

PEOPLE

[Faculty](#)[Research Staff](#)[Postdocs](#)[Administrative Staff](#)[Women in NSE](#)[Meet Our Students](#)**Sow-Hsin Chen**Professor of Nuclear Science and Engineering
(Emeritus)sowhsin@mit.edu

617-253-3810

617-258-8863 (fax)

24-209A

Lab: NW13-205; 617-253-3794

Awards and Honors

2008 Clifford G. Shull Prize from the Neutron Scattering Society of America:

"For seminal contributions to understanding the dynamical properties of supercooled and interfacial water using neutron scattering techniques, and for an exceptional record of training young scientists." [Press release](#)**Education**

B.S., Physics, National Taiwan University, 1956

M.S., Physics, Tsinghua University, Taiwan, 1958

M.S., Nuclear Science, University of Michigan, 1962

Ph.D., Physics, McMaster University, Canada, 1964

Research Interests**Thermal Neutron Spectroscopy of Soft Condensed Matter**

A high-resolution quasi-elastic neutron scattering (QENS) technique is being used to investigate the slow dynamics in supercooled water confined in 1-D and 3-D geometry near hydrophilic and hydrophobic surfaces. The main objective is to understand the origin of the so-called Fragile-to-Strong dynamic crossover phenomenon seen in this type of confined water. A similar crossover phenomenon has also been observed in hydration water in many bio-macromolecular assemblies such as hydrated protein, DNA and RNA.

My group also use small angle neutron and x-ray scattering to investigate the structure-phase behavior relationship of microemulsions, copolymer micellar systems, protein solutions, protein surfactant complexes in solution, and counterion distribution around cylindrical polyelectrolytes, including DNA molecules in solution. The neutron scattering work uses facilities located at various national laboratories including NIST Center for Neutron Research (NCNR) and the Spallation Neutron Source (SNS) at Oak Ridge National Laboratory. At MIT, complementary photon correlation spectroscopy equipment has been set up for the structural arrest transition studies of dense copolymer micellar solutions and dense protein solutions. More recently, a high-resolution inelastic x-ray scattering is also applied to measure phonon dispersion relations and phonon damping in oriented lipid bilayers, in aligned liquid crystalline DNA films and in proteins. This work is being done at the Advance Photon Source (APS) at Argonne National Laboratory.

Teaching Interests

Scattering Theory, Thermal Neutron and X-ray Scattering Spectroscopy and Laser Photon Correlation Spectroscopy, Statistical Thermodynamics of Simple and Complex Liquids.

Text Book

- Chen, Sow-Hsin and Michael Kotlarchyk. [Interaction of Photons and Neutrons with Matter](#). 2nd edition. World Scientific Publishing Co., 2007. 441 pages. ISBN 10 981-02-4214 X.

Recent News

Professor Sow-Hsin Chen receives Dottore di Ricerca "Honoris Causa" in Fisica

Sow-Hsin Chen Distinguished Lectureship in Neutron Science and Technology launched in Taiwan

Findings could lead to better hydrogen storage

Revealing Water's Secrets

How liquids behave

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Selected Publications

1. Zhang, Y., A. Faraone, W. A. Kamitakahara, K.H. Liu, C.Y. Mou, J. B. Leao, S. Chang, and S.H. Chen, "Density hysteresis of heavy water confined in a nanoporous silica matrix," Proc. Nat. Acad. Sci. USA, 108, 12206-12211 (2011).
2. Li, M., X.Q. Chu, E. Fratini, P. Baglioni, A. Alatas, E. E. Alp, and S.H. Chen, "Phonon-like excitation in globular proteins and possible implication in its role in biological function," Soft Matter, 7, 9848-9853 (2011).
3. Chu, X.Q., M. Lagi, E. Mamontov, E. Fratini, P. Baglioni, and S.H. Chen, "Experimental evidence of logarithmic relaxation in single-particle dynamics of hydrated protein molecules," Soft Matter, 6, 2623-2627 (2010).
4. Lagi, M., P. Baglioni, and S.H. Chen "Logarithmic decay in single-particle relaxation of hydrated lysozyme power," Phys. Rev. Lett., 103, 108102 (2009).
5. Liu, Dazhi, Yang Zhang, Chia-Cheng Chen, Chung-Yuan Mou, Peter H Poole, and S.H. Chen, "Observation of the density minimum in deeply supercooled confined water," Proc. Nat. Acad. Sci. USA (PNAS), 104, 9570-9574, (2007). This paper was highlighted on the cover page of June 5, 2007 issue of PNAS.
6. Chen, S.H., L. Liu, E. Fratini, P. Baglioni, A. Faraone, and E. Mamontov, "Observation of fragile-to-strong dynamic crossover in protein hydration water," Proc. Nat. Acad. Sci. USA, 103, 9012-9016 (2006).
7. Chen, S.H., F. Mallamace, C.Y. Mou, M. Broccio, C. Corsaro, A. Faraone, and L. Liu, "The violation of Stokes-Einstein relation in supercooled water," Proc. Nat. Acad. Sci. USA 103,12974-12978 (2006). [This paper received the 2006 PNAS Editorial Board Cozzarelli Prize for its outstanding scientific excellence and originality.]
8. Liu, L., S.H. Chen, A. Faraone, C.W. Yen, C.Y. Mou, "Pressure Dependence of Fragile-to-Strong Transition and a Possible Second Critical Point in Supercooled Confined Water, Phys. Rev. Lett., 95, 117802-1-117802-4 (2005).
9. Yun Liu, Emiliano Fratini, Piero Baglioni, Wei-Ren Chen, S.H. Chen, "Effective long-range attraction between protein molecules in solutions studied by small angle neutron scattering," Phys. Rev. Lett., 95, 118102-1-118102-4 (2005).
10. Chen, S.H., W-R Chen, and F. Mallamace, "The Glass-to-Glass Transition and Its End Point in a Copolymer Micellar System," Science, 300: 619-622 (2003).

Note: A full CV and complete listing of publications is available at:

<http://globalcc.org/shc>

