Robotic Prototypes for 3D printing with Lunar regolith and sunlight developed in the RegoLight project D. A. Urbina[1], H. K. madakashira[1], J. Salini[1], S. Govindaraj[1], R. Bjoerstad[1], J. Gancet[1], M. Sperl[2], A. Meurisse[2] M. Fateri[2], B. Imhof[3], W. Hoheneder[3], P. Weiss[4], M. M. Peer[4], E. Prodeka[5].

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Abstract: The EU-funded RegoLight project advances existing 3D printing technologies and methodologies for the purpose of shaping lunar regolith, a readily available resource on the Moon surface, through the means of concentrated sunlight that sinters the material, making it solid.

An electromechanical feeder system operating in ambient conditions inside a solar simulator has been developed in the context of the project, as well as the software chain enabling the conversion of building blocks in CAD format, into printing paths for the robotic elements.

Two further systems were developed, a TRL5 3D printer capable of operating in vacuum and dusty conditions, a TRL4 mobile printing head capable of sintering regolith simulant, as a proof of concept of a system to be deployed on the Moon.

Challenges include the correct transportation and deposition of the granular material, the dusty environment affecting mechanical and optical components, systems exposed to high temperatures in vacuum conditions and thermal characteristics of the process. Lessons learned from the engineering of these prototype robotic systems and implications for a future lunar base are shown.