



# MARTIAN 3DESIGN

by Northwestern

## PROGRESS UPDATE

April 1, 2018

Given that the Virtual Design Competition is coming up first, we are concentrating most of our resources on that endeavor. We have been actively researching conditions on the Mars surface, possible hazards our structure may face, and options to make it constructible. An initial envelope has been designed and Skidmore, Owings & Merrill (SOM) has been working to evaluate the loading conditions on our structure. Additionally, we have shaped our design around existing 3D-printing abilities to make its construction feasible.



**Martian Concrete.** Pictured is one of the first samples of Martian concrete developed for this competition by the Martian 3Design by Northwestern team. The concrete is entirely composed of Mars-based materials and has exhibited excellent properties for 3D-printing. This sample will be tested and its composition will be further refined to optimize its mechanical properties for the given application. Additionally, we are in the process of evaluating curing scenarios so that if this material were reproduced on Mars it would exhibit the same results as what we are finding in the laboratory.

While we are focusing our immediate efforts on the Virtual Design Competition, progress is still being made on the physical Construction Competition. On the 3D-printing side, we have a working prototype concrete 3D-printer capable of printing with cement paste. Our next step will be improving the design to also print with Martian concrete. After the improved prototype, we will be scaling up the printer to produce prints of the required size.

In parallel with designing the 3D-printer, we have begun testing on our Martian concrete. Initial samples have been prepared (as shown in the image at left) and the fabrication process is being streamlined so that it can be produced in an automated way for the 3D-printer.

We are so excited to be competing in NASA's 3D-Printed Habitat Challenge and look forward to seeing the other team submissions!

This month's fun team fact:

*Team member Melanie Galantino loves engineering so much, she has a tattoo of her favorite bridge - the Ben Franklin in Philadelphia.*