On the geometry of fracture and frustration

Koning, V.

Geometric frustration occurs when local order cannot propagate through space. A common example is the surface of a soccer ball, which cannot be tiled with hexaganons only. Geometric frustration can also be present in materials. In fact, geometry can act as an instrument to design the mechanical, optical or physical properties of fluids and solids. The first two parts of this thesis discuss frustrated liquid crystals confined to droplets of various shapes and sizes. The droplet shape determines the orientation of the liquid crystal molecules and in turn its response to light. In the final part we study the fracture mechanics of curved elastic plates. By tuning the curvature of the plate, the critical length at which the crack starts growing can be controlled. Finally, we find that the path that the crack takes depends on the curvature.

Casimir PhD series 2014-25
ISBN 978-90-8593-198-0

November 2014

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Vinzenz Koning

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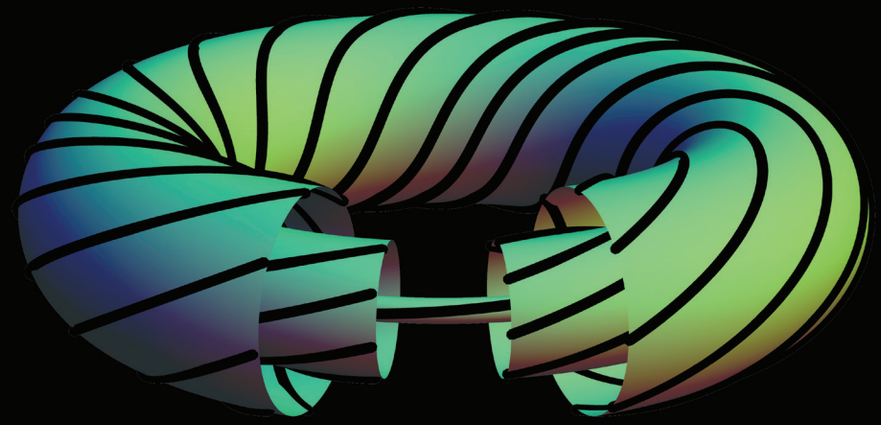

Vinzenz Koning