Genetic inspiration could show the way to revolutionise information technology

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(PhysOrg.com) -- Chemists at the University of Reading have created a synthetic form of DNA that could transform how digital information is processed and stored.

Just as the information in a book is made up of a linear sequence of letters, so the information needed for all living things to function and reproduce is embodied in a linear sequence of chemical units. These make up the chains of DNA and RNA, where an enormous amount of information (the 'genome') is stored in a very small space to direct the molecular processes of life.

A new paper, which appears in *Nature Chemistry* on June 27, shows for the first time that many of the features of biological information processing can be reproduced in synthetic polymer chains.

The Reading team, led by Howard Colquhoun, Professor of Materials Chemistry in the Department of Chemistry, has designed and synthesised short sequences of a synthetic information-bearing polymer.

In the long term, researchers believe this could revolutionise the future of digital information. Synthetic polymer systems could allow information densities several million times higher than current systems.

Crucial to the work is the creation of tweezer-shaped molecules that pick out information along a chain. The two arms of the tweezer 'feel' the different sequences available and then clamp on to the chain at the

precise sequence where the chain structure and tweezer structure are most complementary.

Several tweezer molecules can bind next to one another on the polymer chain, allowing them to 'read' and translate extended, long-range polymer-sequence information. Most notable is that different types of tweezer molecules start reading at different positions on the chain. This selectivity means different types of information can be read from the same sequence which increases the amount of information available.

Professor Colquhoun said: "This type of process is paralleled in the processing of genetic information. In the future, we plan to develop methods for writing new information into the polymer chains with the long-term aim of developing wholly synthetic information technology, working at the molecular level."

Provided by University of Reading