

Growing bones with Lego

March 28 2012

A video produced for Google Science Fair shows how researchers at Cambridge making synthetic bone have turned to legendary children's toy Lego for a helping hand.

Engineering isn't all glamour. In the course of devising and producing the stuff that improves all our lives, the lab often becomes home to laborious procedures that can start to sap the strength of even the hardest engineers.

Researchers at the Department of Engineering developing synthetic bone have struck upon a novel way of getting round this – by using classic kids construction kit Lego – and their innovative use of mechanical toys in world-leading research has been featured in a new video produced by internet giant Google.

The video, which has already had over 100,000 views, goes behind the scenes at the lab to show how the team develop the bone samples.

Bone has excellent mechanical properties for its weight, and synthetic bone has a range of revolutionary applications; from the obvious, such as medical implants, to the almost science fiction, such as a material in building construction. But the process involved in producing samples of bone is tedious and time consuming.

“To make the bone-like substance you take a sample, then you dip it into one beaker of calcium and protein, then rinse it in some water and dip in into another beaker of phosphate and protein – you have to do it over

and over and over again to build up the compound,” says Daniel Strange, one of the PhD students working on the research.

The team started to think about ways of automating the arduous process – the ideal being a robot of some kind that they could set up and run in the background. “One way would be to buy very expensive kit off the shelf,” says Strange. “But when we thought about it Lego just seemed like the simplest, and cheapest, way to go about things.”

After a bit of investigation the researchers decided to build cranes from a Lego Mindstorms robotics kit, which contains microprocessors, motors, and sensors that can be programmed to perform basic tasks on repeat. The sample is tied to string at the end of the crane which then dips it in the different solutions.

The team quickly discovered that the miniature machines made from the famous plastic blocks vastly reduced the human time cost of creating the bone samples: “the great thing about the robots is once you tell them what to do they can do it very precisely over and over again – so a day later I can come back and see a fully made sample,” says Strange.

Dr. Michelle Oyen, team leader and lecturer in the engineering department, added: “Research is a funny thing because you might think that we order everything up from scientific catalogues – but actually a lot of the things we use around the lab are household items, things that we picked up at the local home goods store – so our [Lego](#) robots just fit in with that mind-set.”

Bone defects can result from trauma, infection and the removal of tumours, and beyond a certain size of trauma bone is unable to regenerate itself. Current treatments include bone grafts, which can be risky and greatly increase recovery time.

The team at Cambridge are working on hydroxyapatite–gelatin composites to create synthetic bone, and the work is generating considerable interest due to the low energy costs and improved similarity to the tissues they are intended to replace.

The video was made in the lab at the Department of Engineering by Google to help promote their online Science Fair, an international competition run by the company to encourage teenagers to engage with science. On the competition website, Google state that they are “seeking curious minds from the four corners of the globe. Anybody and everybody between 13 and 18 can enter. All you need is an idea.” The submission deadline for entering the Google [Science Fair](#) is 1 April.

Provided by University of Cambridge

Citation: Growing bones with Lego (2012, March 28) retrieved 18 April 2024 from <https://phys.org/news/2012-03-bones-lego.html>

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