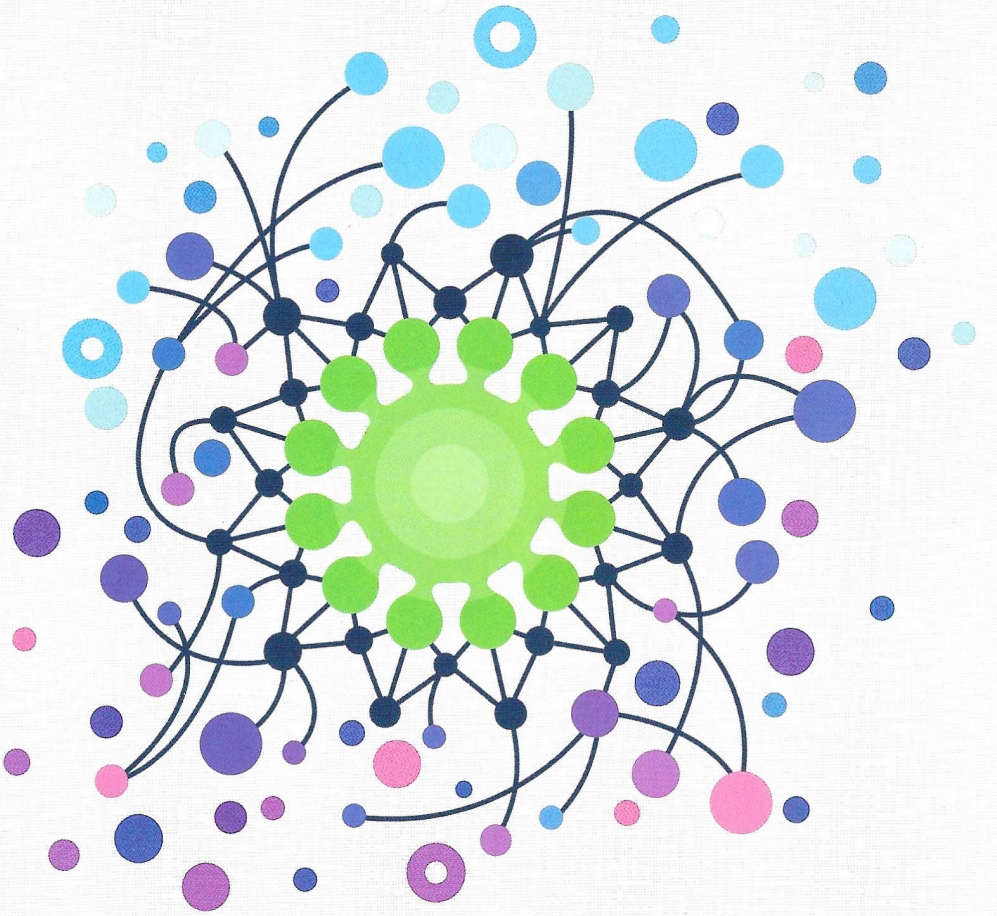
Ultimately, Anderson would like his company to do for knowledge what Elon Musk has done for engineering.

"Here we are with a system that as fast as we can get the data, we can run it," he says. "And as fast as we can run it, we can find treatments. Whoa. Holy moly. Let's go."

PATTERN TAKES ON COVID

COMPANY SAYS RAPID SPIT TEST IS 98.5% ACCURATE

BY M. SHARON BAKER | ILLUSTRATION BY RICHARD HOGG



Startup Pattern Computer Inc. is seeking FDA approval for a rapid Covid testing device that uses two drops of spit to diagnose Covid in a mere three seconds and confirms the virus with 98.5% accuracy. It can also distinguish other viral diseases at a 70% predictive rate.

"We have the world's fastest, most accurate, highest throughput device than anyone in every country in the world," says Mark Anderson, Pattern Computer's chief executive officer. "It will cost the least, probably below $10."

Redmond-based Pattern Computer, or PCI, has signed a production contract with undisclosed partners for the testing device, which it named ProSpectral.

Pattern is also seeking certification for the hardware and simultaneously seeks governmental approval for the device in Australia, Chile, Germany and India, where Anderson says the company is already working with partners and conducting trials.

ProSpectral was designed to make thousands of tests an hour for use in large venues such as airports, schools, stadiums and concerts.

"A Covid test that is very inexpensive, one with good results, is the holy grail," says Omid Moghadam, CEO of Arkansas-based Namida Lab Inc., a diagnostic test maker that pivoted briefly to Covid-19 antibody testing when the pandemic hit. "Imagine if we had something like that when we had travel restrictions. To pay under $10 at an airport? That would be a game changer."

J. Ben Brown, a professor at the University of California, Berkeley and Lawrence Berkeley National Laboratory who is also a PCI consultant, had suggested that Pattern's technology could be potentially useful in infectious disease diagnostics when Covid-19 entered the news in 2020.

PCI partnered with Los Alamos National Labs and Cantor BioConnect for initial data collection and pilot tests. The company designed the device using commercially available subcomponents, combined with the hardware, software and mathematical expertise of its internal team.

PCI focused on a test using saliva since it is readily available, non-invasive and wouldn't require any additional chemical reagents. The only disposable element of the test is a small plastic cuvette and collection aid.

Roughly 400 groups seek FDA approval for Covid testing devices, a market worth billions.

Many of the 20 or so FDA-approved devices on the market are antigen tests that require a nasal swab and take 10 minutes or even a day to return results. Some of the Covid-19 diagnostic tests are authorized only for specific uses, according to the FDA. Only a device designed by engineers at MIT and Harvard University seems to be taking an approach using saliva, but its table-top device takes an hour to detect the virus.

Pattern Computer began work on its device in early 2021. Anderson says it took about six months until its first manufacturable and field-testable prototype was in hand. He hopes the device gains FDA approval soon.

"We are doing more data testing at the request of the FDA regarding confounding agents like cough drops, gum and other diseases," Anderson says. "We have alliance partners and are working in parallel in other countries to go as fast as we can. We'd love to go faster if we could."

"I suspect that in the near future, as we walk through TSA security at an airport, part of the screen will be for infectious diseases," Brown says. "The implications of this technology for public safety and health, especially disease surveillance, are enormous."