International Seminar on Applied Geometry in Andalusia

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Materials Geometry: An Introduction

I will survey the use of differential geometry in materials science.

I Local Theory of Curves: *DNA and Other Chiral Polymers*

II Global Theory of Curves

A Fenchels Theorem: *Energetic Bounds on Closed Curves and Knots*

B The Mermin-Ho Relation: *Basis Vectors to the Rescue*

C Link, Twist and Writhe: *Dynamics of twist-storing polymers*

III Local Theory of Surfaces

A The Area Element: *Minimal Surfaces*

B Mean and Gaussian Curvature: *Energetics of Membranes*

IV Global Theory of Surfaces

A The Gauss-Bonnet Theorem: *Foams on Curved Surfaces*

B The Euler Characteristic and the Genus: *Defects on Surfaces*

V Smectic Liquid Crystals: *Materials with One-Dimensional Periodic Order*

References

[1] *The Geometry of Soft Materials: A Primer, Rev. Mod. Phys. 74 (2002) 953,* http://arxiv.org/abs/cond-mat/0203127.

[2] *Smectic Liquid Crystals: Materials with One-Dimensional, Periodic Order,* http://arxiv.org/abs/math.DG/0601494.