

# Chemists create 'artificial chemical evolution' for the first time

December 9 2014

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Scientists have taken an important step towards the possibility of creating synthetic life with the development of a form of artificial evolution in a simple chemistry set without DNA.

A team from the University of Glasgow's School of Chemistry report in a new paper in the journal *Nature Communications* today (Monday 8 December) on how they have managed to create an evolving chemical system for the first time. The [process](#) uses a robotic 'aid' and could be used in the future to 'evolve' new chemicals capable of performing specific tasks.

The researchers used a specially-designed open source robot based upon a cheap 3D printer to create and monitor droplets of oil in water-filled Petri dishes in their lab. Each droplet was composed from a slightly different mixture of four [chemical compounds](#).

Droplets of oil move in water like primitive chemical machines, transferring chemical energy to kinetic energy. The researchers' robot used a video camera to monitor, process and analyse the behaviour of 225 differently-composed droplets, identifying a number of distinct characteristics such as vibration or clustering.

The team picked out three types of droplet behaviour – division, movement and vibration – to focus on in the next stage of the research. They used the robot to deposit populations of droplets of the same composition, then ranked these populations in order of how closely they

fit the criteria of behaviour identified by the researchers. The chemical composition of the 'fittest' population was then carried over into a second generation of droplets, and the process of robotic selection was begun again.

Over the course of 20 repetitions of the process, the researchers found that the droplets became more stable, mimicking the natural selection of evolution.

The research team was led by Professor Lee Cronin, the University of Glasgow's Regius Chair of Chemistry.

Professor Cronin said: "This is the first time that an evolvable chemical system has existed outside of biology. Biological evolution has given rise to enormously complex and sophisticated forms of life, and our robot-driven form of evolution could have the potential to do something similar for chemical systems.

"This initial phase of research has shown that the system we've designed is capable of facilitating an evolutionary process, so we could in the future create models to perform specific tasks, such as splitting, then seeking out other droplets and fusing with them. We're also keen to explore in future experiments how the emergence of unexpected features, functions and behaviours might be selected for.

"In recent years, we've learned a great deal about the process of [biological evolution](#) through computer simulations. However, this research provides the possibility of new ways of looking at the origins of life as well as creating new simple chemical life forms."

The project is the latest of the Cronin Group's efforts to explore evolution outside organic biology. Other projects have included the development of inorganic chemical cells known as iCHELLs, which are

built from molecules of metal and exhibit some of the same abilities as living cells.

The paper, titled 'Evolution of oil [droplets](#) in a chemorobotic platform', is published in *Nature Communications* today.

**More information:** "Evolution of oil droplets in a chemorobotic platform." *Nature Communications* 5, Article number: 5571 [DOI: 10.1038/ncomms6571](#)

Provided by University of Glasgow

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