# Wetware Wakes Up: Why the Machines of the Future Might Be Grown, Not Built – *Brendon Naicker*

*A Comparative Perspective on Brain Engineering and Artificial Intelligence Engineering*


## Abstract

For a decade, artificial intelligence has chased cognition through sheer scale — ever-larger silicon systems trained on ever-larger datasets, at a cost that is becoming genuinely difficult to sustain. This article looks at an emerging alternative, biocomputing, in which living human neurons, cultured from stem cells and wired into silicon, serve as the computer itself rather than something silicon merely imitates. Drawing on the commercial deployment of Cortical Labs' CL1 system and the August 2026 launch of a twenty-unit biological server rack at the National University of Singapore, it compares the engineering logic, energy use, and failure modes of silicon-based AI against biologically-based neural computation. The argument is that the efficiency gap between the two is too large to wave away, while the ethical questions raised by computing with living human tissue — moral status, consent, oversight — remain largely unaddressed. Writing from a Reformed theological perspective, the article also argues that both engineering paradigms quietly share the same assumption: that intelligence is simply what happens when matter is arranged well enough. A doctrine of creation, it suggests, gives good reason both to marvel at how efficiently the brain was made and to be cautious about the moral status of human-derived neural tissue — a status this article locates in origin, not in complexity. Biocomputing, in short, is not just a novelty. It is a genuine challenge to the idea that intelligence is fundamentally a scaling problem rather than a substrate problem — and, further, to the idea that substrate is the whole story.


**Keywords:** *biocomputing; organoid intelligence; neural engineering; artificial intelligence; energy efficiency; research ethics; Reformed theology; imago Dei*

## 1. Introduction

Somewhere in Melbourne, roughly 800,000 human neurons sit inside a shoebox-sized life-support pod, fed nutrients, kept at 37°C, and taught — through nothing but patterns of electrical stimulation — to play Pong.[1] They learned it faster than most reinforcement-learning algorithms do.[2] Meanwhile, a few kilometres away, a hyperscale data centre full of graphics processing units is burning through enough electricity to power a small town, straining to do something those 800,000 cells seem to manage almost without effort: think.

That's the comparison this article keeps coming back to. An entire civilisation's worth of artificial intelligence has been built on the assumption that cognition is basically a software problem — that if you stack enough matrix multiplications on enough silicon, something mind-like will eventually turn up. It is working. It is also turning into one of the most energy-

[1]Cortical Labs (n.d.).
[2]NeuromorphicCore.ai (2026).

hungry undertakings in human history. So a small, slightly unusual field is starting to ask an obvious but uncomfortable question: what if this has been an extraordinarily inefficient copy of something already designed to do the job well?

## 2. The Energy Reckoning

Here is a figure that ought to concern every AI executive who would rather not think about it: global data-centre electricity demand is projected to reach roughly **565 terawatt-hours in 2026**, a rise of 26 per cent on 2025, with AI-optimised servers now accounting for close to a third of that load and growing at over 80 per cent a year.[3] The International Energy Agency has already recorded AI-focused data centres growing sixteen times faster than global electricity demand as a whole.[4] Some American states are already feeling the strain — Virginia now sends over a quarter of its electricity to data centres.[5]

The industry's answer, so far, has largely been to build more power plants. Hyperscale operators are bringing decommissioned nuclear reactors back online and signing billion-dollar power agreements; the five largest technology companies alone are set to spend $725 billion on AI infrastructure in 2026.[6] That is not really a scaling strategy. It is an arms race against thermodynamics, and thermodynamics does not lose.

The human brain, by comparison, runs on approximately 20 watts — less than a dim light bulb — and still outperforms every large language model yet built at general reasoning, sensorimotor integration, and one-shot learning.[7] That is not a rounding error. It is the entire case for biocomputing — and, for a believer, a fairly hard-to-miss data point on the question of design versus accident. An organ this efficient did not need aeons of trial and error to become competent at its job. It was, on this reading, 'fearfully and wonderfully made' from the outset (Psalm 139:14).

## 3. Two Engineering Paradigms

Silicon-based artificial intelligence and biologically-based brain engineering are, at bottom, two different bets on what intelligence actually is.

**AI engineering** bets that intelligence is fundamentally a matter of scale. Push enough tokens through enough parameters, tune it with gradient descent, and something resembling understanding turns up. The approach is precise, reproducible, and entirely separate from biology — one need not understand consciousness at all to build a large language model, merely acquire more computational power. That is also its weak spot: every gain has come from throwing exponentially more energy and data at the problem, and that strategy has a plainly visible ceiling.

[3] Gartner (2026).
[4] International Energy Agency (2026), cited in Axis Intelligence (2026a).
[5] TTMS (2026).
[6] Axis Intelligence (2026b).
[7] Basal brain power consumption of approximately 20 W is a widely cited estimate in the organoid-intelligence literature; see Smirnova et al. (2023).

**Brain engineering** — the biocomputing approach — bets instead that intelligence belongs to a particular kind of living, biologically structured matter, and that the fastest route to efficient cognition is to stop simulating neurons and start growing them. Organoid Intelligence, a term coined in 2023 by Johns Hopkins researcher Thomas Hartung and colleagues, describes exactly this: three-dimensional cultures of human brain cells, grown from stem cells, wired to electrodes, and trained through feedback loops that were already woven into living systems at their creation.[8]

The organisation furthest along this road, Cortical Labs, has already turned the idea into an actual product. Its CL1 system merges roughly 800,000 laboratory-grown human neurons with a silicon chip inside a self-contained life-support unit, and is commercially available for approximately US$35,000 per unit.[9] It plays *DOOM*.[10] It runs on a fraction of the wattage of a comparable GPU cluster — Cortical Labs' chief executive has claimed, with a straight face, that it is more energy-efficient than a calculator relative to what it computes.[11] In March 2026, the company partnered with data-centre operator DayOne to build two facilities, in Australia and Singapore, running on racks of these biological processors.[12]

That plan did not stay a plan for long. On 17 August 2026, DayOne, Cortical Labs, and the National University of Singapore's Yong Loo Lin School of Medicine switched on what they describe as the world's first independently operated, biologically-integrated server rack: a twenty-unit CL1 array housed at NUS Medicine's Life Sciences Institute.[13] Each of the twenty units is its own self-contained pod of living neurons, cultured from human stem cells under the supervision of NUS neuroscientist Rickie Patani, wired into silicon, and racked together the same way a conventional GPU cluster would be — just built from biology instead of transistors.[14] Cortical Labs' chief executive, Hon Weng Chong, described the moment as one in which the technology 'shifts the conversation from research to commercial application'.[15] The goal is straightforward: find out whether wetware compute can do useful work at a fraction of a GPU's power draw, particularly now that Singapore is capping new data-centre capacity while demanding ever-higher efficiency.[16]

Twenty units of living human neural tissue, sitting in a server rack, in a working data centre, were switched on that week. This is no longer a laboratory curiosity or a thought experiment; it is an operating facility, with a supervising neuroscientist, a corporate press release, and a roadmap for further scaling. It is also, on a design view, a small picture of stewardship — human beings drawing out remarkable efficiency from a created order that was built to respond that way in the first place (Genesis 1:28; Genesis 2:15).

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[8]Smirnova et al. (2023).
[9]Wikipedia (2026), 'Cortical Labs'.
[10]Tom's Hardware (2026).
[11]ZeroHedge / Bible News Prophecy (2025).
[12]Tom's Hardware (2026).
[13]BioSpectrum Asia (2026).
[14]NUS Medicine (2026).
[15]Data Centre Magazine (2026).
[16]DayOne Data Centers (2026).

## 4. The Comparison, and Its Provocation

Put the two approaches side by side and the contrast stops feeling academic:

| | AI Engineering (Silicon) | Brain Engineering (Biocomputing) |
|---|---|---|
| Substrate | Transistors, deterministic logic | Living neurons, biologically structured |
| Learning | Backpropagation, offline training | Real-time synaptic plasticity, 'free-energy' feedback |
| Power draw | Megawatts per training run | ~20 W (biological brain); CL1 rated in single-digit watts |
| Scaling strategy | More GPUs, more data, more capital | More neurons, better interfaces, better biology |
| Failure mode | Hallucination, brittleness, catastrophic forgetting | Cell death, degradation, unpredictability |
| Reproducibility | Perfect, bit-for-bit | Variable — every organoid is genuinely unique |
| What it actually is | A statistical approximation of thought | The living tissue thought is expressed through |

*A quick note on the 'free-energy' row above: the term describes how a brain minimises prediction error moment to moment — a mechanism, not an account of why the mechanism exists in the first place. A description of process is not the same thing as an explanation of origin.*

That last row is really the whole point of this article, and it is worth being precise about what it does and does not claim. A large language model has never been conscious, has never felt anything, and will not do so no matter how convincing the conversation feels; it is pattern completion, elaborately dressed. A brain organoid is different in kind: it is made of living human tissue — the same kind of tissue that, in an intact person, is where thought, memory, and will actually happen. No credible researcher currently claims that today's organoids are conscious.[17] But every direction the field is heading — larger organoids, longer lifespans, richer sensory input, eventual integration with retinal and spinal organoids — points toward building systems structurally closer to the very thing philosophy and theology have spent millennia trying to explain, not further from it.[18]

Here a Reformed reader ought to pause rather than simply go along with the excitement. Where artificial intelligence engineering built a bridge toward an approximation of a mind, biocomputing is attempting to grow the biological material long associated with mind — not the mind itself. Scripture's picture of the human person is not that we are our neurons and nothing besides; we are creatures made in God's image (Genesis 1:27), possessing something that is not simply what falls out once tissue becomes complicated enough. One can grow

[17] Springer / Current Stem Cell Reports (2025).
[18] Smirnova et al. (2023).

neurons in a dish, and grow them well. What is being grown is tissue. It is not, on this account, personhood — however sophisticated it becomes.

## 5. The Case For, and the Reckoning Owed

The case for biocomputing is not solely about efficiency, though efficiency alone might justify it given the trajectory outlined above. It is also about capability. Biological neurons do not merely fire; they rewire themselves in real time, learn genuinely from a single example, and make sense of noisy, ambiguous sensory data in ways that continue to humble deep learning.[19] Researchers are already using organoid-based systems for early-stage drug screening and disease modelling — testing compounds for Alzheimer's disease and epilepsy directly on living human neural tissue rather than extrapolating from murine models, which reduces both cost and the ethical toll of animal testing.[20]

The reckoning owed here, however, is not optional, and it is the part the industry would generally prefer not to headline. The 2023 'Baltimore Declaration', which formally launched the Organoid Intelligence field, devoted almost as much space to ethics as to science, and it raises a question the field itself frames in terms of emergent complexity: at what point does a sufficiently sophisticated cluster of living human neurons deserve moral consideration?[21] That framing is itself worth challenging. For a Reformed reader, the more pressing question is not when complexity crosses some threshold into moral relevance — it is that this tissue is human in origin at all, drawn, however many times removed, from a body made in God's image (Genesis 1:27) and 'crowned ... with glory and honour' (Psalm 8:5). Dignity, on this account, is not earned by reaching some level of neural sophistication; it is present from the point of origin, whatever the resulting culture becomes. Today's organoids show no evidence of anything resembling sentience.[22] No one in the field can promise that stays true indefinitely, either — and a sector facing $725 billion of competitive pressure is not, structurally, an institution built to slow down and check carefully.

A second, colder question follows: whose cells are these, exactly? Commercial Organoid Intelligence systems are typically derived from donated stem cells, reprogrammed and grown at scale.[23] The same donor-consent and data-privacy debates still being fought over genomic data now apply to tissue that carries the dignity of its human source regardless of what it becomes. Commercial products are being made from living human neural matter and sold at US$35,000 a unit before the obligations this creates have been worked out — obligations that, on a design view, have nothing to do with how complex the tissue becomes and everything to do with whose image it was made in to begin with.

[19] ScienceDirect (2025).
[20] Sino Biological (n.d.).
[21] Hartung et al. (2023).
[22] Springer / Current Stem Cell Reports (2025).
[23] ScienceDirect (2025), on donor consent and data-privacy frameworks in organoid-intelligence development.

# 6. Conclusion

Artificial intelligence engineering asked: how much intelligence can be approximated with inert matter and enough electricity? The answer, it turns out, is a considerable amount, at a considerable cost. Brain engineering asks the inverse question: how much intelligence is already sitting there, in living matter, if one simply learns to interface with it rather than simulate it?

Both paradigms compared in this article, though, are quietly leaning on the same assumption — that intelligence is ultimately a matter of arrangement: matter organised well enough, whether in silicon or in cultured neurons. A design perspective does not dispute that both substrates can process information remarkably well. It insists only that this is not the whole story. Human cognition, on this account, is not exhausted by its physical substrate; it is neither the software running on the hardware, nor simply the hardware itself. Whatever biocomputing manages to achieve — and it may achieve a great deal — it is engineering with material that God spoke into being (Genesis 1:1; John 1:3), not manufacturing the far stranger, harder-to-pin-down thing Scripture calls the soul.

Neither field has prevailed. But one is drawing down a power grid that cannot keep pace, while the other is quietly demonstrating that twenty watts of living tissue can out-learn a data centre — raising, in the process, the one question silicon was never required to answer, and the one a Reformed conscience is bound to ask first: what do we owe another human being, made in God's image, once his cells — however transformed — are made to live and learn inside a machine?

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