Abstract Submitted
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Microlenses of smectic flowers[1] FRANCESCA SERRA, MOHAMED-AMINE GHARBI, Dept. Physics and Astronomy, CBE, LRSM, University of Pennsylvania, IRIS B. LIU, YIMIN LUO, NATHAN D. BADE, Chemical and Biomolecular Engineering, University of Pennsylvania, RANDALL D. KAMIEN, Dept. Physics and Astronomy, University of Pennsylvania, SHU YANG, LRSM, University of Pennsylvania, KATHLEEN J. STEBE, Chemical and Biomolecular Engineering, University of Pennsylvania — The search for new and tunable optical components finds suitable candidates in liquid crystals, which have both reconfigurability and unique optical properties. Here we discuss smectic liquid crystals arranged in focal conic domains (FCDs), which can work as gradient-refractive index microlenses. We exploit this property to create an assembly of microlenses that resembles an insect compound eye. The system consists of a thin layer of smectics on a substrate patterned with microposts. The smectic film is pinned at the microposts, creating a curved interface that induces a hierarchical assembly of FCDs called the "flower pattern": each FCD resembles the petal of a flower around the micropost. The arrangement of FCDs, with the largest FCDs pinned at the top of the microposts and the smallest FCDs in the low-curvature regions far from the post, is mirrored into a hierarchy of focal lengths of the microlenses. This structure is reconfigurable by melting and cooling and it allows visualizing objects placed at different distances, hence it can be exploited for 3D image reconstruction. Similarly to the insect eyes, the flower pattern is sensitive to light polarization: the large FCDs, with the largest eccentricity, only work as microlenses for one direction of light polarization.

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Francesca Serra
Dept. Physics and Astronomy, CBE, LRSM, University of Pennsylvania

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