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This Week's Citation Classic

Perey F G. Optical-model analysis of proton elastic scattering in the range of 9 to 22 MeV. *Phys. Rev.* **131**:745-63, 1963. [Oak Ridge National Laboratory, Oak Ridge, TN]

The elastic scattering of protons from nuclei can be very well represented by a spherical potential. The functional dependence of the potential parameters with the energy of the incident protons and the number of neutrons and protons in the target nuclei can be explained on the basis of a few simple considerations. [The *SCI*® indicates that this paper has been cited over 860 times since 1963.]

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"I was very surprised that this paper ranked high in the number of times it has been cited for a physical sciences paper. I will not conjecture why. However, I was not surprised that the results in it are still essentially valid today and will likely remain so for some time. In fact, I became fairly confident of this a long time ago, which explains why I turned my attention to other areas of nuclear physics. In order for this paper to have been frequently cited, this also must have appeared quite likely to other nuclear physicists.

"An interesting aspect of this paper, I think, is that it contains no new ideas. All of the information used in the paper was readily available, had been published for some time, and was well known. It therefore owes its 'success' to the process used to draw inferences from well known facts. We must be able to perceive that, given the data, the conclusions have a high probability of being 'correct.' This last point is an essential aspect of the paper if we are to be able to capitalize upon its results. The paper has been cited mostly for three reasons: by those who needed in their work some 'reliable data,' those who felt that the technique used in the paper, having been successful, could very well work for them in similar circumstances, and finally those who perceived that it would likely be rather significant if the results of the paper could be shown 'incorrect.'

"It is possibly not a coincidence that in the last few years I have become interested in theories of logical inference. When told that this paper had been cited many times, I reread it carefully; I had not done so in more than 15 years. I was rather amazed to see that this paper provides another striking example of the great usefulness of a theory of logical inference developed more than 200 years ago but is thought to have been so thoroughly discredited in the last 100 years that it is hardly known today! Although most scientists today do not know this formal theory, they have heard of it, I am sure.withoutfully realizing what it was. This theory of logical inference is what most statistics textbooks refer to as the old theory of probability. They do so most often in their introduction, when discussing Bayes Theorem or Laplace's rule of succession. The 'deficiencies' of the old theory are supposed to have been cured by the theory of statistics. However, to a growing number of us who have taken the pains to study the old theory and successfully transposed its language in modern terms, we have realized that it has not been replaced by the theory of statistics! The old probability theory was nothing but a theory of information and many of its results have been rediscovered independently in the last 30 years.

"I hope the above comments will be found stimulating to a few people and regret that the small space allowed here does not enable me to substantiate in a logical fashion the above claims."