

# Can we use 3-D printing and stem cells to build a bone?

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Pioneering techniques aiming to recreate human bone for replacement and repair will be showcased at the Royal Society's annual Summer Science Exhibition which opens to the public today.

The processes include 3D printing with [stem cells](#) and building with individual stem cells using [laser tweezers](#).

'The conjunction of these new techniques, could lead to bone, organ or tissue repair within 5 years and replacement in 30 years', according to the stand leader Professor Kevin Shakeshaff, head of the University of Nottingham's Centre for Biomolecular Sciences.

The aim of Prof Shakesheff's team is to be able to repair and eventually replace bones by printing personalised structures which could slot precisely into or take the place of a damaged bone. The team have developed new 'alginate' materials, to use as the 'ink' for 3D printing bone scaffolds. Unlike plastic printing materials, this type of hydrogel allows cells to live and grow within it. Along with their unique technique for injecting live stem cells into these structures, this allows for the creation of more precise and functional structures than ever before.

A bone replacement material previously developed by Professor Shakeshaff's group has the ability to be injected into the human body where it solidifies into a hard structure that does not [damage cells](#). At the moment a surgeon could inject this material into an injury site as a filler. However, for a more serious [bone repair](#) or replacement, larger scale

technologies such as 3D printing would be required, and the group's new techniques and materials may make this possible.

The biologists will also be showcasing another of their novel techniques: using holographic [optical tweezers](#) for manipulating and building with individual stem cells. The system uses the energy produced by [laser beams](#) to grab hold and move cells in three dimensions, allowing positioning of cells with a level of precision that has never before been achieved. This will enable a more detailed study of how cells work and allow them to be used more effectively to produce the best functioning tissues.

The amalgamation of these three new developments might one day create human bones or organs able to function in a human body and visitors to this exhibit will be able to explore building biological structures at all three scales. At the smallest level, they will be able to remotely pick up and build with live stem cells in real time using the laser tweezers. Secondly, the jelly-like scaffolding material, 'alginate', will be available for hands-on moulding into larger scale structures such as veins and arteries. Centre-stage, the 3D printer will build the intricate scaffolds for various recognisable bones and organs.

The researchers will be on hand for questions and explanations for the duration of the exhibition which runs from 2 July to 7 July.

**More information:** [sse.royalsociety.org/2013/](https://www.royalsocietypublishing.org/2013/07/03/130713)

Provided by The Royal Society

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