

**Zeitschrift:** Helvetica Physica Acta  
**Band:** 34 (1961)  
**Heft:** [6]: Supplementum 6. Proceedings of the International Symposium on polarization phenomena of nucleons

**Artikel:** Optical model analysis of proton-nucleus elastic scattering data in the energy range 8-17 MeV  
**Autor:** Bjorklund, F. / Campbell, G. / Fernbach, S.  
**DOI:** <https://doi.org/10.5169/seals-513290>

### **Nutzungsbedingungen**

Die ETH-Bibliothek ist die Anbieterin der digitalisierten Zeitschriften auf E-Periodica. Sie besitzt keine Urheberrechte an den Zeitschriften und ist nicht verantwortlich für deren Inhalte. Die Rechte liegen in der Regel bei den Herausgebern beziehungsweise den externen Rechteinhabern. Das Veröffentlichen von Bildern in Print- und Online-Publikationen sowie auf Social Media-Kanälen oder Webseiten ist nur mit vorheriger Genehmigung der Rechteinhaber erlaubt. [Mehr erfahren](#)

### **Conditions d'utilisation**

L'ETH Library est le fournisseur des revues numérisées. Elle ne détient aucun droit d'auteur sur les revues et n'est pas responsable de leur contenu. En règle générale, les droits sont détenus par les éditeurs ou les détenteurs de droits externes. La reproduction d'images dans des publications imprimées ou en ligne ainsi que sur des canaux de médias sociaux ou des sites web n'est autorisée qu'avec l'accord préalable des détenteurs des droits. [En savoir plus](#)

### **Terms of use**

The ETH Library is the provider of the digitised journals. It does not own any copyrights to the journals and is not responsible for their content. The rights usually lie with the publishers or the external rights holders. Publishing images in print and online publications, as well as on social media channels or websites, is only permitted with the prior consent of the rights holders. [Find out more](#)

**Download PDF:** 21.02.2026

**ETH-Bibliothek Zürich, E-Periodica, <https://www.e-periodica.ch>**

## Optical Model Analysis of Proton-Nucleus Elastic Scattering Data in the Energy Range 8-17 MeV

By F. BJORKLUND, G. CAMPBELL, and S. FERNBACH  
Lawrence Radiation Laboratory, Livermore, California

The proton nucleus elastic scattering data in the energy range 8 to 17 MeV have been analyzed using the Coulomb potential of a uniform charge distribution within a sphere of radius  $R_0$  plus the following nuclear potential

$$V = V_{CR} \varrho(r) + i V_{CI} q(r) + V_{SR} \left( \frac{\hbar}{\mu c} \right)^2 \frac{1}{r} \frac{d\varrho(r)}{dr} \boldsymbol{\sigma} \cdot \mathbf{l}$$

where

$$\varrho(r) = \frac{1}{1 + \exp (r-R_0)/a},$$

and

$$q(r) = \exp \left[ -\frac{(r-R_0)^2}{b^2} \right],$$

$$R_0 = r_0 A^{1/3}.$$

The notation used is that of RIESENFELD and WATSON. For all elements and energies  $a = 0.65$ ,  $b = 1.2$ ,  $V_{CI} = 11$  and  $R_0 = 1.25$ . At each energy  $V_{CR}$  was increased with increasing mass number in the following way,

$$V_{CR} = V_0(E) + Z/A^{1/3}$$

$V_0$  decreased smoothly from 44.5 at 8 MeV to 40.7 at 17 MeV. The polarization and differential cross section curves are less sensitive to small changes in  $V_{SR}$  than to changes in the other parameters.

At 14 and 17 MeV  $V_{SR} = 8 \pm 1$  MeV. At energies below 14 MeV it was necessary to reduce  $V_{SR}$  to  $5 \pm 1$  MeV to obtain agreement with the experimental polarization and differential cross section data. Preliminary calculations indicate that the spin-orbit potential may be even smaller below 8 MeV.

The agreement with experimental data is good for medium weight and heavy nuclei becoming very poor for light elements.

For references to experimental data and other theoretical work see the review articles by: HELMUT FAISSNER, *Ergebnisse der exakten Naturwissenschaften*, Bd. XXXII, 1959, E. J. Squires A.E.R.E. t/p. 75.