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Linking Evolution in Silico, Hardware, and Chemistry to discover or engineer Inorganic Biology

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In our laboratory we have been developing new approaches to discover the 'transition-to-evolvability' in chemistry. This is because if we can discover or engineer an abiotic system that can evolve (we could define this as an inorganic chemical cell –iCHELL, see Figure)[1] we might be able to suggest that synthetic biology can exist in many chemical forms, of which the terrestrial biology found on planet earth is one subset. It could even help us establish the idea that evolvability is the key signature that defines living from non-living systems. In this contribution I will describe how we are connecting evolutionary algorithms, hardware (e.g. flow systems [2], 3d printers[3] and liquid handling robots) and complex chemical systems to produce new types system without classically defined biological genetic material, yet with the potential to evolve.

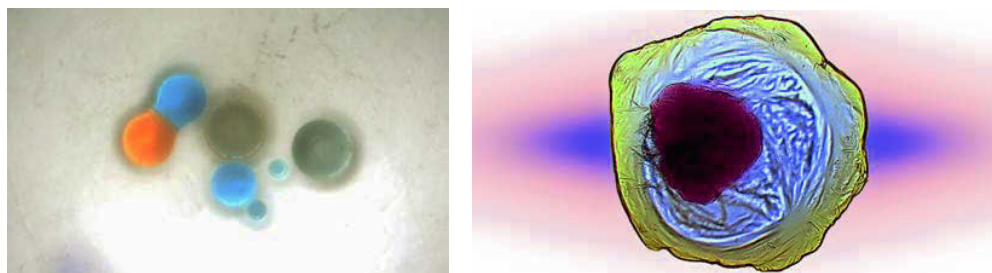


Figure: LEFT picture of some CHELLS fusing. RIGHT picture of an iCHELL made of inorganic salt with an inner 'metabolic' payload.

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