In a first approximation, most liquid crystal molecules may be considered as cylindrical rods. The basic feature governing the packing of such molecules is that the long axis of adjacent rods is more or less parallel to each other. It has, of course, always been known that these axes are never exactly parallel, and that there is always a certain amount of orientational disorder, but it appears that such disorder have not been adequately taken into account.

Recently, we have shown that many long-standing discrepancies, between measured layer thicknesses of smectic phases and the lengths of the molecules in these layers, can be simply explained by taking account of the orientational disorder (A. de Vries, A. Ekachai, and N. Spielberg, Mol. Cryst. Liq. Cryst. Lett. (1979) 49, 143). For the smectic A phase, e.g., the directions of the long molecular axes are distributed over a diffuse cone, with infinite rotational symmetry, around the normal to the smectic layer. This results in an "orthogonal" phase, i.e., a phase in which the average direction of the long axes is perpendicular to the layer plane. In such a model for an orthogonal phase, there are two different models possible for a "tilted" phase: the "tilted-cone" model and the "asymmetric-cone" model (A. de Vries, Proceedings of the Third Liquid Crystal Conference of Socialist Countries, Budapest, Hungary, 1979). The tilted-cone model is obtained, from the symmetric-cone model of the smectic A phase, by tilting the cone axis away from the layer normal. The asymmetric-cone-model is obtained from the symmetric-cone model by leaving the cone axis perpendicular to the layer plane, but introducing a certain asymmetry in the distribution of the directions around this axis, retaining only the symmetry of a mirror plane through the cone axis and the tilt direction.

For a well-defined layer structure, the asymmetric-cone model appears to be more appropriate than the tilted-cone model. The asymmetric-cone model has been used, therefore, to describe the smectic C phase (A. de Vries, J. Chem. Phys. (1979) 70, 25). The tilted-cone model, on the other hand, would seem more suitable for phases with very weak smectic order, e.g., for the skewed cybotactic nematic phase. Attempts to fit this model—or any other cone model—to recently obtained accurate and extensive data on the layer thickness and the tilt angle in a series of skewed cybotactic nematic phases (V.N. Sethna, Ph.D. Dissertation, Kent State University, USA, 1980). The fits obtained with this "comical tilted-cone" model were excellent. The differences between the two order parameters were only relatively small, and the local order was always greater than the overall order, as would be expected. The way in which the various model parameters varied as a function of temperature suggests that the conical tilted-cone model applies not only to the skewed cybotactic nematic phase but also the ordinary nematic phase.