This Week's Citation Classic®

[Harvard University. Cambridge, MA]

February 22, 1990

In 1946, just after World War II, I began my work as a graduate student under C.H. Collie and H. Halban at Oxford. My task was to measure the angular distribution in the photodisintegration of the deuteron, as the work progressed, we redefined the task to measuring the absolute value of the cross section. We realized that theoretically this depends upon the long distance part of the deuteron wave function and its normalization and this gave a measure of the range of nuclear forces. This work was updated by P. Marin, G.R. Bishop, and Halban and by W.R. McMurray and Collie.

From 1952 to 1955 at AERE Harwell until 1961 at Harvard, I worked on nucleon-nucleon interactions, particularly with others in the field. We found double the cross section for neutron-proton scattering near 0° at 150 MeV that others had found. We found a total larger neutron-proton (pp) cross section. But the most dramatic difference was in 1959 when we found a different sign from that found by others for the depolarization parameter D in pp scattering at 150 MeV. The two leading theoretical calculations at that time agreed numerically but also had that difference in sign! We were correct, and the results can be interpreted to show that the spin-orbit coupling in the nucleon-nucleon interaction is a surface effect and not a volume effect.

The spin dependence in proton scattering, particularly from carbon, opened a new experimental tool in the 27 years since I wrote it. But the major conclusions are little changed. I would add, however, one new perspective since 1961. In 1961 the fraction of the D state seemed to have contributed to the obsolescence. At all levels the precision of the data has been improved. For example, the binding energy of the deuteron-already known to 0.01 percent—is now known to a factor of 10 or better.

Since publication of this book, almost all of the data therein became obsolete—and in a couple of cases I have contributed to the obsolescence. At all levels the precision of the data has been improved. For example, the binding energy of the deuteron—already known to 0.01 percent—is now known to a factor of 10 or better.

But the major conclusions are little changed. I would add, however, one new perspective since 1961. In 1961 the fraction of the D state seemed difficult to understand and its value seemed to vary from experiment to experiment. As a result of detailed polarization experiments on nucleon scattering, the deuteron D state is now understood to a few percent accuracy; T.E.O. Ericson et al. have shown that the tensor forces that produce the D state are a beautiful and elegant example of the role of the one-pion-exchange. In all, although I regret the far too numerous misprints, I feel happy that the book has stood up well in the 27 years since I wrote it.