

HS/HSL



Newsletter

Issue number 26

Makers @ HS/HSL: Improving Radiation Delivery to Cancer Patients

Maker:	Jeremy Polf
Affiliation:	University of Maryland Marlene and Stewart Greenebaum Comprehensive Cancer Center
Project:	Design and 3D print cylinders for proton therapy research
Used:	Tinkercad.com , Raise3D N2

[Jeremy Polf](#), PhD, is an Associate Professor of [Radiation Oncology](#). He used the HS/HSL Innovation Space to make a series of cylinders, or cylindrical "phantoms". The cylinders represent the current effort of his team's [ongoing research](#) into prompt gamma imaging to improve cancer treatment.

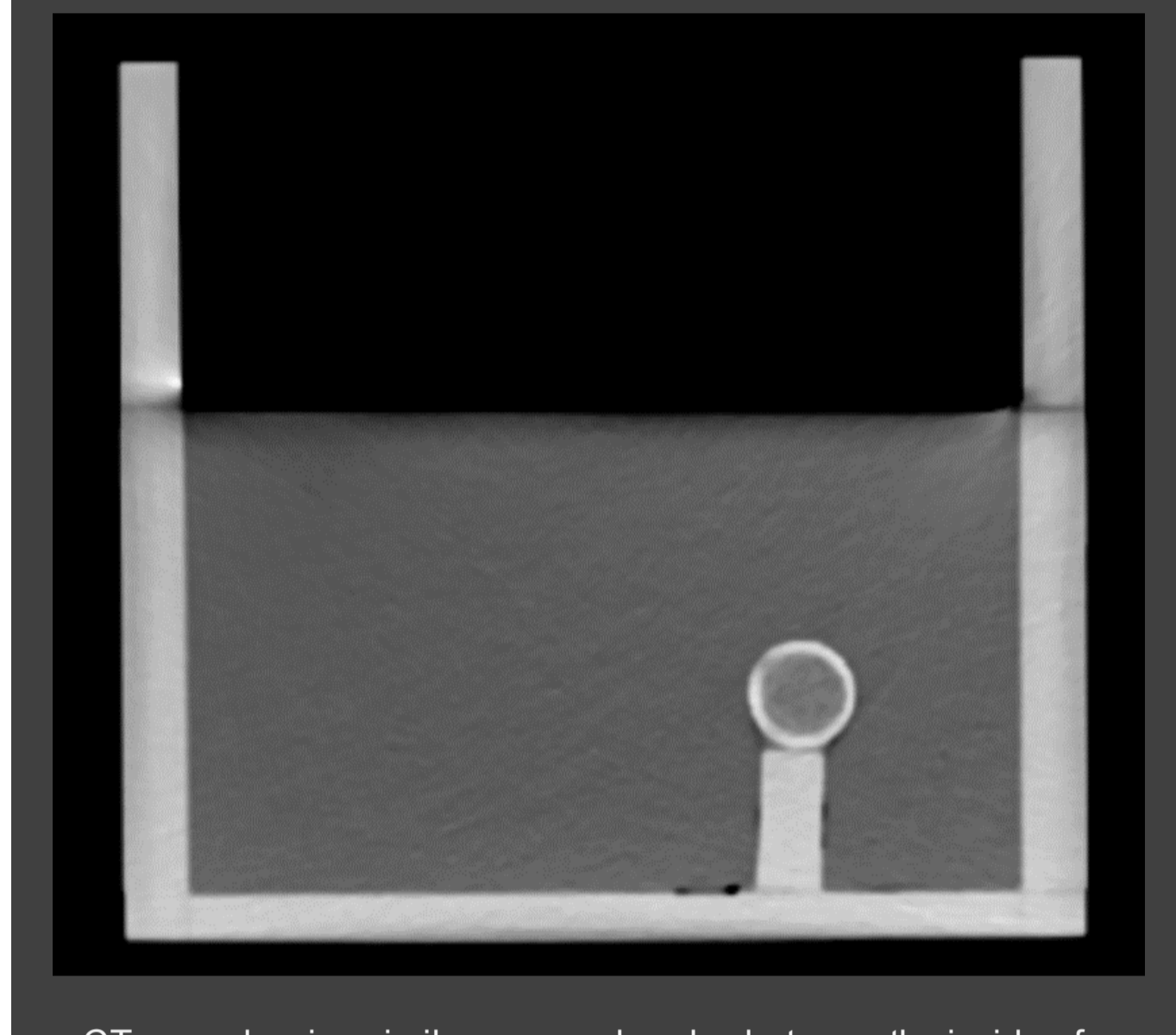
"There are sometimes limitations in how large of a [radiation] dose we can deliver to a tumor because of how close it is to healthy organs and tissues," Dr. Polf observes. "We're trying to improve the precision of radiation delivery, to deliver a higher, more curative doses of radiation to the tumors while sparing the healthy tissues and organs adjacent to them."



Various cylindrical phantoms designed by Dr. Polf using Tinkercad.com, and printed at the HS/HSL Innovation Space. Photo by Jeremy Polf.

Dr. Polf's team is primarily interested in the physical properties of the plastic filament used to 3D print the phantoms. "We submitted some of our prints from the Innovation Space to the [National Institute of Standards and Technology \(NIST\)](#). NIST reported back that the plastic filament has a chemical makeup similar to body tissue, which makes it a good test material," Dr. Polf states.

His team imaged the cylinders in water using a CT scanner. The scans show a resemblance in gray scale value between the cylinder and the surrounding water; the two substances appear similar from the perspective of the CT scanner. Dr. Polf anticipates these "tissue-equivalent" phantoms will help his team collect useful data.



CT scan showing similar gray scale value between the inside of a cylindrical phantom and the larger body of water surrounding it. Photo by Jeremy Polf.

With help from Innovation Space staff, Dr. Polf is guiding his department's purchase of their own 3D printer. In the future, he hopes to create custom plastic filaments to achieve tissue equivalence with different organs.

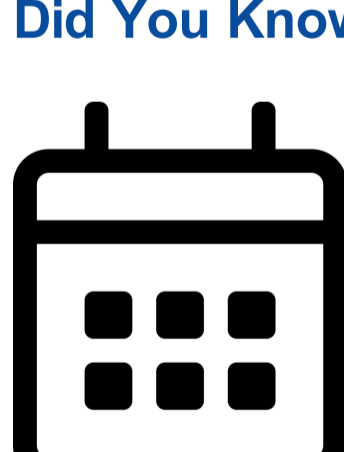


Jeremy Polf received a PhD and MS in physics from [Oklahoma State University](#). He is a Board certified clinical medical physicist.

Emerging Tech in the News and Literature

1. [Use of 3D Printed Materials as Tissue-Equivalent Phantoms](#) ([researchgate.net](#))
2. [Mirror Therapy Versus Augmented/Virtual Reality Applications: Towards a Tailored Mechanism-based Treatment for Phantom Limb Pain](#) ([nih.gov](#))
3. [3D Printing - Encompassing the Facets of Dentistry](#) ([nih.gov](#))

Did You Know?



You can use the [HS/HSL Innovation Space calendar](#) to schedule a consultation and reserve our equipment.

Upcoming HS/HSL Innovation Space Workshops

Introduction to 3D Printing

- February 19, 2019

Introduction to 3D Modeling

- February 25, 2019

[Register for our free workshops](#)

New to the HS/HSL Innovation Space?

The Innovation Space is designed for innovative and collaborative hands-on learning experiences. It offers a [HTC Vive VR system](#), three [3D printers](#), two [3D scanners](#), a plotter for [poster printing](#), a [zSpace](#) virtual reality station, [Google Cardboard](#) viewers, a large DNA model, two molecule kits, a button maker, and a 3D printing pen. The staff provides orientations as well as workshops on a regular basis for those who are new to 3D printing and 3D scanning.

For more information, please visit the [HS/HSL Innovation Space website](#).



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