This Week's Citation Classic

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Mountain R D. Spectral distribution of scattered light in a simple fluid.
Rev. Mod. Phys. **38**:20514, 1966.
[National Bureau of Standards, Washington, DC.]

Light scattered by flutuations in a fluid contains information about the dynamics of the fluctuations in the form of frequency shifts relative to the incident frequency. The theory which relates the spectra to other properties of simple fluids is developed in this review. [The *SCI*® indicates that this paper has been cited over 250 times since 1966.]

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"I joined the National Bureau of Standards (NBS) in September 1963 as a postdoctoral fellow. Shortly after my arrival I was asked to provide a theoretical estimate of the spectral intensity of light scattered by fluctuations in liquidHe^3. Since I had just completed an extensive course on electromagnetic scattering offered by L.L. Foldy, I readily agreed. Thus began what has turned out to be a major research interest for me, the study of liquid state dynamics.

"My mentor at NBS, Mel Green, was deeply interested in critical phenomena and encouraged me to broaden my light scattering work to include critical point effects in nonquantum fluids. This was the time when gas lasers were becoming available as research tools and the possibility of using this tool to probe dynamical processes near the critical point was an exciting prospect.

"Light scattering studies of critical point fluctuations were not something new as critical opalescence had been extensively examined over the previous 60 years. In fact, Ornstein and Zernike[1] had provided in 1918 the essential physical arguments needed to develop theoretical descriptions of the long range correlations which exist near the critical point. So why was there excitement about an old subject? Simply because the frequency resolution available with gas lasers made it possible to study fluctuations with lifetimes of milliseconds and longer. Prior to this, the frequency resolution available limited light scattering studies to processes with lifetimes shorter than nanoseconds. Thus, a new and, as it turned out, rewarding area of research was now open.

"Light scattering by density fluctuations had been analyzed by several authors. In preparing my review I attempted to put various treatments into a single, coherent story so that one not at home in the language of Green functions could follow the development of the theory. This involved the merging of elements of electromagnetism, statistical mechanics, irreversible thermodynamics, and hydrodynamics. I recall that at one point I was quite dissatisfied with my efforts and I threw the whole business into a drawer where it gathered dust for several months while I worked on other things. When I finally returned to writing the review article, I found that the pieces fell into place rather easily. I was able to provide a systematic discussion of the information available from light scattering measurements involving simple fluids. The review provides an introduction to the theory which can be readily understood by most physical scientists. I suspect this is the reason for the large number of citations this article has received.

"During the 1970s light scattering 'matured.' It is now viewed as a tool for studying fluids, polymers, solids, etc., and not as a research subject. The review by Berne and Pecora[2] indicates some of the areas where the tool of light scattering has been applied."

1. **Ornstein L S & Zernike F.** Die linearen Dimensionen der Dichteschwankungen. *Physik. Z.* **19**:134, 1918.
2. **Berne B J & Pecora R.** Laser light scattering from liquids. *Annu. Rev. Phys. Chem.* **25:**233-53, 1974.