A) Highlights of Accomplishments

At the beginning of the contract period (1972) the aim was to use quasi-elastic light scattering to study the nematic-isotropic transition in liquid crystals. The work supported showed this to be a weakly first order transition (as required by symmetry) with pre-transitional behavior quite analogous to that observed near critical points. The mean field approximation appears to satisfactorily explain these observations. These experiments have provided the basis for our understanding of this phase transition.

More recently studies were made of the smectic A-nematic transition in a material (cyanobenzylidene-octyloxyanilene) where it is second order. The smectic A phase is a further step along the way to solidification and the proposed model for this phase transition is mathematically isomorphous to the Ginsburg-Landau model of superconductivity. The results of our experiments were interesting because, contrary to previous work, they showed an inconsistency between the model and the scaling law hypothesis. This work continues under NSF sponsorship; perhaps this is more appropriate in view of its basic nature.

In summary, the work supported under this contract contributed substantially to our fundamental knowledge of liquid crystals and towards testing current ideas in statistical mechanics.

B) Degrees Awarded (Partial Support from this Contract)

Henryk Birecki Ph.D. (1976)
**Abstract**

This report summarizes the results of light scattering studies of the nematic-isotropic and smectic A-nematic phase transitions in liquid crystals. Reference to ten resulting publications is given.
A thesis was written, or will be written, for each of the above degrees.

C) Publications of Work Supported by this Contract

1. "Static and Dynamic Behavior Near the Order-Disorder Transition of Nematic Liquid Crystals", (with T. W. Stinson and N. A. Clark), J. de Physique 33, colloque C-1, 69 (1972).


10. "Director Bend Mode Behavior Near a Nematic to Smectic-A Phase Transition", (with H. Birecki), Mol. Cryst. and Liquid Cryst., to be published.