C. Calderer: James Serrin, The Applied Mathematician

In a tribute article*, *Applied Mathematics and Scientific Thought*, James Serrin states that *the mathematical work of Lamberto Cesari has always had a strong element of concrete reality running through it.* In this article, Serrin sets out his vision and thoughts on *the nature of mathematics as it is related to the physical world.* This is also Serrin's definition of *applied mathematics.* It is within this context, that he gives praise as well as cautionary advice on the use of the term *modeling: … it carries a certain pedestrian tone, subtly lowering the intellectual level.*

This article appeared in 1982, also the inaugural year of the *Institute for Mathematics and its Applications.* Under its founding director, Hans Weinberger, the IMA soon became the world hub of applied mathematics, where Serrin's vision and organizational activities met with those of many other renowned scientists and mathematicians. In that framework, the concept of *modeling* grew into many new and exciting directions, and spanned many fields. In the field of mechanics, Jerry Ericksen led a vigorous research initiative that met with significant progress in nonlinear analysis, especially in the field of liquid crystals.

Works by James Serrin, especially some published in the 1980's and 1990's, remain highly relevant to address some of the challenges posed by current liquid crystal research. In this presentation, I will explore mathematical connections between some topics of Serrin's research, V*ariational Problems for Minimal Surfaces, Fluid Interfaces and Phase Transitions, Liquid Mixtures and the Prandl Boundary Layer Theory* and current problems of liquid crystals. These include *defects*, *colloidal* and *chromonic* systems, and *elasticity*. The latter arise, for instance, in applications to the modeling and design of nanofluidic devices and clustering phenomenon in biology.

* *Nonlinear Analysis and Optimization,* Ed, C. Vinti, Lecture Notes in Mathematics, no. 1107, (1982), pages 19-27, Springer-Verlag.