

Citation Classics

Van Hove L. Correlations in space and time and born approximation scattering in systems of interacting particles. *Physical Review* **95**:249-62, 1954.

The paper's central aim is to describe the distribution of momentum and energy transfers in a scattering process in terms of the correlation between scattering centers in space and time. The general method is described and illustrated for the case of slow neutron scattering by liquids, gases, and crystals. [The *SCI*[®] indicates that this paper was cited 582 times in the period 1961-1975.]

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"Although I knew that my 1954 paper was much read, I was very surprised to hear that it was among the most cited science articles of the last 15 years. Wondering why the paper was so often referred to, I got the impression that the general considerations which led my work at that time may have something to do with its later impact.

"In 1952-1953 I was working on the theoretical interpretation of slow neutron scattering experiments in solids and liquids, the aim being to extract information on structure properties of the solid or liquid from the scattering data. I was disturbed by the difficulty, with the methods then in use, to

obtain a general physical insight into a problem which was basically the same, whether the scattering system was a solid, a liquid or a molecule. In the case of X-ray scattering this difficulty had been overcome as early as 1927 by F. Zernike and J. Prins by their description of the distribution of scattered X-rays in terms of the pair correlation function of the scattering system. My aim was to achieve something similar for the more general case where, contrary to X-rays, the energy transfer could not be neglected with respect to the incident energy of the particle to be scattered.

"After the question had been formulated in this way, the answer turned out to be both very simple and very general. Basically it consisted in realizing that the pair correlation concept had to be generalized to deal with both space and time co-ordinates of the scattering centres. The 1954 paper does no more than to work out this idea. It may well be that this combination of simplicity and generality is one of the reasons why the paper was so often quoted. For example, its basic idea can be found again in later work by many people on the time-dependent Green functions used in the field-theoretic treatment of solid-state physics problems.

"In addition, there was of course the circumstance that my article was written at the moment when slow neutron scattering began to be extensively exploited as a tool for structure studies of condensed matter. It was only natural for the many experimentalists working in this new domain to make reference to the paper when publishing their results."