3D printing exploratory and settlement structures on Mars with Martian Concrete

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Abstract. As interest in the exploration of Mars intensifies and advancements in technology increase the viability of just such a mission, one of the very first problems facing explorers, and eventually settlers, is adequate shelter. An extremely promising candidate material for the building of these structures is concrete made using Martian soil as the aggregate and Sulphur as the cement. This Martian Concrete is strong, and would be more durable in Mars' weaker gravity, more reusable than regular concrete, and significantly dense[1], enough to provide a measure of protection from the radiation found on Mars' surface, which is moderately more pervasive than the radiation on Earth's surface. Building these structures by hand would be inefficient and costly, taking time away from other important and urgent activities. The advent and proliferation of 3D printing in Earth based architecture holds many possibilities for application off-world. Since 3D printing technology is advancing and often providing cheaper ways of building many different types of structures of virtually any design. By adapting and redesigning some of the plans and ideas presented for 3D printing structures on the Moon[2] and conceptualizing architecture that would be better suited for the Martian environment, it is possible to build adequate and lasting structures quickly and cheaply using materials found in abundance on the Martian surface. As numerous projects advancements in 3D printing in architecture and construction have demonstrated[3], 3D printed structures are safe, sound, and easily made. Combining existing technology and Martian Concrete will be the best and most sustainable way to build habitats on Mars.

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[1] L. Wan, R. Wendner, G. Cusatis*, A Novel Material for In Situ Construction on Mars*, (2015)
[2] G Cesaretti, E. Dini, X. De Kestelier, V. Colla, L. Pambaguian *Building components for an outpost on the Lunar soil by means of a novel 3D printing technology*, (2013)
[3] Such as *WASP*, *Dus Architects*, and see this article: http://www.wired.co.uk/article/giant-3d-printer-builds-houses