# Recursive Systems Engineering

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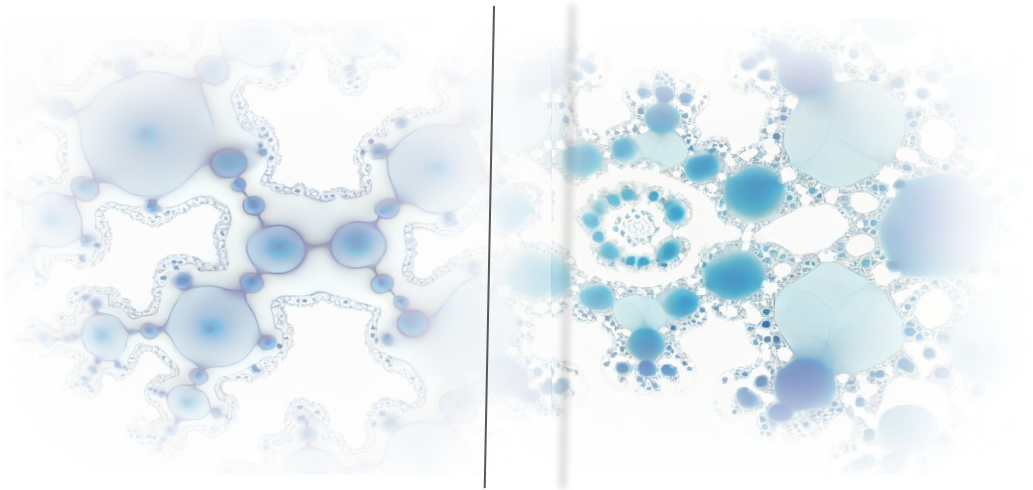


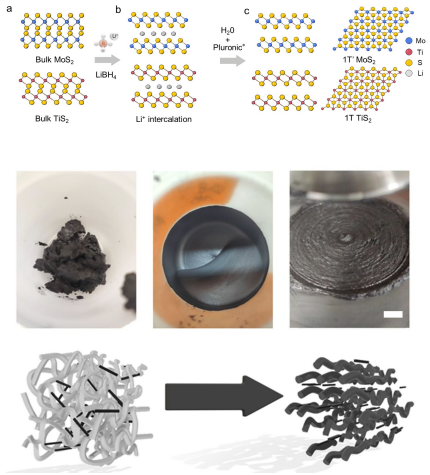
I build systems that connect modelling, materials, and machines — integrating simulation, data, and automation to accelerate how functional devices are designed, made, and improved. My work focuses on scalable methods that link quantum-mechanical insight, experimental feedback, and manufacturing control to deliver better-performing materials, faster.

Showcases across autonomous energy fabrication, degradation forecasting, and causal AI for catalysis, the platforms I’ve developed are recursive and adaptable — combining scientific insight with real-time data to guide decisions and improve outcomes.

# Designing Intelligence into Materials

Modular, programmable and scalable additively manufactured energy storage devices

Rheology tuned for high mass loading, and print fidelity
Inherent flow dynamics to arrange nanosheets preferentially
Pattern resolution mapped to energy density trade-offs

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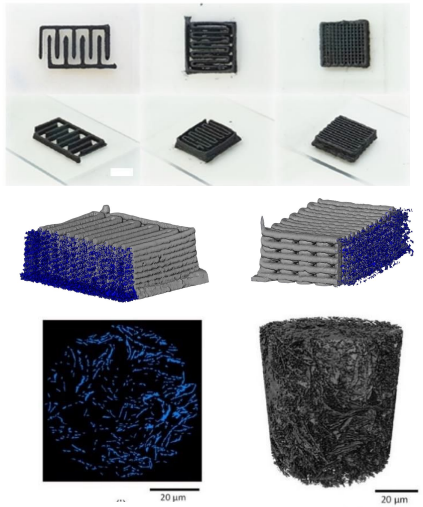


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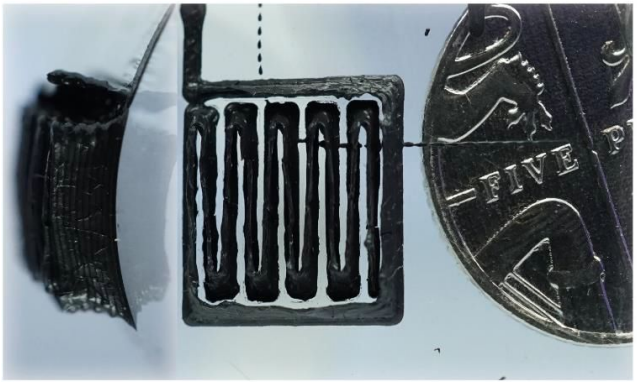
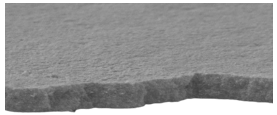


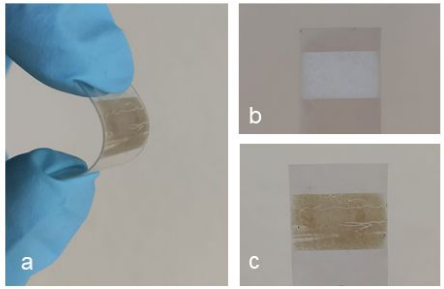
**How do we design materials that embed intelligence into form?**

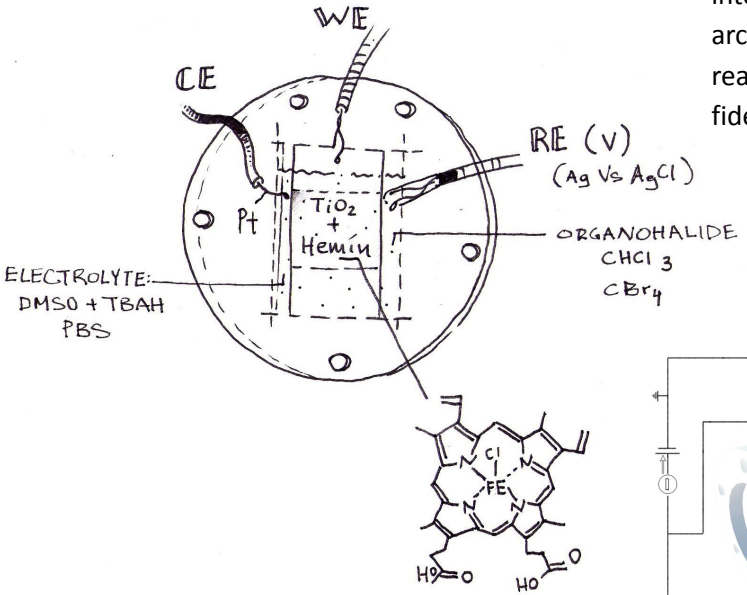
I developed printable systems that turn flow, geometry, and feedback into functional design — adapting structure to performance across scales. Each device becomes a testbed for learning:informed by architecture, optimised through degradation, and reprinted for improvement.

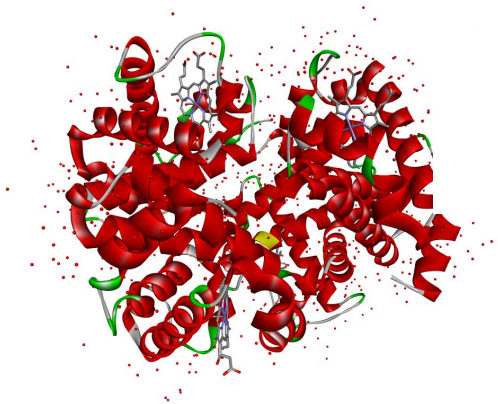
# Molecules to Meaning: Diagnostic Systems on Demand

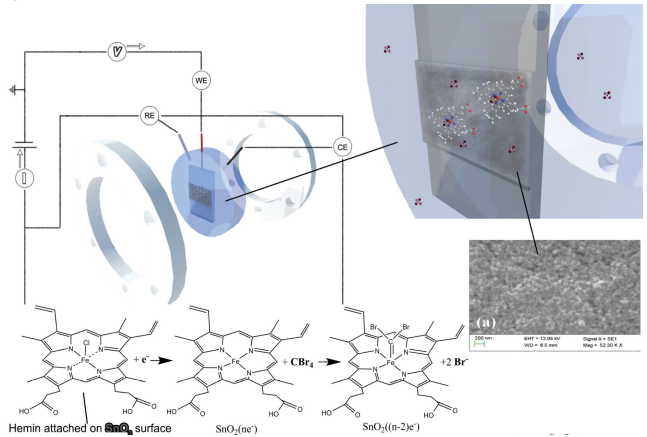
Low-cost, printable functional platforms with fast, and accurate ligand anchors








**How do we bridge material design and diagnostic deployment?**

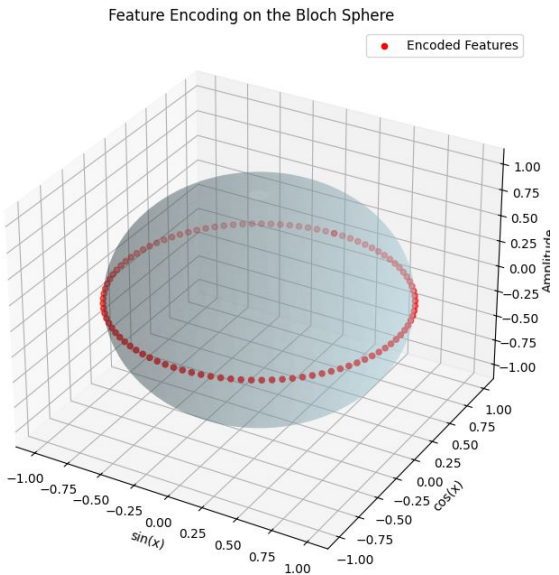
Developed printable sensing platforms that integrate molecular specificity with scalable architecture. These systems were tuned for real-time bio-recognition — balancing signal fidelity, surface chemistry, and device durability.

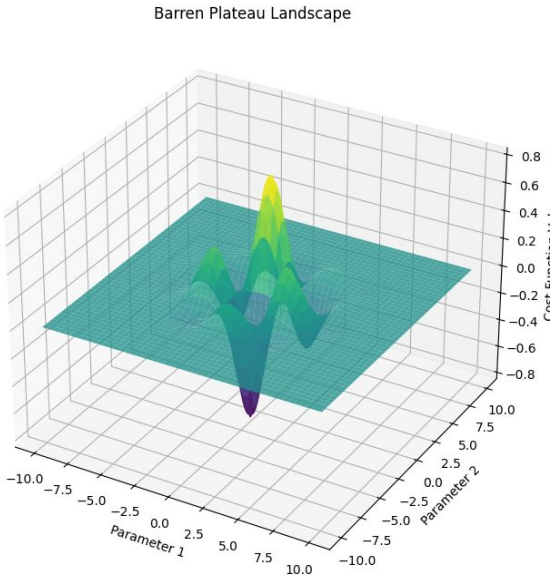
10.1002/elan.201800188

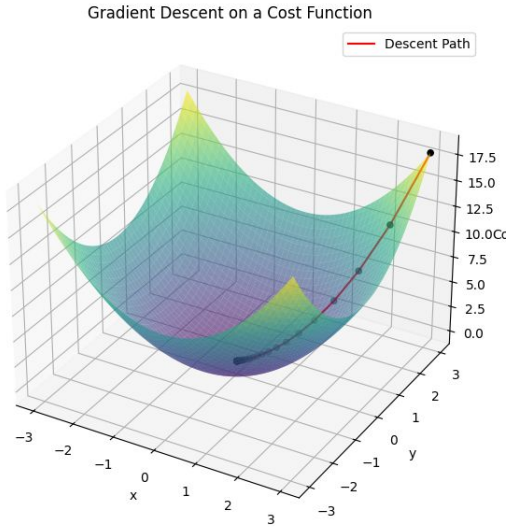
# Quantum Logic for Adaptive Design in Matter Causality

Encoding, navigating and optimising variational complex many-body systems.

Building blocks of matter with expressive Bloch sphere encodings, through barren plateaus, to descent-guided convergence - enabling design logic across materials and processed

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