UK-based deep tech organization CPI collaborates with researchers to develop novel innovations in HealthTech using the Stratasys Digital Anatomy Printer

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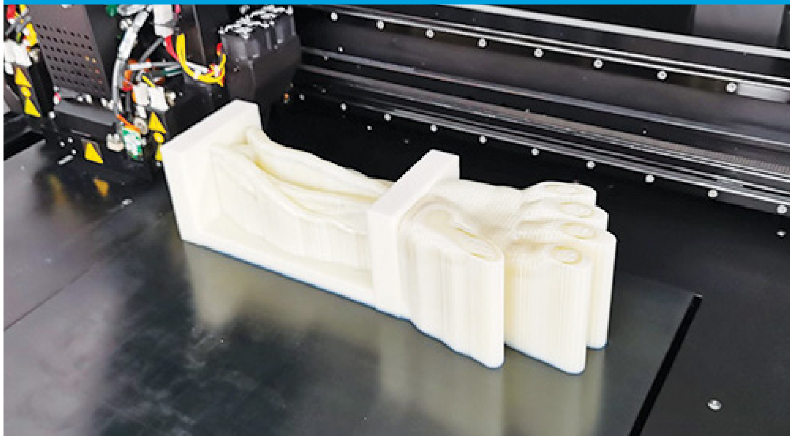
Principal Mechanica
Design Engineer, CPI



stratasys

Case Study

CPI catalyzes the adoption of advanced technologies and manufacturing solutions that benefit people, places and our planet.

This work includes a burgeoning HealthTech division that solves scale-up and adoption challenges for transformative health and wellness technologies to meet global healthcare needs = from medical and in vitro diagnostic devices, to bioprinting, microfluidics, and Digital Anatomy Printing.

Wayne Morton serves as a principal mechanical design engineer at CPI, working to apply interesting technology to new use cases—which includes additive manufacturing and 3D printing.

CPI acquired a Stratasys J735TM printer in 2019 and upgraded shortly after to the J750™Digital Anatomy™Printer, which uses PolyJet™ 3D printing technology, because of its larger build volume and the ability to print with biocompatible materials.

"The Digital Anatomy materials are unique materials we're able to work with for digital anatomy projects and other product development applications. GelMatrix, for example, is a gel-like material that is used to build an easy removal support structure for applications in IVD, microfluidics and fluid handling apparatus."

"Additive gives us the ability to come up with a design in the morning, print in the afternoon, and test it on the same day. In the timeframe it would normally take to design a product, we can go through 50+ iterations to get to a mature product that we have a lot of confidence in very quickly." says Morton.

Digital Anatomy Materials

BoneMatrix™

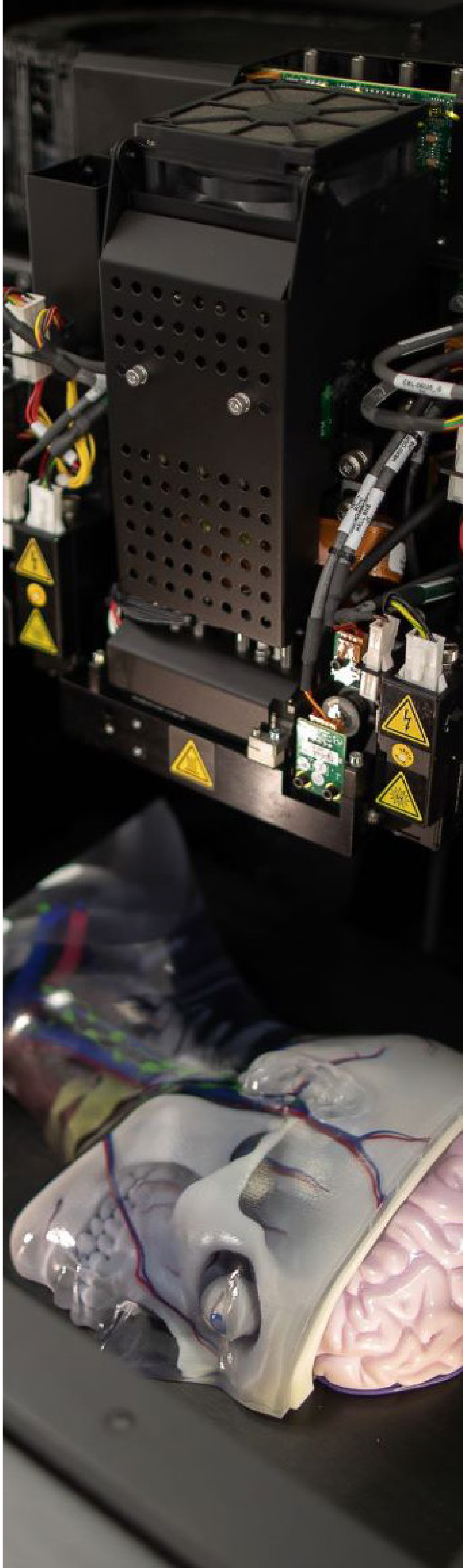
Complex material depositing patterns mimic porous bone structures, fibrotic tissues, and ligaments.

GelMatrix™

Unique GelMatrix material and GelSupport™ depositing patterns allow you to print small, complex vascular structures and easily remove internal support material.

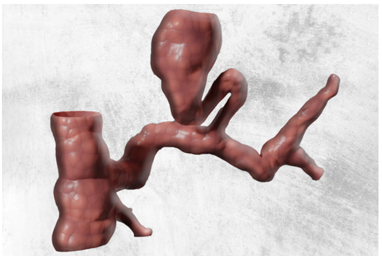
TissueMatrix™

Sophisticated material configurations make models that feel and behave like native organ tissue when force is applied.

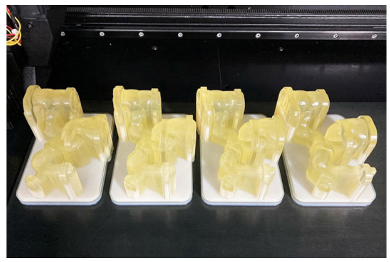


Digital Anatomy in Action

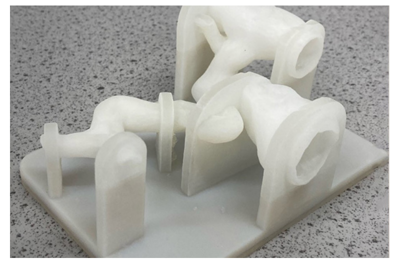
Developing a novel hepatobiliary model for systematic testing of a new medical device



Rendered image of the anatomical design created using medical images at CPI



A series of designs of vessel models related to the liver, that was printed on the J750 Digital Anatomy Printer varying material properties and design features



The final part after post processing and clean up. The flexible support structure allows the anatomical model to move whist still being held in place.

Acknowledgment: Gastrointestinal and Liver Theme of the NIHR Nottingham BRC (Link), Craig Manning [CPI] & Kirst Allis [CPI]

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Digital Anatomy blows people’s minds. They still don’t believe that it’s a 3D printed part.

Wayne Morton
Principal Mechanica Design Engineer, CPI

“We’re working with is the Gastrointestinal and Liver Theme of the NIHR Nottingham Biomedical Research Centre who are developing a new type of endoscope. They wanted to be able to test their device without a cadaver or animal model, so we were able to print part of the biliary tree on a test rig that they could use for in situ testing.

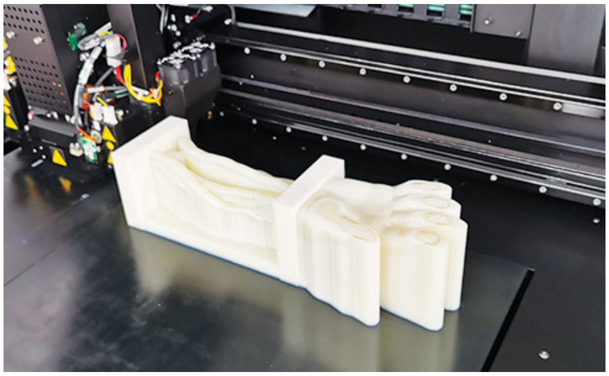
We went through a lot of iterations and material choices, and honed in on their key requirements (for example, biomechanically accurate geometry vs. flexibility vs. resistance), and it took 5 or 6 different materials combined in the model to make it successful.

There aren’t many other ways you could print that model without Digital Anatomy technology. They hadn’t seen anything like that before and didn’t even know it was possible.”

Creating functional and visual models to demonstrate the capabilities of the Digital Anatomy Printer

“When we commission a new piece of equipment at CPI, it’s not just about putting the machine in place, turning it on, getting the green light, and walking away. We need to showcase what the equipment can do for different projects, SMEs, and clients. Part of the commissioning process is making demonstration models to show what the technology can actually do.

We have a couple of really nice Stratasys examples to show the differences between a visual model and a biomechanical model.”

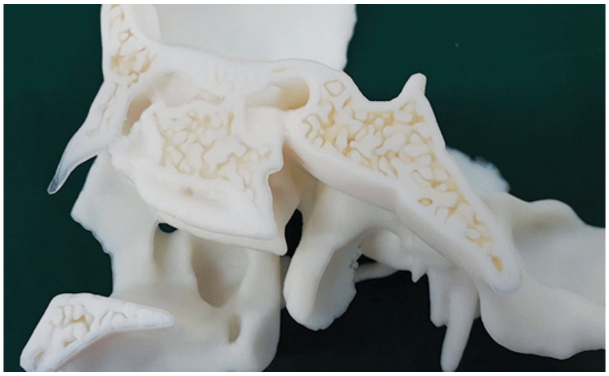


Functional vascular hand model

“We created a hand model embedded into an arm with a vascular system. The vascular system runs through the bottom of the arm and follows back around into the hand.

Inside the hand, we created bone and tissue structures, and then in situ, we added the framework for tube adapters and engineering-type parts.

It’s a nice example that showcases the complexity of the model you’re able to build with Digital Anatomy Printer.”



Visual skull model

“Our skull model shows the very intricate detail that you can achieve with the Digital Anatomy PolyJet system.

There are very few techniques that would enable you to get that level of details, and there are no other techniques that can do the multi-material printing in the same way.”

The Advantages of Digital Anatomy

Multi material.

"The ability to combine materials in the way that we want is very, very powerful. We have a lot of scientists and engineers who are experts in their field. As soon as you give them the freedom to be able to design something in this way or fine tune the material properties to exactly what you want—it's a powerful tool for us."

Unmatched quality.

"We can go down to 14 micron layer height in the high quality mode on the J750 Digital Anatomy Printer, which is fantastic."

Programmed with presets and slice-by-slice material control.

"The existing presets on the Digital Anatomy Printer allow us to create incredibly complicated models from a relatively simple design file."

Tips for investing in 3D printing technology

When people are new to 3D printing, they think of one-off plastic parts, says Morton. But the technology has advanced far beyond.

"Someone may come to us and say, 'I'm thinking about 3D printing for my business. Can you help me?' That's a perfect opportunity for us to partner, because we're an open access facility, so we'll always invite people to come in and look at the different types of technology, and we can show the advantages and disadvantages of each system."

Before investing in a printer, Morton recommends carefully assessing your use case. Then, you can go out and find the right technology fit for the application—not the other way around.

"Talk to someone who has the equipment and can give you an honest answer about how the technology would work for your actual application," says Morton. "Not every printer is the right tool for the job."

> "The technology is amazing because of the amount of possible material variations. It really sets us apart because it gives us another level of quality and design freedom.
>
> Wayne Morton
> **Principal Mechanical Design Engineer, CPI**

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