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NEWSLETTER
For 3D Printing

MIT Creates a New 3D Printer & Art Form: Will the World of Making Glass Be Forever Transformed?

by Bridget Butler Millsaps | Mar 19, 2016

While this is a category bursting at the seams with innovations from the 3D printing industry, we have one more that must be stuffed into the 'what will they think of next?' arena too. Not common at all, however, is this latest of inventions from some of those many terrifyingly bright minds over at MIT: the glass 3D printer. And if you belong to one of the inner circles at this prestigious institution, you know it as the 'viscous sewing machine.

In a recent interview with Sculpteo, Dr. Pierre-Thomas Brun explained a bit about his recent work with molten glass. As an Instructor in Applied Mathematics at MIT, Brun set the stage regarding his work saying that as he began working with Neri Oxman at the MIT Media Lab, she and her team inquired as to whether he would help in the study of molten glass. Together, they all began uncovering the secrets of how to tame it with the 3D printer—and as a result they may eventually the change the way glass is made altogether.

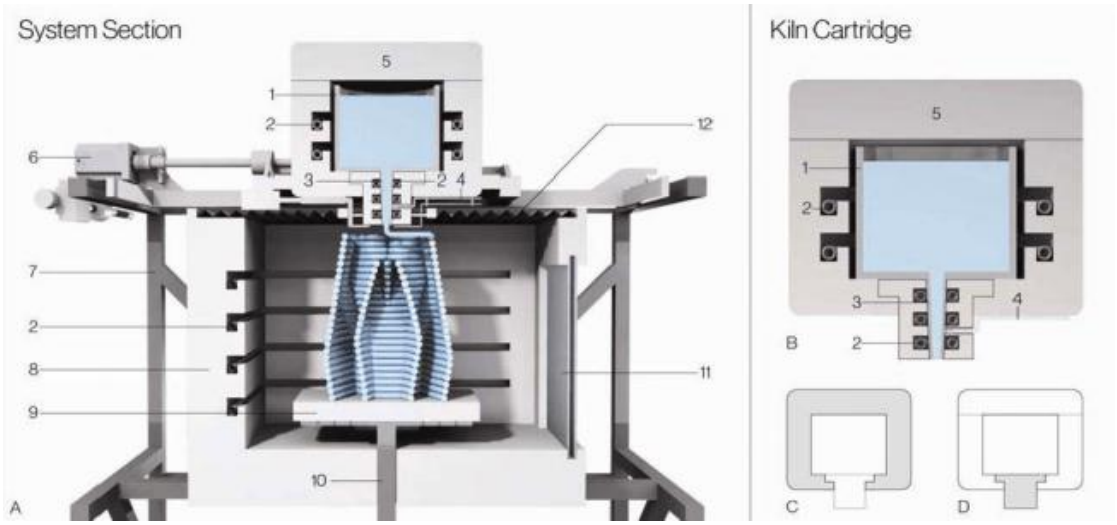
Brun seemingly jumped at the idea to work with Oxman and her team, enthusiastic about working with different materials—and as one can see (we've included a video at the end of this article)—the results are mesmerizing and truly lovely. Dr. Brun's previous experience has been in working with how materials coil, and has brought him to study some unique things indeed, much with the use of manipulation through mathematical formulas:

"My research is concerned with the mathematics driving the world that surrounds us, from mundane situations such as the coil formed by honey falling onto a toast to the

self-similar solution describing the curling of blood cells during egress of malaria parasites," says Brun. "I concentrate on studying the dynamics of fluids and flexible solids, with particular attention given to non-linear effects which I explore combining table sized experiments, precision numerics and theory. I strive to take the best out of these complementary tools to rationalize the physics underlying such systems."
Perhaps a bit tired of working with honey and parasites, Brun expressed that he was happy to work with making something more 'concrete' for a change. He does state, however, that between honey and molten glass, the similarities are not so vast—and that many would be surprised to find out how strong honey is when coiled into a shape and hardened.

Glass, which Brun states is somewhere in the middle of elastic and viscous, while in the 3D printer must be maintained quite strictly in terms of temperature so that they can create a viable structure. Brun says it's about compromise with temperature in order to reach 'a specific viscosity.'

It seems to be well-known within their circles that what they are doing with glass has been previously nearly impossible to achieve–and because of that, they wanted to share their accomplishments with manipulating glass. Mediated Matter, Neri Oxman's group, has teamed up with not just Brun, but also the MIT Glass Lab as they have been working to create the hardware for their molten glass—all for a project titled G3DP (Glass 3D Printing), and indeed it seems to toggle between industrial applications and a spectacular new art form in itself; in fact, the shapes are so mesmerizing that it's easy to forget this group is involved in the nuts and bolts of *science*–and has created a new machine as well.



The team altogether has made new hardware which consists of one section functioning as a kiln, melting glass at temperatures higher than 1000° Celsius. The lower section is constructed like a traditional extruder from which the melted glass flows, then cools, and hardens.

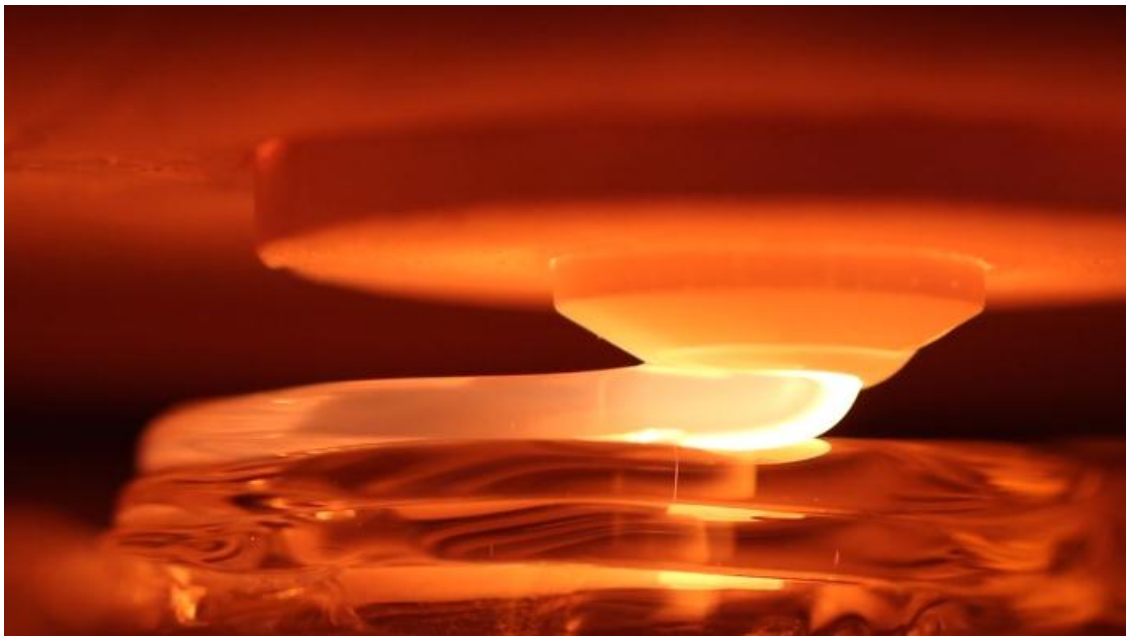
“This research lies at the intersection of design, engineering, science and art, representing a highly interdisciplinary,” states the team in their research regarding 3D printing.

Their findings have also been released in a recent paper, ‘Additive Manufacturing of Optically Transparent Glass.’ Here, they outline the fact that with specific processing parameters—mainly temperature—they are able to control:

- Glass viscosity
- Flow rate
- Layer Height

They found that the resulting 3D printed displayed good adhesion in between each layer, along with ‘satisfying optical clarity.’ They state that the with their new 3D printer they are able to fabricate pieces and production of glass parts that are highly repeatable, translucent, and offer the same aesthetic and mechanical performance of traditional pieces.

“Utilizing the optical nature of glass, complex caustic patterns were created by projecting light through the printed objects,” state the researchers. “The 3D-printed glass objects described here can thus be extended to implementations across scales and functional domains including product and architectural design. This research lies at the intersection of design, engineering, science, and art, representing a highly interdisciplinary approach.”



As with so many other areas of manufacturing being transformed by 3D printing, it would now appear that glass is next. The researchers in this project believe that with their new innovations, those who work in the industry of glass may now look toward enjoying substantive and transformative new applications. All of the creations they’ve made with their new 3D printer will be on display in a show later this year at the Cooper Hewitt, Smithsonian Design Museum.

The G3DP project was created in collaboration between the Mediated Matter group at the MIT Media Lab, the Mechanical Engineering Department, the MIT Glass Lab and the Wyss Institute. Researchers include: John Klein, Michael Stern, Markus Kayser, Chikara Inamura, Giorgia Franchin, Shreya Dave, James Weaver, Peter Houk and Prof. Neri Oxman.

Are you surprised to see molten glass as a material for printing? Tell us your thoughts in the MIT Glass 3D Printer forum over at 3DPB.com.

http://3dprint.com/125096/mit-new-3d-printer-glass-art/