

Contact Information

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**Biodata**

Date of Birth	9 Dec. 1979
Nationality	Singaporean

Interest areas

Statistical Physics of the elusive mesoscale liquid boundary layer on interfaces. Continuum fluid mechanics break down on very small length scales and correlated interactions of molecules can cause them to spontaneously self-organize.

Dynamic structural heterogeneity in nanoscale phenomena (e.g. liquids and aerosols) and biological macromolecules.

Technique development

Using ideas from Statistical Optics and Physics to design robust algorithmic-driven measurements despite incomplete and extremely noisy data (e.g. large, heterogeneous datasets from femtosecond x-ray free-electron lasers and in-situ electron microscopy).

Bayesian methods in data science.

Education**Graduated**

Cornell University, Ph.D. in Physics Dissertation: " <i>Statistics in Diffractive Imaging</i> "	Aug. 2010
Cornell University, Masters of Science in Physics	Jan. 2009
Harvey Mudd College, Bachelor of Science in Physics	Aug. 2004
Hwachong Junior College	Dec. 1997
The Chinese High School	Dec. 1995

Research**Dates**

Lee Kuan Yew Postdoctoral Fellow National University of Singapore Centre for BiImaging Sciences Diffraction imaging for x-ray free-electron lasers Algorithm development for electron microscopy	Aug 2013 - current advisor: Prof. Paul Matsudaira
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Curriculum Vitae for Ne-te Duane Loh

Postdoctoral Fellow PULSE Institute at SLAC National Accelerator Laboratory Diffraction imaging (aerosols, biomolecules, supercooled water) Cryptotomography algorithm development Pulse profiling with injected aerosols	Oct. 2010 - Aug 2013 advisor: Dr. Michael J. Bogan
Graduate Student Research Assistant Cornell University Reconstruction algorithms for diffraction imaging Constraint satisfaction problems	Jun. 2006 - Aug. 2010 advisor: Prof. Veit Elser
Graduate Student Research Assistant Cornell University Biophysics: aggregation dynamics of Dictyostelium Discoideum	Jun. 2005 - Jun. 2006 advisor: Prof. Carl P. Franck
Undergraduate Research Assistant Harvey Mudd College String theory phenomenology	Aug. 2003 - Aug. 2004 advisor: Prof. Vatche Sahakian
Undergraduate Research Assistant Harvey Mudd College General Relativity	Aug. 2002 - Aug. 2003 advisor: Prof. Thomas M. Helliwell

Grant proposals

<i>Mathematica in BioImaging</i> (as principal investigator)	Awarded
S\$69K funding from National University of Singapore Learning Innovation Fund-Technology (LIFT).	
<i>Resolving nanoscale heterogeneity and dynamics from incomplete, noisy datasets</i> (as principal investigator)	Awarded
S\$180K research funding for the National University of Singapore Lee Kuan Yew Postdoctoral Fellowship	
<i>Non-periodic imaging</i> (co-author)	Awarded
US\$700K sub-task to the U.S. Department of Energy Basic Energy Science grant Ultrafast Chemical Sciences Field Work Proposal	

Recognition and travel grants

	Date
Lee Kuan Yew Postdoctoral Fellowship	Aug. 2013
Travel grant for Ringberg Meeting on free-electron lasers. Max Planck Institute for Medical Research, Heidelberg, Germany	Feb. 2013
Invitational project on hardware and software requirements for single particle imaging European XFEL GmbH	Dec. 2011
Travel grant for 25th European Crystallographic Meeting Georg-August University Institute for X-ray Physics, European Crystallographer's Meeting Bursary Committee, Cornell University	Aug. 2009
High Distinction Award Harvey Mudd College	Aug. 2004

Physics Departmental Honors Harvey Mudd College	Aug. 2004
William Lowell Putnam Math Competition, U.S. Top 500	2004
Dean's List (four years) Harvey Mudd College	2000 - 2004
Distinguished Hwa Chong Scholar Award The Chinese High School	1996

Publications: 15 total, 11 as primary contributor (underlined below).

"Bonding Pathways of Gold Nanocrystals in Solution"

Z. Aabdin, J. Lu, X. Zhu, U. Anand, N.D. Loh, H. Su, U. Mirsaidov.
Nanoletters, in press (2014).

"A minimal view of single-particle imaging with X-ray lasers"

N. D. Loh.
Philos. Trans. R. Soc. B Biol. Sci. 369, 20130328 (2014). [1 citation]

"Experimental Observation of Bulk Liquid Water Structure in 'No Man's Land'"

J. A. Selberg, C. Huang, T. A. McQueen, **N. D. Loh**, H. Laksmono, D. Schlessinger, R. Sierra, M. J. Bogan, A. Nilsson and others
Nature 510, 381–384 (2014). [4 citations]

"Nanoparticle dynamics in a nanodroplet"

J. Lu, Z. Aabidin, **N. D. Loh**, D. Bhattacharya, U. Mirsaidov.
Nanoletters 14(4) 2111-2115 (2014).

"Toward unsupervised single-shot diffractive imaging of heterogeneous particles using X-ray free-electron lasers"

Hyung Joo Park, **N. Duane Loh**, Michael J. Bogan, Veit Elser and others.
Opt. Express 21:23, 28729-28742 (2013). [1 citation]

"Mesoscale morphology of airborne core-shell nanoparticle clusters: X-ray laser coherent diffraction imaging"

E. Pedersoli, **N. D. Loh**, F. Capotondi, M. Kiskinova, M. J. Bogan and others.
J. Phys. B: At. Mol. Opt. Phys. 46 (2013) 164033. [1 citation]

"Probing the wavefront of x-ray free-electron lasers using aerosol spheres"

N. D. Loh, D. Starodub, L. Lomb, H. N. Chapman, M. J. Bogan and others.
Optics Express 21, 12385-12394 (2013). [3 citations]

"Nanoflow electrospinning serial femtosecond crystallography"

R. G. Sierra, H. Laksmono, ... **N. D. Loh**, ... M. J. Bogan and others.
Acta Crystallographica Section D 68, 1584-1587 (2012). [23 citations]

"Single-Particle structure determination by correlations of snapshot x-ray diffraction patterns"

D. Starodub, ...**N. D. Loh**, ... H. N. Chapman, J. C. H. Spence, M. J. Bogan and others.
Nature Communications 3, 1276 (2012). [22 citations]

"Fractal Morphology, imaging and mass spectrometry of single aerosol particles in flight"

N. D. Loh, C. Y. Hampton, A. V. Martin, D. Starodub, R. G. Sierra, A. Barty, I. Schlichting, H. N. Chapman, M. J. Bogan and others.

Nature 486, 513 (2012)¹. [55 citations]

"Noise-robust coherent diffractive imaging with a single diffraction pattern".

A. V. Martin, F. Wang, **N. D. Loh**, M. J. Bogan, and H. N. Chapman and others.
Optics Express 20, 16650 (2012). [17 citations]

"Femtosecond dark-field imaging with an x-ray free electron laser".

A. V. Martin, **N. D. Loh**, C. Y. Hampton, M. J. Bogan, H. N. Chapman and others.
Optics Express 20, 13501 (2012). [14 citations]

"Unsupervised classification of single-particle X-ray diffraction snapshots by spectral clustering".

C. H. Yoon, P. Schwander, ... **N. D. Loh**, ... A. Ourmazd and others.
Optics Express 19(17), 16542–16549 (2011). [28 citations]

"Recovering magnetization distributions from their noisy diffraction data".

N.-T. D. Loh, S. Eisebitt, S. Flewett, and V. Elser.
Physical Review E 82, 061128 (2010). [6 citations]

"Cryptotomography: reconstructing 3D Fourier intensities from randomly oriented single-shot diffraction patterns".

N. D. Loh, M. J. Bogan, V. Elser, A. Barty, H. N. Chapman and others.
Physical Review Letters 104, 25501 (2010). [57 citations]

"Reconstruction algorithm for single-particle diffraction imaging experiments".

N.-T. D. Loh and V. Elser.
Physical Review E 80, 6705 (2009). [87 citations]

Conference Proceedings (2 total)

"Profiling structured beams using injected aerosols".

N. D. Loh, D. Starodub, L. Lomb, C. Y. Hampton, A. V. Martin, H. N. Chapman, M. J. Bogan and others.
SPIE Optics + Photonics (Aug. 2012)

"Effects of extraneous noise in Cryptotomography".

N. D. Loh.
SPIE Optics + Photonics (Aug. 2012)

Book chapter

"Femtosecond imaging of single particles and molecules using x-ray free-electron lasers".

Invited book chapter for Review Volume on Synchrotron Radiation Applications
(2014)

News Articles

"Review of single particle imaging at the Linac Coherent Light Source".

Invited article for Synchrotron Radiation News
(Mar. 2013)

Presentations (22 total, 12 invited)

Date

¹ Press coverage: Chemistry World, R&D Magazine, Science Daily, Green Car Congress, InMenlo, Nanotech, Planet Save, PhysOrg, RedOrbit, SciTechDaily, French Tribune, Lightsources, Chemistry & Engineering News.

<i>"Fractal structures"</i> Invited teaching session at the RACIRI Summer school Stockholm, Sweden.	Aug. 2014
<i>"Single-particle imaging with x-ray free-electron lasers"</i> Invited talk at the 12th Conference of the Asian Crystallographic Association The Hong Kong University of Science and Technology, Hong Kong, PRC.	Nov. 2013
<i>"Computational imaging with x-ray free-electron lasers"</i> Invited talk at Applied and Computational Mathematics Seminar National University of Singapore, Singapore.	Oct. 2013
<i>"Will single-particle structural imaging be possible with X-ray free-electron lasers?"</i> Invited talk at the Meeting for X-ray lasers in biology -- techniques The Royal Society, London, UK.	Oct. 2013
<i>"Sensing free-electron laser pulses with injected aerosols."</i> Invited talk at Ringberg Meeting on Free-electron lasers Ringberg Castle, Bavaria, Germany	Feb. 2013
<i>"Effects of extraneous noise in Cryptotomography."</i> Invited talk at Uppsala University, Sweden	Nov. 2012
<i>"Aerosol Morphology with X-ray Free-electron Lasers."</i> Invited talk at the 70th Annual Pittsburgh Diffraction Conference at SLAC National Accelerator Laboratory	Oct. 2012
<i>"Aerosols and Morphology."</i> Invited talk at Photon Science Seminar at SLAC National Accelerator Laboratory	Jul. 2012
<i>"Cryptotomography with free-electron lasers."</i> Invited talk at Coherence Workshop at Fukuoka, Japan	Jun. 2012
<i>"Effects of extraneous noise in cryptotomography."</i> Progress on Statistical Issues in Searches at SLAC National Accelerator Laboratory	Jun. 2012
<i>"Simulation of single-particle diffraction experiments: Requirements for hardware and software."</i> Invited seminar at European XFEL GmbH	Dec. 2011
<i>"Imaging single airborne nanoparticles and ultrafast x-ray lasers."</i> Talk at the 30th annual conference of the American Association for Aerosol Research	Oct. 2011
<i>"The EMC Algorithm."</i> Invited talk at Lawrence Berkeley National Laboratory	Sep. 2011
<i>"Single-particle morphometry of complex airborne nanoparticles using ultrafast x- ray lasers."</i> Talk at Imaging Retreat organized by Heidelberg Max Planck Institute	May 2011
<i>"The EMC Algorithm: 3D single-particle imaging."</i> Talk at SLAC Scientific Workshop	Jun. 2011
<i>"3D single-particle reconstruction of experimental diffraction data."</i> Invited talk at Lawrence Berkeley National Laboratory	Jan. 2011
<i>"Cryptotomography in single-particle imaging."</i> Talk at PULSE Institute SLAC National Accelerator Laboratory	May 2010

<i>"Cryptotomography, coherent diffraction imaging of single bio-molecules."</i> Talk at Singapore Synchrotron light source	Jan. 2010
<i>"Is single-particle diffraction imaging possible?"</i> Poster presentation at the 2nd Gotham-Metro Condensed Matter Meeting	Nov. 2009
<i>"A reconstruction algorithm for single-particle diffraction imaging experiments."</i> Invited talk at 25th European Crystallographic Meeting	Aug. 2009
<i>"Reconstruction of thin film magnetic domains using an illumination mask."</i> Poster presentation at Coherence 2007	Jun. 2007
<i>"New Visions of Stages of Collective Behavior in Social Amoeba Colonies."</i> Poster presentation at 6th Annual Nanobiotechnology Symposium	Aug. 2005

Teaching (TA = teaching assistant)

Date

TA for Undergraduate Thermodynamics and Statistical Physics (Cornell University)	Fall 2009
TA for Undergraduate General Physics (Cornell University)	Spring 2009
TA for Undergraduate Analytical Mechanics (Cornell University)	Spring 2008
Grader for Graduate Basic Training in Condensed Matter Theory (Cornell University) Constraint-based problems	
TA for Undergraduate Fundamentals of Physics (Cornell University)	Spring 2007
Grader for Graduate Basic Training in Condensed Matter Theory Statistical Physics	
TA for Undergraduate General Physics (Cornell University)	Fall 2004 - Fall 2006
Grader and tutor for undergraduate Physics classes (Harvey Mudd College) Electromagnetic Theory and Optics Quantum Physics Electrodynamics General Relativity Fluid Mechanics	2001 - 2004