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Cooperative Ordering at Liquid Crystal Interfaces and its Role in Orientational Memory DAVID PATRICK, Western Washington University — Orientational memory in interfacial liquid crystal films occurs when cells heated above the isotropic transition temperature return to their initial ordered texture upon cooling. First observed over 80 years ago, the origins of orientational memory, which is sometimes called the surface memory effect, remain poorly understood. In this study, films of the thermotropic liquid crystal 4'-octyl-4-cyanobiphenyl on graphite were studied by scanning tunneling and polarizing optical microscopy. Strong orientational memory was observed despite relatively weak molecule-surface interactions of the kind previously thought to be responsible for this effect. By preparing cells in a uniformly oriented initial reference state and separately measuring bulk and surface order parameters as systems were thermally disordered, cooperative interactions were found to play an important role, leading to the recovery of long-range order that neither the bulk nor surface layers alone retained. When the surface and bulk layers were partially decoupled using a magnetic field, orientational memory in the surface layer almost disappeared. The findings provide a new interpretation of the origins of orientational memory in liquid crystal films and underscore the potentially important role of cooperativity in bulk $\leftrightarrow$ interfacial liquid crystal interactions.

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