

# Bringing Innovation to 3D Printing

Professor Rob MacCurdy,  
University of Colorado –  
Boulder

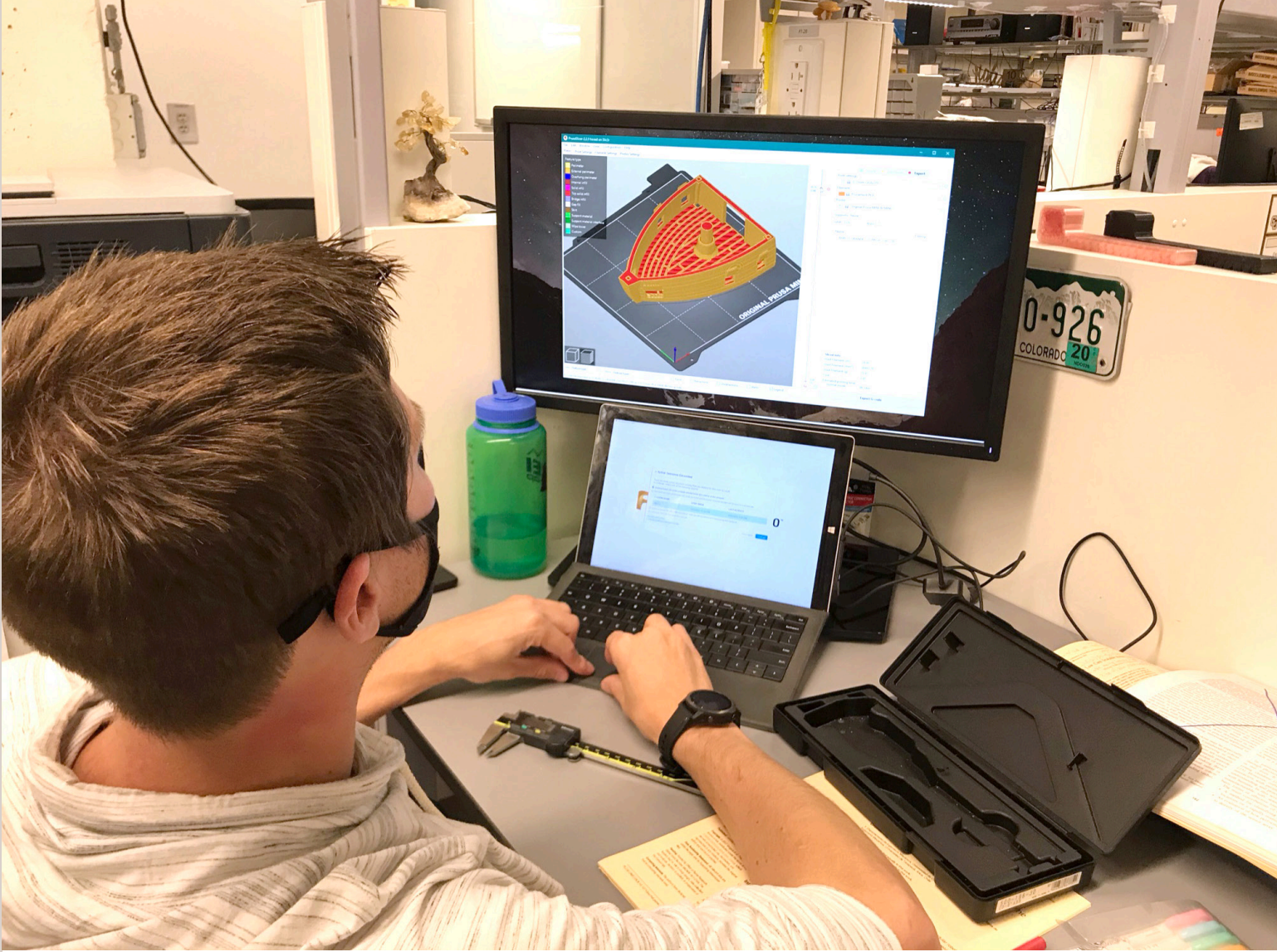


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We are building design tools that help us to address the billions of voxels that are available in this multi-material design space. So, we're trying to make it easier for people to describe 3D models in that space. We're also creating tools that allow users to verify that a print will be printable with their original intent.”

Rob MacCurdy

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## Bringing Innovation to 3D Printing

Professor Rob MacCurdy's vast experience using 3D printing has enabled him to use advanced tools and software to implement multi-material printing to enhance the structure and functionality of his 3D printed robots. Together with his team, he is also working on medical models that are specific to each individual patient and will show surgeons ahead of time what each unique patient's morphology looks like. To assist the advancement of unique technologies, Stratasys® is offering a Research package which provides power users with advanced software tools, providing increased flexibility and accurate control to achieve their innovative goals. Using Stratasys' PolyJet™ printers and specific design tools, users achieve precise control when printing each voxel. By accessing this level of control, MacCurdy has been able to create innovative functionality in his multi-material designs.

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## Challenge

On the campus of University of Colorado, Boulder, a 6,000 square foot engineering center is leading the way in utilizing multi-materials in the design of 3D printed robots. The center, formed by Professor Rob MacCurdy together with three other mechanical engineering professors, includes a team of PhD students, master students and undergraduate students attempting to improve multi-material printing to create robots with advanced functionalities. Professor MacCurdy has been using Stratasys 3D printers to bring about innovation in mechanical engineering for years, but his current goal is to utilize a combination of different materials to 3D print complex structures and functionalities in his 3D printed robots.

In addition, MacCurdy is also working on creating unique medical models to assist surgeons in understanding unique patient morphology. Using these pre-surgical planning models improves patient outcomes by reducing the amount of time for the patient to recover and reducing the cost by shortening the procedures.

Many researchers and innovation centers face similar challenges in their attempt to gain more flexible and precise control over their additive manufacturing processes, but advanced users often find the tools available on the market to be very limiting. To enable users with innovative goals the tools and capabilities they seek to facilitate implementing these ideas with their 3D printing, Stratasys is releasing their Research package.

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While there are many 3D printing manufacturers that are heading in this direction, Stratasys PolyJet printers offer more material channels, and by introducing a variety of materials — including liquid materials — we can increase the realism of these 3D printed parts. We're also pioneers in exploring the ability to change the material properties to make mechanically-realistic, pre-surgical planning models.”

Rob MacCurdy

**Professor, University of Colorado – Boulder**

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## Solution

Robert MacCurdy has been very successful creating robots that are completely 3D printed and utilize hydraulic actuation, which facilitates mechanical operation with the use of fluids. Using added manufacturing to make flexible structures made of multiple materials, the lab has successfully 3D printed using a combination of materials, both rigid and fluid. The fluid is printed by the printer itself rather than being added in at a later stage.

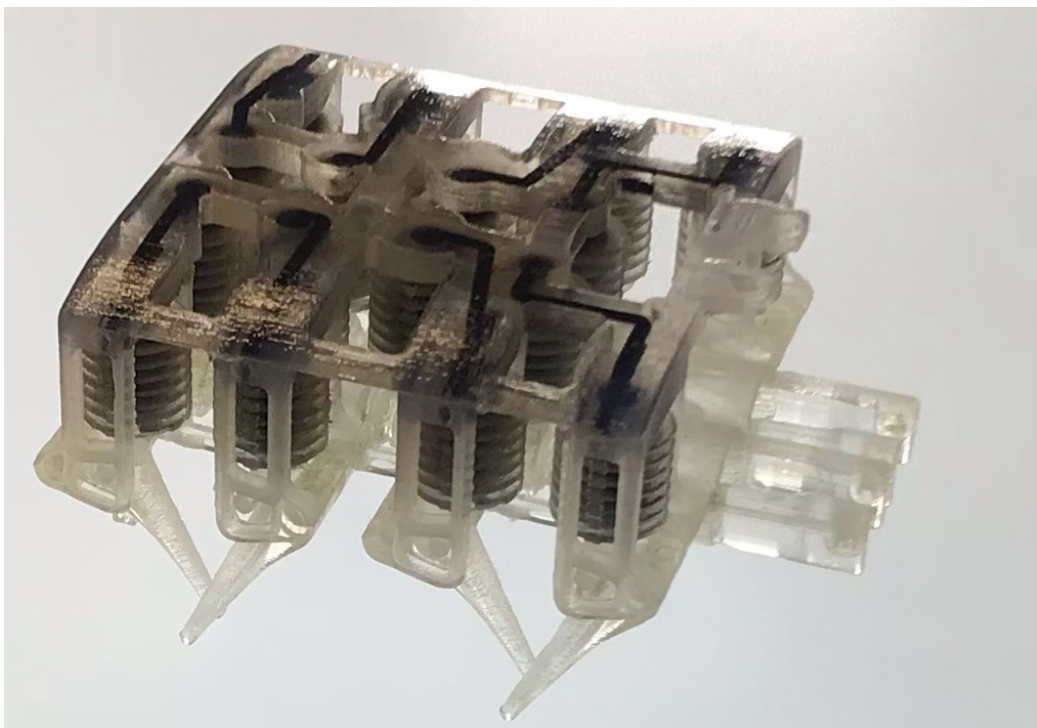
As Professor MacCurdy explains, “This is an essential component of this particular robot because we wouldn’t be able to add the fluid in as a post-processing step. We simply wouldn’t be able to access all the nooks and crannies that are in this design.” By printing the solid and liquid material simultaneously, these robots can be activated as soon as they come out of the printer using the fluid areas as part of the actuation strategy.

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One of the big challenges that we are contending with in my lab is that once you have the ability to 3D print with many different materials and using a voxel print strategy and Stratasys technology, is that we are able to create incredibly complex design.”

Rob MacCurdy

**Professor, University of Colorado – Boulder**



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## Results

Current software offerings aim to help users simplify their work processes, but advanced users often need more specific or flexible control. By providing more advanced command over the printer and the software, users can make detailed edits that enable them to achieve their goals and unparalleled progress.

Stratasys PolyJet printers are designed to make 3D printing easy, but when users want more detailed and complex control over their 3D printing capabilities, they need more advanced tools that give them precise command. Learn more about our Stratasys Research Package [here](#).

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