



Emerging Stocks Down Under

👏 *I have to be seen to be believed.* 🗨️

- Queen Elizabeth II (b. 1936), Queen of the United Kingdom and the Commonwealth



ARCHER MATERIALS

Quantum Computing at
room temperature

NOXOPHARM

Hot, hotter, hottest...

EMYRIA

Evidence-generating
care

ARCHER MATERIALS

Quantum Computing at room temperature

Stocks Down Under rating: ★★ ★

ASX: AXE
Market cap: A\$253M

52-week range: A\$0.36 / A\$1.24
Share price: A\$1.11

Archer Materials is working on Quantum Computing, which is essentially fundamental physics research. The company is formally headquartered in Adelaide, but the techies spend a lot of time in the nanoscience hub of the University of Sydney. If Archer can actually achieve what it hopes to achieve, i.e. Quantum Computing at room temperature, then the sky is the limit. However, much bigger companies and many researchers around the world have been working on Quantum Computing for many years and most are still a long way off from having a practical solution. So, it's fair to say Archer's got its work cut out if it is to achieve its ambitions within any meaningful period of time.

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NOXOPHARM

Hot, hotter, hottest...

Stocks Down Under rating: ★★ ★★

ASX: NOX
Market cap: A\$179M

52-week range: A\$0.26 / A\$0.99
Share price: A\$0.61

Ostensibly oncology focused, Noxopharm is working on building a pipeline of drugs based on its unique technology platform in the treatment of both cancer and septic shock. While the prevalence of COVID-19 complications has necessitated a greater focus on unmet patient needs, this company could be uniquely positioned to address those needs in both areas. Early combination clinical programs pairing Veyonda with cancer drugs have held promise and now Noxopharm seeks to show the same in its new COVID-19 program.

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EMYRIA

Evidence-generating care

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52-week range: A\$0.041 / A\$0.27
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Quantum Computing at room temperature

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Share price chart



Source: Tradingview

To be or not to be ... or to be both at the same time

Today's, classical, computers operate transistors that can represent a value of either a 1 or a 0. This logical state is called a bit, a contraction of the words binary and digit. And any calculations done by the processor can only be done sequentially, i.e. one after the other in a long sequence of calculations. So, today's processors run many millions of individual calculations one after the other, which is very time and energy consuming.

In Quantum Computer, however, things are very different, even a bit weird, so bear with us. The bit in a Quantum Computer is called a quantum bit, or qubit. As opposed to a regular bit, a qubit can not only be in the 1 or 0 state, but it can be in both states at the same time, which is called superposition. Are you still with us?

Superposition is a weird, but really interesting phenomenon. For our purposes, the key take-away is that a qubit can represent multiple states simultaneously and that if you increase the number of qubits in your system, the power of your Quantum Computer grows exponentially. Let us explain. Let's say you have two classical bits. Each of them can be only a 1 or a 0. That means you can have 4 possible states resulting from these 2 bits, i.e. 00, 10, 01 and 11. However, whatever the combination is, the 2 bits together can still only represent one of those combinations at any given time.

Now, because a qubit can be in both states at the same time, 2 qubits can represent all four of those combinations at the same time. In other words, you quadruple your computing power this way! And it gets better. By adding another qubit, you can have 8 states at the same time. With 4 qubits you get 16 states at the same time. And with 10 qubits you have 1,024 states, all at the same time!

So, the power of a Quantum Computer grows exponentially as the number of qubits increases, which is why scientists and companies alike are working so frantically to harness Quantum Computing. The application areas are massive, specifically in database searching, decryption and simulations, for instance in medical research.

It's freezing in here

Today's experimental Quantum Computing setups can only operate at very low temperatures, i.e. near zero degrees Kelvin, which is minus 273 degrees Celsius. That's about how cold it is in outer space. You see, heat can throw a Quantum Computer off. Heat can create errors in the states of the qubits and in the readout of their values. Additionally, the so-called the electron spin, which indicates the state a qubit is in, needs to last at least 100 nanoseconds (10 millionth of a second) and temperatures close to minus 273 degrees increase the lifetime of that spin. Hence, the need for outer space temperatures.

However, Quantum Computers need to interact with the non-quantum world to operate, i.e. the backend electronics that support the quantum part of the system, and these systems operate at room temperature. In order to improve Quantum Computers, researchers are trying to also bring those auxiliary systems into the extreme deep freezer that houses the qubits, the so-called dilution refrigerator. Efficiently controlling dozens and, eventually, hundreds of qubits is crucial and getting those auxiliary systems as close to the qubits as possible helps improve that process. But as you can imagine, getting big electronics systems to be able to operate at minus 270 degrees presents challenges of its own and is quite costly too.

So, a giant leap forward in Quantum Computing would be to get qubits to operate at room temperature, just like a classical computer. Archer claims it has found a way to do just that: Quantum Computing at room temperature!

A different approach

Instead of using inorganic materials in semiconductor structures that require extremely cold operating environments, Archer is working with carbon-based molecules. Within a so-called carbon nanosphere, a qubit is represented by an electron spin that, in this setup, has a long lifetime at room temperature, meaning there is enough time for the state of the qubit to be read. In addition to the carbon nanosphere there's also a control and readout device to set and read the qubit.

Archer has filed patents around this Intellectual Property (IP) with one patent already granted, in Japan. The company is also working with IBM's Quantum Network. This network, consisting of more than 70 organisations, is IBM's way of staying in the loop with many new, possible technologies in Quantum Computing to make sure it doesn't miss out on the next big thing.

Archer's tech will take a long time to commercialise

All of this adds credibility to Archer's claim and work. However, as investors, our main concern with a listed company doing fundamental physics research is that it will likely take a very long time before any of its IP can be commercialised.

Look at companies like Weebit Nano (ASX: WBT) and BrainChip (ASX: BRN). They have been developing new IP for many years. The key difference is that these companies are using existing semiconductor manufacturing technologies. Archer is introducing carbon into the equation, which will need to be integrated into today's CMOS manufacturing processes. We believe that will be very challenging in itself. Apart from that, we believe Archer's starting point is a lot further back compared to WBT and BRN, which are currently on the verge of commercialising their respective technologies.

Notwithstanding yesterday's announcement regarding "indication of on-chip qubit control" and despite the company's future potential, at a market cap of \$253m we believe Archer stock has gotten ahead of itself and we don't see much upside for the share price in the near to medium term. It will likely take 5 to 10 years and a lot more capital, and dilution, for Archer to realise its ambitions. In the meantime, it's three stars from us. In the ASX-listed semiconductor space, we prefer a company like WBT, that is substantially further advanced, but is trading at a valuation similar to Archer's.

NOXOPHARM

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Share price chart



Source: Tradingview

The cold to hot effect

Of the 55 million deaths globally from disease, 10 million are from cancer while another 10 million stem from septic shock. Septic shock is a life-threatening condition which occurs in response to viral or bacterial infections. In cases of septic shock, those infections can cause a hyperinflammatory response called cytokine release syndrome ('cytokine storm') or CRS. CRS can cause blood clotting as well as lung, kidney and heart damage. Lung damage from hyper-inflammation has been observed in some COVID-19 patients, with high rates of disability and death. The company estimates that an estimated three million deaths from the 10 million deaths from septic shock per annum are linked to COVID-19.

While cancer and septic shock don't appear to be linked on the surface, both are underscored by abnormal immune and inflammatory responses to trauma. As cancer manipulates (and inhibits) the body's natural immune response and increases inflammation, Noxopharm's lead immuno-oncology drug, Veyonda, works with the body's natural defence system to boost the immune response in combination with existing cancer treatments, like chemotherapy and radiotherapy. This is necessary as chemo and radiotherapy have the negative effect of damaging those defence systems. Noxopharm calls this the 'hot to cold effect' – essentially turning off 'cold' immune-suppressing cells and restoring 'hot' cancer-fighting cells, like T cells.

As Veyonda has so far been effective in its ability to block the hyper inflammatory cytokine response, one of the next objectives for the company is trialling Veyonda in COVID patients with lung dysfunction. Despite the company's previously faltering share price, more inspiring clinical data using Veyonda has helped to push the share price to February's high of 94 cents.

Pushing that proof-of-concept

We believe Noxopharm's pivot toward novel coronavirus treatments makes sense given Veyonda's potential to boost the immune response beyond various cancers. There is currently a lack of effective treatment options for septic shock – in relation to COVID-19 or other – and so the company's patent application for Veyonda's use in septic shock cases provides a significant commercial opportunity with the market size set to grow to \$5.9bn by 2026. As the NOXCOVID-1 trial advances to the next phase, initial pre-clinical data has identified idronoxil's (Veyonda's active ingredient) capacity to block the cytokine storm as well as a previously unidentified molecular target believed to be involved in the STING pathway. The lack of other drug treatments in this area gives Noxopharm a few leads to follow as new strains of the COVID-19 virus continue to pop up.

Following its cancer program data, Noxopharm is continuing its development of Veyonda as a combination drug to boost effectiveness in current cancer treatments. Both the company's DAART program (Veyonda and low-dose radiotherapy) and the LuPIN program (Veyonda and a radiotherapy product from Novartis called 7Lu-PSMA-617) found that combination therapies delivered a major boost to the hot to cold effect, so the next step for the company will be to bring its proof-of-concept to its IONIC program – a combination trial between Veyonda and Bristol Myers Squibb's Opdivo. This is a perfect program opportunity for Noxopharm and Veyonda: Opdivo is an effective immune checkpoint inhibitor (ICI), but as some patients are inherently resistant to ICIs, the primary rationale will be to investigate Veyonda's hot to cold ability to overcome this resistance in various cancers. A positive outcome could increase the likelihood of future potential partnerships. Just as a point of reference, the annual sales for an established treatment like Opdivo is US\$8bn annually.

Two distinct avenues

Although the transference of Veyonda towards septic shock treatments was directly inspired by the experience of COVID-19 patients, the NOXCOVID-1 program is a reminder that the pandemic represents only a small portion of patients who die each year from septic shock, and that the need for effective treatments will become a priority after the pandemic abates. As NOXCOVID advances to the final cohort phase, Noxopharm has established a new drug development subsidiary, Pharmorage Pty, to build its septic shock/autoimmune disease drug pipeline.

Noxopharm raised \$23m raise at 54 cents in December 2020, bringing the cash reserve to \$22.9m. Now that the Phase 1/2 of LuPIN and the Phase 1 of DARRT have provided evidence of Veyonda's effectiveness, Phase 2 of DARRT and Phase 1 of IONIC will provide a much wider scope for Veyonda against a range of cancer types – prostate, breast and lung – to boost confidence in Noxopharm's approach. Four stars on all fronts.

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Share price chart



Source: Tradingview

Please, call me 'Em-meer-ree-uh'

Emyria – pronounced 'Em-meer-ree-uh', not 'Em-mai-ree-uh' – is not a traditional drug development company. It runs a network of medical clinics in Australia, London and New York where it captures patient data (or real world evidence) to provide better insight into what patients groups might need in terms of long-term treatment. But all that data also represented a great opportunity to come up with new and better cannabis-based medicines, predominantly in areas of unmet medical need, and that's where the current focus lies.

Emyria's two lead compounds are EMD-003 and EMD-004, targeting, respectively, mental health conditions like anxiety and depression; and irritable bowel syndrome (IBS). EMD-003 is potentially very powerful. Where many mainstream anxiety/depression medications can cause withdrawal, sedation and memory impairment issues, EMD-003 seeks to find a suitable low-dose cannabinoid treatment that works without these side effects. Over 50% of Emyria's patients present with moderate to severe anxiety, stress and depression. Those poor folks are looking for alternatives to registered treatments, such as antidepressants.

While mental health is an obvious (and worthy) choice for Emyria, IBS is another condition, which seems to receive little attention, despite the fact it affects 11% of the population and is difficult to treat. The comorbidity between IBS and mental health conditions, like anxiety, is a likely factor in the development of EMD-004.

Individual vs one size fits all

As this company behaves more like a medical practice than a traditional pharma, it won't surprise anyone to know that Emyria's take on the drug development model is slightly different. Where the traditional drug development companies go from preclinical work to clinical trials to product, this company wants to use insights from its care model to create a more personalised platform for treatment. At last count, Emyria had around 2.6 million data points throughout its clinics. That's not from clinical trials. It's from real-world patients being treated in 'real time' with varying conditions and needs, with the data suitably de-identified to fit best practice on privacy issues

Traditional drug trials combined with real world evidence brings some advantages, including better access to the best patient groups, real-time monitoring and faster insights from tailored programs, saving both time and costs. In the case of EMD-003, the company has already completed Phase 1 work on its CBD capsules.

A digital health player

Because monitoring is a part of Emyria's process, the company has also made the leap to a digital health platform. Inasmuch as the medicinal cannabis market holds treatment possibilities, it's hardly surprising that digital healthcare has gained much momentum during a major pandemic. Although remote healthcare is not new, COVID-19 has accelerated the uptake of telehealth and remote monitoring tools, which have caught investor attention.

Emyria's remote monitoring service, called 'Openly', recently won an \$880,000 grant from the University of Western Australia to boost mental health infrastructure. Designed for COVID-19 isolation, the app collects real-time medical information, like heart rate, to detect physiological stress. This has long-term implications for both patient care and the company's programs, with the data used to inform EMD-003. But it also suggests a bigger trend toward tech health apps with or without a pandemic. Around 20% of Australians have mental health problems and not all of them can access a city clinic.

Myriad health opportunities

Given that Emyria only listed on ASX in February 2020, the company has made a lot of progress on patient numbers, partnership deals and, thankfully, the share price, which now sits not far from its high of 26 cents in February thanks to the digital health grant. In the short term, the circular approach to its in-person and digital health platforms will help continue to drive patient numbers (currently around 4,900) and data points, but the big money will be in Emyria's accelerated registration of low-dose cannabidiol capsules with the TGA, jointly done with Cann Group. Thanks to previous testing, the gelcap product could be the first CBD product approved for sale under the new schedule 3 guidelines.

Long term, it's all about possibilities: beyond the current programs, Emyria has plans for CBD-based programs covering PTSD, major depression and chronic pain, but psychedelic medicine will likely also have a place in the company's future drug development. Emyria has already partnered with Mind Medicine Australia to develop MDMA and psilocybin-assisted therapies for PTSD and depression and build on the previous research. It's list of priorities seems endless, but for now everything depends on the outcome of EMD-003 and EMD-004. Four stars.

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