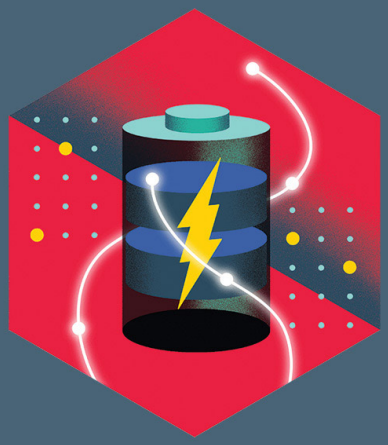
Natron Energy

c&en's 10 START-UPS TO WATCH Class of 2020



C&EN's 2020 10 Start-Ups to Watch

c&en CHEMICAL & ENGINEERING NEWS

By Melody M. Bomgardner | NOVEMBER 15, 2020

Nothing stops these chemistry entrepreneurs from working toward a better future

And while 2020 has felt unlike any other year, the drive of science-based entrepreneurs to bring technologies that benefit people, the environment, and the economy to market hasn't changed.

The start-ups profiled in this package illustrate the breadth of solutions that chemistry-based innovators can deliver. They've found new ways to discover drugs, produce sustainable food and materials, harness quantum computing, and even mimic the human nose.

Readers from around the world helped us find this year's crop of notable start-ups by sending in nominations via our website. We also keep track of all the great new companies we hear about in our day-to-day reporting. After much discussion and debate about more than 200 companies, we selected 10 on the basis of their revolutionary science and the importance of the problems they are working to solve.

It has not been easy for leaders of start-ups to navigate a world turned upside down by the novel coronavirus. The early days of a chemistry or biotech company are spent mainly in the lab, where space is often tight. Will Patrick, CEO of California-based Culture Biosciences, says his firm shuttered operations at the end of March and slowly reopened, with staggered shifts, in May.

Firms trying to grow quickly faced pauses in hiring staff and **difficulties** rounding up early-stage funding from investors. Culture Biosciences works with a number of biotech companies whose founders have told Patrick they worry about hitting their scientific milestones. "They're definitely stressed because they feel like they need to hit those goals in order to get additional funding, but they have to balance that with creating a safe working environment for employees," he says.

By Marsha-Ann Watson | NOVEMBER 15, 2020

Colin Wessells, CEO and founder of Natron Energy. Credit: Natron Energy

Designing safe and reliable batteries with Prussian blue pigment

The world's thirst for power has pushed engineers to think hard about how we use and store energy. We're familiar with lithium-ion batteries in our cell phones and laptops, but less-visible, stationary batteries—often used for emergency power—rely on older technologies, like lead acid. Both technologies pose safety, environmental, and performance problems. Natron Energy believes its Prussian blue battery is a safer and more reliable option.

In 2012, Colin Wessells was finishing his PhD in materials science at Stanford University and working on electrode materials. Robert Huggins, a professor he was working with, recalled old research on Prussian blue—a pigment created by the oxidation of ferrous ferrocyanide salts—showing it could make windows change color with the application of an electric charge. Huggins suggested it could also be used to store and release energy. Wessells was tasked with figuring out "What is battery-grade Prussian blue, and how do we adapt this material system for energy storage?"

Wessells delved into research and discovered that Prussian blue's crystal structure allows for an almost friction-free transfer of electrons, meaning a Prussian blue–based battery can charge and discharge significantly faster than a lithium-ion battery without risk of explosion. He realized he had something with commercial potential, so as soon as he finished his PhD, he launched Natron.

AT A GLANCE

Launched: 2012

Headquarters: Santa Clara, California

Focus: Battery technology for industrial and grid energy storage

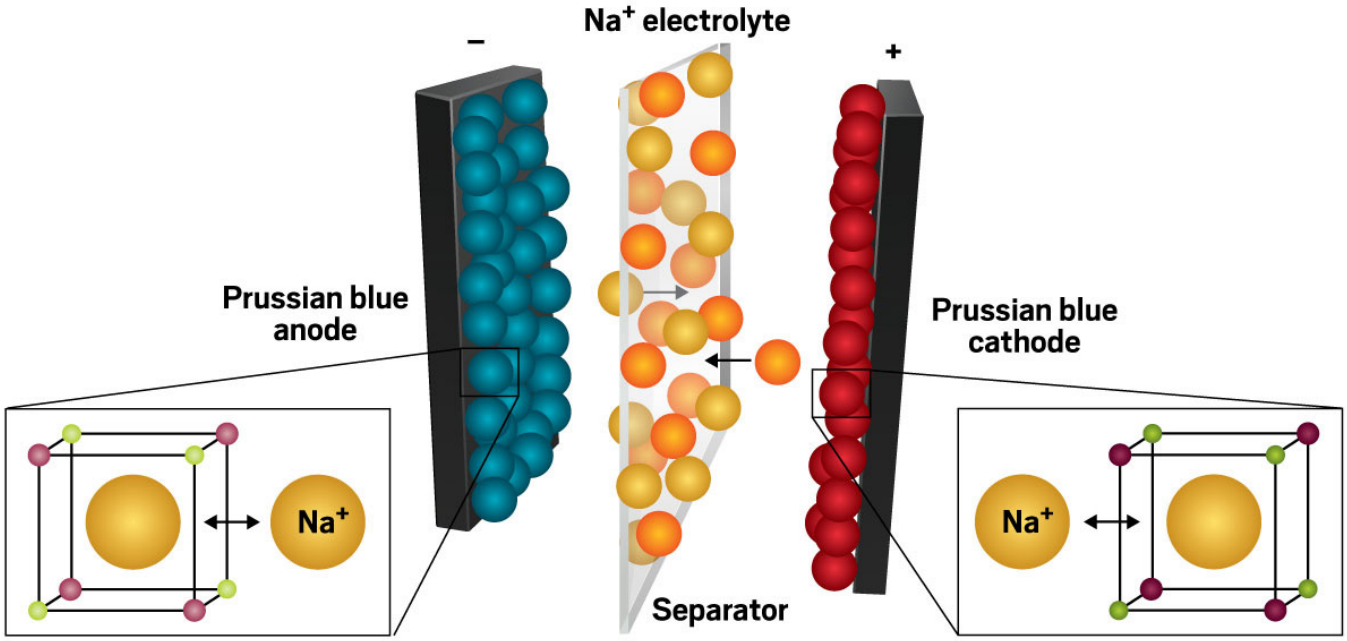
Technology: Prussian blue sodium-ion batteries

Founder: Colin Wessells

Funding or notable partners: $20 million in funding from the US Department of Energy and $35 million in series D funding

Natron Energy

SAFER, FASTER, LONGER



Natron Energy uses a Prussian blue analog for the anode and cathode, which contain crystalline nanoparticles of manganese hexacyanomanganate. The cubic open-framework structure—made of iron and manganese (small spheres) bridged by cyanide ligands (bars)—allows sodium ions to pass through with almost zero strain. This ultralow resistance allows quick energy discharge and long cycle life.

Credit: Adapted from Natron Energy/Yang H. Ku/C&EN/Shutterstock

Natron has developed a battery made of low-cost materials that can discharge in 2 min or less and charge in 8 min. Made primarily of salt, iron, and manganese, it is touted as having a smaller ecological footprint than both lithium-ion batteries, which may use rare-earth metals, and lead-acid batteries, which contain large amounts of the toxic metal lead.

But Prussian blue batteries aren't as energy dense as lithium-ion batteries and can't replace them in most uses. Natron does not see that as a drawback. "There's no such thing as a perfect battery; there are appropriate batteries for every situation," says Natron's vice president of sales, Jack Pouchet. Natron has aimed its battery technology at data centers, electric forklifts, and small electrical grids—applications that demand a quick discharge of power.

As more electric vehicles hit the road and many pull into charging stations at the same time, the sudden increase in power demand can strain electrical grids. Natron figures its battery, installed at a charging station, can address that problem by providing the initial surge of power needed to supercharge electric vehicles.

Prussian blue batteries can also replace lead-acid batteries typically used for backup power at data centers. In a power outage, Natron's batteries can provide a quick surge before generators kick in.

Natron says its batteries are long lasting. While lead-acid batteries have a service life of 1–2 years, Natron says its batteries perform for 5 years or more and have lasted 35,000 charge-discharge cycles without degradation. The company is confident that more than 50,000 cycles are possible.

Natron Energy

“There’s no such thing as a perfect battery; there are appropriate batteries for every situation.” *—Jack Pouchet, vice president of sales, Natron Energy*

This reliability has proved attractive to investors. In September, Natron was awarded $20 million from the US Department of Energy’s Advanced Research Projects Agency–Energy. With this new funding and $35 million in series D funding raised earlier this year, Natron plans to scale up battery production. It’s spending some of the money to firm up its supply chain and continue research to increase the battery’s energy density.

The company recently received a UL 1973 listing for its BlueTray 4000 rack-mounted battery, certifying its safety for use in stationary applications. The listing “allows us to start selling batteries generally” for commercial purposes rather than just research, Wessells says. “We are now shipping battery systems as fast as we can,” he says, “and we’re overbooked with customers.”

Natron has about 57 employees at its Santa Clara, California, headquarters. It expects to more than double that number as it builds new production centers, including one in Valais, Switzerland, funded by a grant from the Swiss government.