

Abstract Submitted  
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**Nanoscale Positional Order Correlations: Swarms, Cybotactic Groups, Clusters, and Pretransitional Fluctuations in Liquid Crystals<sup>1</sup>**

SATYENDRA KUMAR, DENA AGRA-KOOIJMAN, Kent State University, BHARAT ACHARYA, Platypus Technologies, LLC — Short-range molecular associations in organic liquids were first described as “cybotactic” groups [1] followed by the development of the swarm theory [2] to explain the structure, strong light scattering, and flow behavior of the nematic (N) liquid crystal phase. However, these ideas became inconsequential with the advent of the Oseen-Frank’s continuum theory [3]. In 1970, de Vries reinvoked *cybotactic* groups for the N phase of bis-(4'-n-octyloxybenzal)-2-chloro-1,4-phenylenediamine. These were eventually understood to be SmC pretransitional fluctuations, i.e., small correlated regions of the lower symmetry phase near the transition. Thermotropic biaxial mesophases have resurrected the faith in *cybotacticity* in the guise of a new word - “clusters”. Previous x-ray studies of normal organic fluids, and calamitic, lyotropic, and bent-core mesogens show that these clusters fall into three groups depending on the relative contributions of normal liquid structure and pretransitional fluctuations. A comparison with other organic and inorganic fluids will also be made.

[1] G.W. Stewart, Phys. Rev. **35**, 726 (1930).

[2] L.S. Ornestein and W. Kast, Trans. Farad. Soc. **29**, 931 (1933).

[3] FC Frank, Discuss. Faraday Soc. **25**, 19 (1958); W. Oseen, Ark. Mat., Astron. Fys. **19**, 1 (1925).

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