



Dynamic knotted chiral meta matter

Prof. Dr. Ivan I. Smalyukh

*Department of Physics
University of Colorado
Boulder, CO, USA*



Feynman's words "What I cannot create, I do not understand" inspire us to use the power of topology and chirality to experimentally re-produce phenomena and "bring to life" theories from diverse fields like particle physics and cosmology. Even physically sound models that turned out not describing the real World around us can materialize in the artificial "meta-World" table-top experiments that we meticulously design. I will first discuss how vortex knots in chiral liquid crystals can exhibit atom-like behavior, including fusion, fission and self-assembly into various crystals with giant electrostriction properties. These findings will let us admire the beautiful history of the early model of atoms by Lord Kelvin, as well as the very last poem by Maxwell related to it. I will then show that these vortices interact with light similar to what was predicted for the elusive cosmic strings, with knots and crystalline arrays of vortices allowing to spatially localize beams of light into closed loops and knots. Finally, I will discuss how we also develop entanglement-enabled mesostructured materials that combine thermal super-insulation with pre-designed light transmission in visible and infrared spectral ranges to re-create a highly controlled Earth's greenhouse effect on the single-brick scales, which can be useful for harnessing solar energy, boosting efficiency of buildings and potentially even enabling extraterrestrial habitats.

Wednesday, March 26th, 2025 at 2:15 pm

MPI-DS, Prandtl Lecture Hall
Am Fassberg 11, Göttingen, and
Zoom Meeting ID: 959 2774 3389
Passcode: 651129, [direct link](#)



Max Planck Institute for Dynamics and Self-Organization
Living Matter Physics
Prof. Dr. Ramin Golestanian

Email: golestanian-office@ds.mpg.de, Phone: +49-(0)551/5176-101
Am Faßberg 17, 37077 Göttingen, Germany