# Design and build of synthetic DNA goes back to 'BASIC'

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A new technique for creating artificial DNA that is faster, more accurate and more flexible than existing methods has been developed by scientists at Imperial College London.

The new system - called BASIC - is a major advance for the field of synthetic biology, which designs and builds organisms able to make useful products such as medicines, energy, food, materials and chemicals.

To engineer new organisms, scientists build artificial genes from individual molecules and then put these together to create larger genetic constructs which, when inserted into a cell, will create the required product. Various attempts have been made to standardise the design and assembly process but, until now, none have been completely successful.

BASIC, created by researchers from Imperial's Centre for Synthetic Biology & Innovation, combines the best features of the most popular methods while overcoming their limitations, creating a system that is fast, flexible and accurate. The new technique should enable greater advances in research and could offer industry a way to automate the design and manufacture of synthetic DNA.

Dr Geoff Baldwin, from Imperial's Department of Life Sciences, explains: "BASIC uses standardised parts which, like Lego, have the same joining device, so parts will fit together in any order.

"Unlike some systems that can only join two parts at a time, forcing the gene to be built in several, time consuming steps, BASIC enables multiple parts to be joined together at once. It is also 99 per cent accurate, compared to bespoke designs which usually have an accuracy of around 70 per cent."

BASIC is fast to use because it can draw on a large database of standardised parts, which can be produced in bulk and stored for use as required, rather than creating new parts each time.

The standardisation and accuracy of the process means that it could be used on an industrial scale. BASIC is already set to be used in a high throughput automated process in SynbiCITE, the innovation and knowledge centre (IKC) based at Imperial which is promoting the adoption of synthetic biology by industry. Two industrial partners - Dr Reddys and Isogenica - are also already making use of BASIC in their research laboratories.

Professor Paul Freemont, co-Director of the Centre for Synthetic Biology & Innovation, says: "This system is an exciting development for the field of synthetic biology. If we are to make significant advances in this area of research, it is vital to be able to assemble DNA rapidly in multiple variations, and BASIC gives us the means to do this."

Professor Stephen Chambers, CEO of SynbiCITE, says: "The way BASIC has been designed lends itself very well to automation and high throughput processes, which is the future of synthetic biology. If innovations in the field are to be translated into the marketplace, we need the capability to do things at larger scale - creating larger numbers of constructs so we have more opportunities to find something unique and valuable. BASIC is a foundational technology which will enable us to do this and will be one of the first protocols to be used in our new, fully automated platform for synthetic biology, set to begin production

later this year."

**More information:** 'BASIC: a new Biopart Assembly Standard for Idempotent Cloning provides accurate, single-tier DNA assembly for synthetic biology' by Marko Storch, Arturo Casini, Ben Mackrow, Toni Fleming2, Harry Trewhitt, Tom Ellis and Geoff S. Baldwin is published in *ACS Synbio* - pubs.acs.org/doi/pdf/10.1021/sb500356d

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