

# Charlotte Elster

Professor of Physics, Ohio University

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## Professional Preparation:

<i>Institution</i>	<i>Major</i>	<i>Degree</i>	<i>Date</i>
University of Bonn	Physics	Diploma	1983
University of Bonn	Theoretical Physics	Ph.D.	1986

## Appointments:

Professor of Physics	Ohio University	2002-
Director, Institute of Nuclear and Particle Physics	Ohio University	2003-09
Senior Research Scientist	Forschungszentrum Jülich	1999-03
Associate Professor of Physics	Ohio University	1996-02
Assistant Professor	Ohio University	1991-96
Postdoctoral Fellow	The Ohio State University	1989-91
Battelle Fellow	The Ohio State University	1988-89
Research Fellow	University of Maryland	1987-88
Research Fellow	Kent State University	1986-87

## Honors:

Fellow of the American Physical Society (APS)	2001
JUSTIPEN Fellow, Nuclear Science Research Center, RIKEN (Japan)	2008 & 2011
Battelle Fellow, The Ohio State University	1988-89

## National and International Committees:

Member, JLAB Program Advisory Committee	2018-
Member, Editorial Board, Few-Body Systems	2015-
Member, FRIB Theory Alliance Board	2017-20
Chair, Feshbach Prize Committee, DNP	2017-18
Chair, DNP Nominating Committee	2014-15
Organizer, 21st International Few-Body Conference	2013-2015
Convener, Low Energy Nuclear Physics Town Meeting and White Paper	2014-15
Member, Program Committee, DNP	2012-14
Chair, Bonner Prize Committee, DNP	2010-11
Secretary Treasurer, Few-Body Topical Group, APS	2003-15
DOE/NSF Nuclear Science Advisory Committee	2007-09
INT National Advisory Committee	2006-08
NNPSS Steering Committee, DNP (Chair 2007-08)	2005-09
Member, Executive Committee, Division of Nuclear Physics, APS	2001-03
Member, Program Committee, Neumann Institute for Computing, FZJ	2001
Program Advisory Committee, IUCF (Chair 1998-99)	1997-00
Member, Executive Committee, Few-Body Topical Group, APS	1996-99
Chair, Statewide Users Group at the Ohio Supercomputer Center	1996-98
Member, Committee on the Status of Women in Physics, APS	1992-95

## Publication Summary

Refereed Journals	:	98
Invited talks at professional meetings	:	62
Contributions to professional meetings	:	129
Books, un-refereed articles, proceedings	:	46

## Research Support

Federal/State career total	:	\$5,000,000+
Computational Support	:	National Energy Research Supercomputer Center (NERSC), Ohio Supercomputer Center (OSC)

## Consultantships, Memberships

Consultantships:	Los Alamos National Laboratory (1988-1994)
Member:	American Physical Society (APS); APS: Division of Nuclear Physics, Few-Body Topical Group, Division of Computational Physics; Deutsche Physikalische Gesellschaft (DPG)

## Current Research Support

- ‘Nuclear Dynamics and Astrophysics in Few and Many-Body Systems’, U.S. Department of Energy, 11/19 - 10/22, \$1,160,000
- Computational Support through the National Energy Research Supercomputer Center (NERSC) and the Ohio Supercomputer Center (OSC).

## Research Interests

Nuclear reaction with stable and exotic nuclei. Application of few-body methods to nuclear reactions.

Scattering of nucleons from very light nuclei in the intermediate energy range. Investigations of relativistic effects in few-body and many-body dynamics and the role of subnuclear degrees of freedom. Modeling light nuclei as three-body systems.

Multiple scattering theories with non-relativistic as well as relativistic dynamics. Application to nucleon-nucleus scattering and nuclear reactions with exotic nuclei.

Effective field theories; especially models for the nucleon-nucleon, nucleon-nucleon-pion, and pion-nucleon system derived from hadronic field theories, pion production in nucleon-nucleon scattering.

Computational physics with emphasis on nuclear reactions and few-body systems. Development of computational tools to carry out three and four nucleon scattering without employing methods of angular momentum decomposition. Developing of computational tools to describe (d,p) reactions on exotic nuclei.

## Teaching Experience

- **Graduate Courses:** Quantum Mechanics, Relativistic Quantum Mechanics, Nuclear Theory, Nuclear Reactions, Field Theory, Mathematical Methods in Physics, Scattering Theory, Computational Physics, Introduction to Nuclear Physics.
- **Undergraduate Courses:** Introductory Physics for non-physics majors, Calculus based Introductory Physics, Modern Physics, Dynamic Meteorology.

- **Web-based Courses:** Computational Physics for the Ralph Regula School for Computational Science, Interactive Physical Science Course for non-science majors using multimedia and java-based applications, course incorporated in LonCapa.

### Graduate and Undergraduate Research Participation

- M. Burrows Ph.D. Thesis, Ohio University, September 2020  
'*Ab initio* Leading Order Effective Interactions for Scattering of Nucleons from Light Nuclei'  
MS Thesis, Ohio University, September 2016  
'Translationally Invariant Local Densities for Light Nuclei'
- G. Tupper Honors Thesis, Ohio University, Spring 2020  
Effect of Nonlocality in Nuclear Potentials on Nuclear Observables and Scattering Wave Functions
- L. Hlophe Ph.D. Thesis, Ohio University, June 2016  
'Separable Representation of Nucleon-Nucleus Optical Potentials as Input to (d,p) Reaction Calculations'
- A. Orazbayev Ph.D. Thesis, Ohio University, September 2013  
'Open Shell Effects in a Microscopic Optical Potential for Elastic Scattering of Exotic Helium Isotopes'
- K. Khaldi Ph.D. work in collaboration with U. Bourmerdes, Algeria, July 2011:  
'The Borromean Nucleus  ${}^6\text{He}$  as Three-Body System'
- T. Lin Ph.D. Thesis, Ohio University, June 2008  
'Poincare Invariant Three-Body Scattering'
- H. Liu Ph.D. Thesis, Ohio University, August 2005  
'Study of the Nuclear Three-Body System with Three-Dimensional Faddeev Calculations'
- A. Schwick Diplom in Physics, University Bonn, November 2004  
'Analyse der pp-Streuung im GeV-Bereich anhand des Mesonaustauschmodells'
- A. Motzke Diplom in Physics, University Köln, March 2002  
'Der Einfluss von Dreiteilchenschnitten auf die Reaktion  $NN \rightarrow NN\pi$ .'
- G. Caia MS Degree, Ohio University, November 2001.  
'Study of Derivative Couplings in an OBE Model in Time Ordered Perturbation Theory.'
- S.P. Weppner Ph.D. Thesis, Ohio University, August 1997.  
'Microscopic Calculations of First Order Optical Potentials for Nucleon-Nucleus Scattering.'
- E.E. Evans Honors Thesis, Ohio University, Spring 1995  
'Effect of a nonlocal Yukawa interaction on the bound state properties of a two and three fermion bound state.'
- B.E. Barmore Honors Thesis, Ohio University, Spring 1993  
'Sensitivity of Back Angle (n,p) Scattering to the Pion-Nucleon Coupling Constant.'

## Publications in Refereed Journals (2014-2021):

1. Nuclear spin features relevant to *ab initio* nucleon-nucleus elastic scattering, R.B. Baker, M. Burrows, Ch. Elster, K.D. Launey, P. Maris, G. Popa, S.P. Weppner, Phys. Rev. C**103**, 054314 (2021).
2. *Ab initio* Leading Order Effective Potentials for Elastic Nucleon-Nucleus Scattering, M. Burrows, R.B. Baker, Ch. Elster, S.P. Weppner, K.D. Launey, P. Maris, G. Popa, Phys. Rev. C**102**, 034606 (2020).
3. From Bound States to the Continuum, C.W. Johnson *et al.*, J. Phys. G**47**, 123001 (2020).
4. Deuteron-alpha scattering: separable vs nonseparable Faddeev approach, L. Hlophe, Jin Lei, Ch. Elster, A. Nogga, F.M. Nunes, D. Jurciukonis, A. Deltuva, Phys. Rev. C**100**, 034609 (2019).
5. *Ab initio* Folding Potentials for Nucleon-Nucleus Scattering based on NCSM One-Body Densities, M. Burrows, Ch. Elster, S.P. Weppner, K.D. Launey, P. Maris, A. Nogga, G. Popa, Phys. Rev. C**99**, 004603 (2019).
6. Few-body universality in the deuteron-alpha system, Jin Lei, L. Hlophe, Ch. Elster, A. Nogga, F.M. Nunes, D.R. Phillips, Phys. Rev. C**98**, 051001(R) (2018).
7. *Ab initio* Translationally Invariant Nonlocal One-body Densities from No-core Shell-model Theory, M. Burrows, Ch. Elster, G. Popa, K.D. Launey, A. Nogga, P. Maris, Phys. Rev. C**97**, 024325 (2018).
8.  ${}^6\text{Li}$  in a Three-Body Model with Realistic Forces: Separable vs. Non-Separable Approach, L. Hlophe, Jin Lei, Ch. Elster, A. Nogga, F.M. Nunes, Phys. Rev. C**96**, 064003 (2017).
9. Separable Representation of Multichannel Nucleon-Nucleus Optical Potentials, L. Hlophe and Ch. Elster, Phys. Rev. C**95**, 054617 (2017).
10. White paper on nuclear astrophysics and low energy nuclear physics, Part2: Low-energy nuclear physics, J. Carlson, M.P. Carpenter, R. Casten, Ch. Elster, P. Fallon, A. Gade, C. Gross, G. Hagen, A.C. Hayes, D.W. Higinbotham, C.R. Howell, C.J. Horowitz, K.L. Jones, F.G. Kondev, S. Lapi, A. Macchiavelli, E.A. McCutchen, J. Natowitz, W. Nazarewicz, T. Papenbrock, S. Reddy, M.A. Riley, M.J. Savage, G. Savard, B.M. Sherill, L.G. Sobotka, M.A. Stoyer, M. Betty Tsang, K. Vetter, I. Wiedenhover, A.H. Wuosamaa, S. Yenello, Prog. Part. Nucl. Phys. **94**, 94 (2017).
11. Separable Representation of energy-dependent Optical Potentials, L. Hlophe and Ch. Elster, Phys. Rev. C**93**, 034601 (2016).
12. Coulomb Wave Functions in Momentum Space, V. Eremenko, N.J. Upadhyay, I.J. Thompson, Ch. Elster, F.M. Nunes, G. Arbanas, J.E. Escher, L. Hlophe, Comp. Phys. Comm. **187**, 195 (2015)
13. Separable Representation of Proton-Nucleus Optical Potentials, L. Hlophe, V. Eremenko, Ch. Elster, F.M. Nunes, G. Arbanas, J.E. Escher, I.J. Thompson, Phys. Rev. C**90**, 061602(R) (2014).

14. The Relativistic Bound State in a 3D Formulation, M.R. Hadizadeh, Ch. Elster, W.N. Polyzou, Phys. Rev. **C90**, 054002 (2014).
15. The  ${}^6\text{He}$  Nucleus in Halo EFT, C. Ji, Ch. Elster, and D. R. Phillips, Phys. Rev. **C90**, 044004 (2014).
16. Panel Session on the Future of Few-Body Physics, B.L.G. Bakker, J. Carbonell, Ch. Elster, E. Epelbaum, N. Kalantar-Nayestanaki J-M. Richard, Few-Body Systems **55**, 683 (2014).
17. The Coulomb Problem in Momentum Space without Screening, N.J. Upadhyay, V. Eremenko, L. Hlophe, F.M. Nunes, Ch. Elster, G. Arbanas, J.E. Escher, I.J. Thompson, Phys. Rev. **C90**, 014614 (2014).
18. Relativistic Formulation of Reaction Theory, W.N. Polyzou, Ch. Elster, J. Phys. G **41**, 094006 (2014).
19. Revisiting Surface-Integral Formulations for One-Nucleon Transfers to Bound and Resonance States, J.E. Escher, I.J. Thompson, G. Arbanas, Ch. Elster, V. Eremenko, L. Hlophe, F.M. Nunes, Phys. Rev. **C89**, 054605 (2014).

**Other important publications:**

1. 3N Scattering in a Three-Dimensional Operator Formulation, W. Glöckle, I. Fachrudin, Ch. Elster, J. Golak, R. Skibiński, H. Witała, Eur. Phys. J. **A43**, 339 (2010).
2. Poincaré Invariant Three-Body Scattering at Intermediate Energies, T. Lin, Ch. Elster, W.N. Polyzou, H. Witała, W. Glöckle, Phys. Rev. **C78**, 024002 (2008).
3. Relativistic Effects in Exclusive pd Breakup Scattering at Intermediate Energies, T. Lin, Ch. Elster, W.N. Polyzou, W. Glöckle, Phys. Lett. **B 660**, 345 (2008).
4. Three-Body Scattering at Intermediate Energies, H. Liu, Ch. Elster, W. Glöckle, Phys. Rev. **C72**, 054003 (2005).
5. Application of Multiple Scattering Theory to Lower Energy Elastic Nucleon-Nucleus Reactions, C.R. Chinn, Ch. Elster, R.M. Thaler, S.P. Weppner, Phys. Rev. **C51**, 1418 (1995).
6. Momentum Space Treatment of Coulomb Distortions in a Multiple Scattering Expansion, C.R. Chinn, Ch. Elster, R.M. Thaler, Phys. Rev. **C44**, 1569 (1991).
7. Full Folding Optical Potentials in Elastic Proton-Nucleus Scattering, T. Cheon, Ch. Elster, E. F. Redish, P.C. Tandy, Phys. Rev. **C41**, 841 (1990).
8. The Bonn Meson Exchange Model for the Nucleon-Nucleon Interaction, R. Machleidt, K. Holinde, Ch. Elster, Physics Reports **149**, 1 (1987).