

CURRICULUM VITAE

Lester Ingber



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Brief Summary

Professional Experience

- Over 100 publications
- Lester Ingber Research (LIR), Interdisciplinary Research/Consulting 1989-
- Extreme Science and Engineering Discovery Environment, Principal Investigator 2013-2018
- Pion Capital, Partner 2011-2013
- Research Publisher, Editor-in-Chief 2012
- DUNN Capital Management, Stuart FL, Director R&D 2002-2003
- DRW Trading, Chicago IL, Director R&D 1997-2001
- George Washington University, Research Professor of Mathematics 1989-1990
- National Research Council, Senior Research Associate 1989
- US Army Concepts Analysis Agency, Guest Professor 1989
- Naval Postgraduate School, Professor of Physics 1986-1989
- National Research Council, Senior Research Associate 1985-1986
- Physical Studies Institute, President Nonprofit Corp. 1970-1986
- UC San Diego, Asst. Research Physicist 1970-1972
- State University New York at Stony Brook, Asst. Professor of Physics 1969-1970

Education

- National Science Foundation Postdoc, UC Berkeley and UC Los Angeles 1967-1969
- University of California San Diego, Ph.D. 1967, Theoretical Nuclear Physics
- California Institute of Technology, B.S. 1962, Physics
- Brooklyn Technical High School, Diploma 1958

Published Expertise

- Summary of Projects — https://www.ingber.com/ingber_projects_brief.pdf
- Recent Projects — https://www.ingber.com/lir_computational_physics_group.html
- Statistical Mechanics of Financial Markets — Options, Bond Futures, Trading Systems, Risk
- Statistical Mechanics of Neocortical Interactions — Memory, EEG, Intelligent Systems
- Statistical Mechanics of Combat — Baselined Simulations to Exercise Data
- Stochastic Algorithms — Simulated Annealing Optimization and Path Integration
- Theoretical Nuclear Physics — Nucleon-Nucleon Scattering, Nuclear Matter, Neutron Stars
- Teaching Methodologies — Private School Developed High-School and College Curricula
- Physics of Karate — Teaching Methodology Leading to 8th-Dan Black Belt

Positions

2003-	Lester Ingber Research	R&D, Consultant
2013-2018	Extreme Science Engineering Discovery Environment	Principal Investigator
2011-2013	Pion Capital, Round Rock TX	Partner
2012	Research Publisher	Editor-in-Chief 3 Journals
2002-2003	DUNN Capital Mgmt, Stuart FL	Director R&D
1997-2001	DRW, Chicago	Director R&D
1989-1997	Lester Ingber Research	R&D
1989-1990	George Washington University Dept of Mathematics, DC	Research Professor
1989	Naval Ocean Systems Center San Diego, CA	Senior Research Associate National Research Council NAS
1989	USA Concepts Analysis Agency Bethesda, MD	Guest Professor Extended Temporary Duty
1986-1989	NPS Physics Dept GS-15 Step 10 Equiv.	Professor of Physics
1986-1988	ANSER (Nonprofit Lab) Arlington, VA	Consultant
1985-1986	Naval Postgraduate School (NPS) Monterey, CA	Senior Research Associate National Research Council NAS
1980-1986	UC San Diego, IPAPS	Research Associate
1972-1978	Physical Studies Institute	Director Alternative School
1970-1978	Physical Studies Institute San Diego, CA	President
1972-1974	UC San Diego, Music Dept	Research Associate
1972-1973	UC San Diego Extension	Director, Learning to Learn
1970-1972	UC San Diego, Physics Dept Institute for Pure & Applied Physical Sciences (IPAPS)	Asst. Research Physicist
1969-1970	SU New York Stony Brook Physics Department	Asst. Professor
1968-1969	UC Los Angeles, Physics Dept	NSF.gov Postdoctoral Fellow
1967-1968	UC Berkeley, Physics Dept	NSF.gov Postdoctoral Fellow Lecturer
1965-1966	RAND Corp., Santa Monica	Consultant
1962-1967 1964	UC San Diego, Physics Dept UCSD/Niels Bohr Institute	Research Assistant
1960-1962	Caltech	Research Asst.: Metallurgy
1961-1962	Caltech	Grader: Math Physics (graduate)
1960-1961	Caltech	Grader: Algebra (undergraduate)

SCIENTIFIC PURSUITS. Lester Ingber has published over 100 papers and books in the categories of: theoretical physics, neuroscience, finance, optimization, combat analysis, karate, and education. Through Lester Ingber Research (LIR) he develops and consults on projects documented in the [https://www.ingber.com/ archive](https://www.ingber.com/archive). **NUCLEAR PHYSICS:** From 1965-1972 he published in atomic, nuclear, astro-, and elementary particle physics. His major work was to develop a nucleon-nucleon interaction described by exchanged mesons, and to apply this interaction to calculate properties of nucleon-nucleon scattering, the deuteron, nuclear matter, and neutron stars. In 1983-1986 he used modern methods of nonlinear functional analysis developed in the late 1970's to discover contributions induced by velocity-dependent potentials to nuclear matter binding energies. **NEUROSCIENCE:** Since 1978 he has developed a statistical mechanics of neocortical interactions applicable to a broad range of spatial and temporal scales, using modern methods of nonlinear nonequilibrium statistical mechanics of neocortical interactions (SMNI) to calculate brain 'observables', e.g., short-term memory and EEG analyses. His 1983 *Physical Review* paper was the first paper accepted on the brain in this premier physics journal. From 2013 through 2018 he used XSEDE.org resources, extending the range of SMNI from EEG to molecular processes, and currently developing quantum algorithms that have broad applications ranging from computational neuroscience to computational physics to blockchains. **FINANCE:** Since 1980 he has developed a statistical mechanics approach to financial markets, e.g., to multivariable term structure and stochastic markets. His 1990 *Physical Review* paper was the first paper accepted on finance in this premier physics journal. From 1997-2001, as Director R&D at DRW in Chicago, he led a team developing multi-factor nonlinear stochastic models of markets. From 2002-2003 he was Director R&D at DUNN Capital Management in Stuart FL, developing risk-management algorithms. From 2011-2013 he was a Partner in Pion Capital, a hedge-fund partnership of Caltech alumni. **OPTIMIZATION/MODELING:** Since 1987 he has developed Adaptive Simulated Annealing (ASA), one of the most powerful optimization algorithms for nonlinear and stochastic systems, working with thousands of users. Other codes have been developed to model multivariate nonlinear stochastic systems. In 1994-1995, as principal investigator (PI) of an NSF Supercomputer grant, he ported his ASA and PATHINT codes onto parallel supercomputers. **COMBAT SIMULATION:** From 1986-1989, as PI of an Army contract, he applied these methods of mathematical physics, leading a team of scientists and officers to develop mathematical comparisons of Janus computer combat simulations with exercise data from the National Training Center (NTC), developing a testable theory of combat successfully baselined to empirical data.

EDUCATION AND POSITIONS. He received: his diploma from Brooklyn Technical High School in 1958; his B.S. in physics from Caltech in 1962; his Ph.D. in theoretical nuclear physics from UC San Diego in 1967, having studied at the Niels Bohr Institute in 1964, and having consulted at RAND in 1965-1966. He was a National Science Foundation Postdoctoral Fellow at UC Berkeley in 1967-1968 and at UC Los Angeles in 1968-1969, an Assistant Professor in physics at SUNY at Stony Brook from 1969-1970, and a research physicist in the Physics department and in the Institute for Pure and Applied Physical Sciences (IPAPS) at UC San Diego from 1970-1972. From 1970-1986 he was President of Physical Studies Institute (PSI), a nonprofit corporation he founded in 1970, which was an agency account in IPAPS from 1980-1986. From 1970-1972 he developed teaching methodologies for academics and fine arts, instructing in and administrating a six-course program through UC San Diego Extension. From 1972-1978, though PSI, he founded, funded, and instructed in an experimental alternative high school offering 30+ courses in academics, fine arts, and physical disciplines. He was a Research Associate at UC San Diego in the Music department from 1972-1974 and in IPAPS from 1980-1986. He was awarded a Senior Research Associateship for 1985-1986 by the National Research Council (NRC) of the National Academy of Sciences, taken at the Naval Postgraduate School (NPS) in Monterey, CA. From 1986-1989 he was Professor of Physics at NPS at a GS-15 Step 10 equivalent position. In March 1988 he was officially offered a Senior Executive Service (SES) appointment as Assistant Director of the Joint Tactical C³ Agency (JTC3A); he declined to complete his projects. From February through June 1989 he was on extended temporary duty at US Army Concepts Analysis Agency (CAA) in Bethesda, MD. In 1989 He won a second NRC Senior Research Associateship, taken at the Naval Ocean Systems Center (NOSC) in San Diego. From 1989-1990 he was Research Professor of Mathematics at The George Washington University (GWU), D.C. From 1989-1997, through Lester Ingber Research (LIR), he consulted on projects in his fields of expertise. From 1997-2001 he was Director of Research and

Development at DRW, a trading firm in Chicago, IL. From 2002-2003 he was Director R&D at DUNN Capital Management in Stuart FL. Currently, through LIR, he conducts research in selected interdisciplinary projects. In 2012 he was Editor-in-Chief at Research Publisher in Santa Clara, CA for three journals and associated e-conferences. From 2011-2013 he was a Partner in Pion Capital, a hedge-fund partnership of Caltech alumni. From 2013 through 2018 he was a PI of NSF XSEDE.org physics projects.

OTHER PURSUITS. KARATE: From 1958-1988 he founded and instructed karate classes at: Caltech, UC Berkeley, UC Los Angeles, SU New York at Stony Brook, UC San Diego, PSI, and NPS. He has developed and published in several textbooks techniques promoting the learning of attentional skills in parallel with a physics approach to the learning of traditional physical skills. He received his black belt in karate in 1961 and became the first Westerner to receive the Instructor's degree from the Japan Karate Association in 1968. Now he is an 8th Dan black belt. From 1989-1991 he was Director of Scientific Studies of the American JKA Karate Associations (AJKA). **MARRIED:** Since 1976 he and his spouse Louise Ingber have been partners in several projects, including running a ballet company and karate studio (1976-1985). He helps with cleanup for her current chocolate and pastry business [<https://creekhousechocolates.com>].

Professional Experience

LIR — Projects and Interdisciplinary Research 2003-

Through Lester Ingber Research (LIR), I continue to pursue research and consult in several disciplines in which I have gained expertise over several decades. The total number of publications in these fields is over one hundred. Some recent projects are described in https://www.ingber.com/lir_computational_physics_group.html.

I continue my research in statistical mechanics of multivariate nonlinear systems, which have included: Statistical Mechanics of Neocortical Interactions (SMNI), Statistical Mechanics of Combat (SMC), Statistical Mechanics of Financial Markets (SMFM), Trading in Risk Dimensions (TRD), and Statistical Mechanical Numerical Tools such as my optimization algorithm Adaptive Simulated Annealing (ASA), and path-integral algorithms PATHTREE and PATHINT.

Often I collaborate via the internet on such projects. Summaries are usually updated in https://www.ingber.com/ingber_projects.html. I continue to answer short technical queries on my publications and codes at no charge. I still maintain and update my ASA code, available at no charge from my archive <https://www.ingber.com>. Mirrors of the ASA code are at <http://asa-caltech.sourceforge.net> and <https://code.google.com/p/adaptive-simulated-annealing>.

I regularly put aside time for anonymous or signed reviews, usually a few per month. Most of my reviews for 50+ journals or scientific agencies are of interdisciplinary subjects since my own interests have led me through a few interdisciplinary projects. Such reviews often have a different nature than reviews in relatively well-established disciplines where expert opinions can be considered definitive.

I continue to educate people on the art and science of karate. I am an 8th Dan black belt. My three karate text books and other files are available at no charge on my internet archive.

NSF Extreme Science and Engineering Discovery Environment 2013-2018

From 20 Feb 2013 through 31 Dec 2018 I was a Principal Investigator (PI), of the National Science Foundation (NSF) collaborative resource, The Extreme Science and Engineering Discovery Environment (XSEDE.org), supercomputer project "Quantum path-integral qPATHTREE and qPATHINT algorithm". These codes have broad applications, e.g., ranging from computational neuroscience to computational physics to blockchains.

Some similar prior work was accomplished in 1994-1995 when I was PI of an NSF Pittsburgh Supercomputing Center (PSC) Grant, "Porting Adaptive Simulated Annealing and Path Integral Calculations to the Cray; Parallelizing ASA and PATHINT Project" (PAPP).

Work performed under a related project, "Electroencephalographic field influence on calcium momentum waves", utilized an initial grant spanning 20 Feb 2013 - 19 Aug 2014, which passed peer review for a second research grant spanning 1 Jul 2014 - 30 Jun 2015. On 20 Nov 2014 a request to double the current resources passed another round of review and was granted. In Jun 2015 my Renewal Request passed peer review, extending this grant through Jun 2016. In Jun 2016 my Renewal Request passed peer review, extending this grant through Dec 2016. From Feb 2017 to Dec 2018 my yearly XSEDE projects focussed on quantum variables. Applications have been published in multiscale neocortical interactions and in quantum financial options.

Reviews of the former project are at https://www.ingber.com/smni14_eeg_ca_JTB_reviews.txt, and some press releases are at <https://www.xsede.org/mechanism-of-short-term-memory>, http://www.sdsc.edu/News%20Items/PR041414_short_term_memory.html, and http://ucsdnews.ucsd.edu/pressrelease/the_mechanism_of_short_term_memory.

Pion Capital — Partner 2011-2013

Pion Capital was a hedge-fund partnership of Caltech alumni. I helped this early-stage start-up by representing them as a Partner to vendors to get good pricing for datafeeds and co-location of their systems, and by building interfaces for such feeds. I benchmarked some of my own TRD trading systems in their formats. I worked on various administrative and R&D projects.

Research Publisher — Editor-in-Chief 2012

I was Editor-in-Chief for Research Publisher for: Current Progress Journal (timely topics in science), Graduate Journal of Research, and Undergraduate Journal of Research, and associated e-conferences for these three journals. I recruited and set up their Editorial Boards.

DUNN Capital Management — Director Research & Development 2002-2003

From January 2002 to June 2003, I was Director R&D at DUNN Capital Management, then a \$billion hedge fund in Stuart FL. Their contract included a non-compete agreement expiring 1 December 2004. I developed state of the art copula risk-management algorithms and worked with others to enhance and perform due diligence on trading models.

DRW — Director Research & Development 1997-2001

From July 1997 to December 2001, I was Director R&D at DRW, a Chicago-based proprietary trading firm. Although all projects, initiated by agreement with or requested by traders, were brought to proper focus and completion, most of our products were not implemented as the company quickly expanded five-fold. Projects included: (a) Developing my previously published PATHINT numerical algorithms, and a novel fast tree algorithm motivated by PATHINT, PATHTREE, to process new multivariate nonlinear generalizations of currently used options models. (b) Modeling indexes and options on indexes and baskets of their components, including risk scenarios and dynamic balancing of portfolios using my published Adaptive Simulated Annealing (ASA) code (an importance-sampling optimization algorithm). (c) Developing an optimized inter-minute computerized trading system, based on my published studies using Canonical Momenta Indicators (CMI). (d) Modeling US and German Cheapest-To-Deliver futures contracts on bonds. (e) Modeling Eurodollar and US Treasury options. (f) Optimizing portfolios of other traders, enhancing the effectiveness of their trading rules. (g) Directing mathematical modeling of codes being prepared for a commercial risk-management product, including preparation for exotic and energy options modules. (h) Working with other team members to obtain and integrate several data resources into a central database accessible to traders as well as to analysts. (i) Working with other team members to develop an electronic trading system interface to exchanges, prototyped using Canonical Momenta Indicators. (j) Leading, managing and administrating many projects associated with a growing company.

LIR — Interdisciplinary Research 1989-1997

I have made available in a public archive, Adaptive Simulated Annealing (ASA), the optimization algorithm of choice for many complex problems. From 1993-1996, ASA was located at <https://www.alumni.caltech.edu/~ingber/>. Pointers were placed in NETLIB and STATLIB to this location. As the archive grew, more room and maintenance was required, and in February 1996 the site was moved to the present [ingber.com](http://www.ingber.com) location. Pointers were placed in the Caltech site to the present locations. Since 1992 I have helped several thousand people with my code and papers via electronic mail, processing hundreds of queries per year on ASA.

Through Lester Ingber Research (LIR), I further developed mathematical and numerical algorithms for selected problems in finance, combat analysis, and optimization, creating and testing multivariate nonlinear models. As published in over 30 papers during this period, projects developed decisions-aids for each of these systems that are intuitive and graphical, but faithful to the relatively complex

multivariate nonlinear stochastic models that have established their worth by fitting data generated by these systems. These decision aids brought these multiple-year projects to reasonable foci, my intended goal.

GWU — Research Professor of Mathematics 1989-1990

I held a position as Research Professor of Mathematics at The George Washington University (GWU) for one year before deciding to continue my projects on a full time basis on my own.

NRC-NPS — Senior Research Associate 1989

I won a second one-year Senior Research Associateship from the National Research Council (NRC) of the National Academies of Sciences and Engineering, taken at Naval Ocean Systems Center (NOSC), San Diego, CA, beginning 3 July 1989. My successful research proposal was, “Statistical Mechanics of Mesoscopic Information Processing in C^3 and Neocortical Systems.” I accepted this award for three months to extend my work in combat analyses.

From 1989-1991, I was a ranking member, 7th Dan (Master level) black belt in Shotokan karate, and Director of Scientific Studies, one of three executive directors, of the American JKA Karate Association (AJKA), an international federation of over 100 karate organizations.

NPS — Professor of Physics 1986-1989

On 1 August 1986, I was appointed Full Professor of Physics at the Naval Postgraduate School, Monterey, CA, with a joint appointment to the C^3 (Command, Control & Communications) Academic Group.

My research focused on application of statistical mechanics to large-scale systems, specifically in neuroscience and modeling of combat-simulation systems. This research also directly involved directing thesis officer-students. I taught officer-students various physics subjects, including: mechanics, statistical physics, mathematical physics, and Combat Simulation Analysis (a physics course I created at NPS). Class sizes ranged from 15 to 30 students. I also regularly taught extra reading courses, composed of one or two students each, in advanced statistical physics and advanced stochastic physics. I served on the Physics curriculum committee and as Chairman of the Combat Analysis Sequence, a new sequence of eight courses.

During this period, I led an excellent team of military officers and civilians to accomplish my goals, helping most of my thesis students to win awards for their contributions.

On 25 March 1988, after several panels of technical and managerial review, I was officially notified that I was selected as Assistant Director Washington Operations, Joint Tactical C^3 Agency (JTC3A), a Senior Executive Service (SES) position, and that I would have to begin this new appointment immediately. However, I had worked for three years to carve out an approach to realistically baseline combat models to field data, had obtained funding for a civilian-military team from the Deputy Under Secretary of the Army for Operations Research, and (correctly) estimated that we needed a few more months to bring this project to some focus, as I did at CAA from February through June 1989 until the end of my contract with NPS.

NRC-NPS — Senior Research Associate 1985-1986

In August 1985 I received a one-year award as a Senior Research Associate from the National Research Council of the National Academies of Sciences and Engineering, tenured at NPS, to pursue my research into applications of my published methods of nonlinear nonequilibrium statistical mechanics to analyses of large-scale systems. My project was, “Applications of Nonlinear Nonequilibrium Statistical Mechanics to Options Planning.”

PSI — President 1970-1986

Physical Studies Institute (PSI) was a 501(c)(3) nonprofit scientific and educational California corporation I founded in 1970 and kept in operation through 1991. From 1978-1985, I developed methods of nonlinear nonequilibrium statistical mechanics derived by mathematical physicists in the late 1970s, and applied these methods to specific problems in neuroscience, theoretical physics and economics. From 1980-1986, PSI was an independent agency account of the Institute for Pure and Applied Physical Sciences (IPAPS) at UC San Diego.

In 1978, I received California Certification as an Emergency Medical Technician (EMT), and volunteered my time in this capacity.

From 1970-1978 I personally funded and administrated the Institute for Study of Attention (ISA) High School, a subsidiary of PSI, developing and publishing an educational methodology emphasizing restructuring of standard text material to enhance personal learning strengths. We offered over 30 courses in academics, fine arts and physical disciplines. From 1981-1986 I helped administrate another subsidiary, Conservatory of Ballet Arts Company, consisting of over 100 students, and an active dancing group of about 30.

From 1970-1978 I worked with other ISA teachers to prepare teaching aids in the form of problem-texts in Algebra, Chemistry, Probability, and Tennis. I also taught Mathematics and Physical Science at the ISA school.

I trained in and taught karate since 1958, at Caltech, UCSD, UCB, UCLA, SUNY SB, PSI, and NPS. I developed and published a methodology promoting the learning of attentional skills in parallel with a physics approach to the learning of traditional physical skills. From 1970-1988 I regularly taught karate through PSI, and published three textbooks in this discipline.

This period was extremely creative and fulfilling, albeit also quite challenging and difficult. I fully understood the necessity of my commitment to ideas and people to carry out these programs. I was able to use my trained mind and body effectively and artistically to help thousands of people, many on an individual basis for several years on a daily or weekly basis, reaching across many walks of life. Many of these people trained or worked with me simply to better themselves; many others required guidance and discipline to overcome adversity and personal problems; some contributed their own expertise to this organization to help others.

UCSD — Research Associate, Physics 1980-1986

I held an honorary position at UC San Diego as a Research Associate in the Institute for Pure and Applied Physical Sciences (IPAPS), a research branch of the Physics Department.

UCSD — Research Associate, Music 1972-1974

I held an honorary position as a Research Associate in the UCSD Music Department, doing research with Pauline Oliveros creating music with autonomic feedback.

UCSD — Asst. Research Physicist 1970-1972

In 1970 I left my position as Assistant Professor of Physics at the State University of New York at Stony Brook, and returned to the University of California at San Diego (UCSD) to work with Keith Brueckner in theoretical nuclear physics.

I ran my first marathon with Keith, along the beach, in 2 hrs 40 mins.

In 1967 I had received my Ph.D. in theoretical physics from Keith Brueckner, the first Dean of Science and Engineering at UCSD. My thesis was entitled "One-Meson-Exchange Potentials and Properties of Nucleon-Nucleon Scattering and of Nuclear Matter."

Three papers from 1983-1986 calculated a contribution to the binding energy of nuclear matter induced by nonlinearities of realistic momentum-dependent nucleon-nucleon interactions, using methods developed by the author in the early '60's. These effects are large enough to possibly finally bring theory and experiment into agreement, but a much more detailed project would be required to fully test this conjecture.

SUNYSB — Asst. Professor 1969-1970

I was an Assistant Professor in the Physics Department at the State University of New York (SUNY) at Stony Brook, developing my thesis work in theoretical nuclear physics. During this time I also performed research with the Psychology Department, working with Les Fehmi on behavioral correlates of control of EEG.

UCB & UCLA — NSF Postdoctoral Fellow 1967-1968

I won a two-year National Science Foundation (NSF) Postdoctoral Fellowship to develop my thesis work in theoretical nuclear physics. I spent the first year with the Physics Department at UC Berkeley, and the second year with the Physics Department at UC Los Angeles.

UCSD — Graduate Student 1962-1967

Influential Professors:

Keith Brueckner: Thesis advisor, "One-Meson-Exchange Potentials and Properties of Nucleon-Nucleon Scattering and of Nuclear Matter". See summary paper https://www.ingber.com/nuclear68_forces.pdf.

Bernd Matthias: Friend and Colleague.

Maria Goeppert Mayer: Offered much encouragement and motivation to work in her discipline.

I spend most of 1964 studying at the Niels Bohr Institute in Copenhagen. In 1965-1966 I worked with friend and colleague Hal T. Yura at Rand Corporation on Collective Interactions Between Light and Matter.

Caltech — Undergraduate Student 1958-1962

In 1960-1961 I was a Reader for undergraduate Algebra. In the Summer of 1960 I worked as a Research Assistant in Metallurgy. In 1961-1962 I was a Reader for graduate course Mathematical Physics.

Karate — 1958-1970

My first instructor was Tsutomu Ohshima for a couple of years. My second instructor was Hidetaka Nishiyama for over 10 years, from whom I received my 3rd Dan Black Belt and my Sensei/Instructor's training and degree in 1969, becoming the first Westerner to receive the Sensei/Instructor's degree from the Japan Karate Association (JKA) and the All America Karate Federation (AAKF).

Publications

Some of my publications are listed on:

<https://www.ingber.com/ingber.bib.html>
<https://authors.repec.org/pro/pin1/>
<https://orcid.org/0000-0003-1502-3910>
<https://researcherid.com/rid/C-3211-2018>
<https://www.mendeley.com/profiles/lester-ingber/>
https://www.researchgate.net/profile/Lester_Ingber

- L. Ingber, “Quantum Variables in Finance and Neuroscience,” Lecture Plates 2018:QVFN, Lester Ingber Research, Ashland, OR, (2018). [URL https://www.ingber.com/path18_qpathint_lecture.pdf]
- L. Ingber, “Quantum Variables in Finance and Neuroscience II,” Report 2018:FNQV, Lester Ingber Research, Ashland, OR, (2018). [URL https://www.ingber.com/path18_qpathint.pdf]
- L. Ingber, “Quantum calcium-ion interactions with EEG,” *Sci* **1** (7), 20 (2018). [URL https://www.ingber.com/smni18_quantumCaEEG.pdf and <https://doi.org/10.3390/sci1010007>]
- L. Ingber, “Quantum path integral for financial options,” Report 2018:QPIO, Lester Ingber Research, Ashland, OR, (2018). [URL https://www.ingber.com/markets18_quantum_options.pdf and <https://dx.doi.org/10.13140/RG.2.2.18226.45765>]
- L. Ingber, “Evolution of regenerative Ca-ion wave-packet in neuronal-firing fields: Quantum path-integral with serial shocks,” *International Journal of Innovative Research in Information Security* **4** (2), 14-22 (2017). [URL https://www.ingber.com/path17_quantum_pathint_shocks.pdf]
- L. Ingber, “Options on quantum money: Quantum path-integral with serial shocks,” *International Journal of Innovative Research in Information Security* **4** (2), 7-13 (2017). [URL https://www.ingber.com/path17_quantum_options_shocks.pdf]
- L. Ingber, “Quantum Path-Integral qPATHINT Algorithm,” *The Open Cybernetics Systemics Journal* **11**, 119-133 (2017). [URL https://www.ingber.com/path17_qpathint.pdf and <https://dx.doi.org/10.2174/1874110X01711010119>]
- L. Ingber, “Statistical mechanics of neocortical interactions: Large-scale EEG influences on molecular processes,” *Journal of Theoretical Biology* **395**, 144-152 (2016). [URL https://www.ingber.com/smni16_large-scale_molecular.pdf and <https://dx.doi.org/10.1016/j.jtbi.2016.02.003>]
- L. Ingber, “Path-integral quantum PATHTREE and PATHINT algorithms,” *International Journal of Innovative Research in Information Security* **3** (5), 1-15 (2016). [URL https://www.ingber.com/path16_quantum_path.pdf]
- L. Ingber, “Calculating consciousness correlates at multiple scales of neocortical interactions,” in *Horizons in Neuroscience Research*, edited by A. Costa and E. Villalba (Nova, Hauppauge, NY, 2015), p. 153-186. [ISBN: 978-1-63482-632-7. Invited paper. URL https://www.ingber.com/smni15_calc_conscious.pdf]
- L. Ingber, “Biological Impact on Military Intelligence: Application or Metaphor?,” *International Journal of Intelligent Defence Support Systems* **5** (3), 173-185 (2015). [URL https://www.ingber.com/comb15_milint.pdf]
- L. Ingber, “Synergy among multiple scales of neocortical interactions,” Report 2015:SCSM, Lester Ingber Research, Ashland, OR, (2015). [URL https://www.ingber.com/smni15_synergy.pdf]
- L. Ingber, M. Pappalepore, and R.R. Stesiak, “Electroencephalographic field influence on calcium momentum waves,” *Journal of Theoretical Biology* **343**, 138-153 (2014). [URL https://www.ingber.com/smni14_eeg_ca.pdf and <https://dx.doi.org/10.1016/j.jtbi.2013.11.002>]
- L. Ingber, “Influences on consciousness from multiple scales of neocortical interactions: Lecture plates,” Report 2014:LFIC, Lester Ingber Research, Ashland, OR, (2014). [3rd World Neuroscience Online Conference 17 June 2014. URL https://www.ingber.com/smni14_conscious_scales_lect.pptx and https://www.ingber.com/smni14_conscious_scales_lect.pdf]
- L. Ingber, “Electroencephalographic (EEG) influence on Ca²⁺ waves: Lecture plates,” Report 2013:LEFI, Lester Ingber Research, Ashland, OR, (2013). [2nd World Neuroscience Online Conference 18 June 2013. URL https://www.ingber.com/smni13_eeg_ca_lect.pptx and https://www.ingber.com/smni13_eeg_ca_lect.pdf]

- P.L. Nunez, R. Srinivasan, and L. Ingber, "Theoretical and experimental electrophysiology in human neocortex: Multiscale correlates of conscious experience," in *Multiscale Analysis and Nonlinear Dynamics: From genes to the brain*, edited by M.M. Pesenson (Wiley, New York, 2013), p. 149-178. [URL <https://dx.doi.org/10.1002/9783527671632.ch06>]
- L. Ingber, "Slides for Electroencephalographic field influence on calcium momentum waves," *Journal of Theoretical Biology* **343**(2013). [URL https://www.ingber.com/smni14_eeg_ca_slides.pdf and <https://dx.doi.org/10.1016/j.jtbi.2013.11.002>]
- L. Ingber, "Columnar EEG magnetic influences on molecular development of short-term memory," in *Short-Term Memory: New Research*, edited by G. Kalivas and S.F. Petralia (Nova, Hauppauge, NY, 2012), p. 37-72. [Invited Paper. URL https://www.ingber.com/smni11_stm_scales.pdf]
- H.A. Oliveira, Jr., A. Petraglia, L. Ingber, M.A.S. Machado, and M.R. Petraglia, *Stochastic global optimization and its applications with fuzzy adaptive simulated annealing* (Springer, New York, 2012). [URL <https://dx.doi.org/10.1007/978-3-642-27479-4>]
- L. Ingber, "Adaptive Simulated Annealing," in *Stochastic global optimization and its applications with fuzzy adaptive simulated annealing*, edited by H.A. Oliveira, Jr., A. Petraglia, L. Ingber, M.A.S. Machado, and M.R. Petraglia (Springer, New York, 2012), p. 33-61. [Invited Paper. URL https://www.ingber.com/asa11_options.pdf]
- L. Ingber, "Influence of macrocolumnar EEG on Ca waves," *Current Progress Journal* **1** (1), 4-8 (2012). [URL https://www.ingber.com/smni12_vectpot.pdf]
- L. Ingber, "Computational algorithms derived from multiple scales of neocortical processing," in *Pointing at Boundaries: Integrating Computation and Cognition on Biological Grounds*, edited by A. Pereira, Jr., E. Massad, and N. Bobbitt (Springer, New York, 2011), p. 1-13. [Invited Paper. URL https://www.ingber.com/smni11_cog_comp.pdf and <https://dx.doi.org/10.1007/s12559-011-9105-4>]
- L. Ingber, "Trading in Risk Dimensions," in *The Handbook of Trading: Strategies for Navigating and Profiting from Currency, Bond, and Stock Markets*, edited by G.N. Gregoriou (McGraw-Hill, New York, 2010), p. 287-300.
- L. Ingber, "Real Options for Project Schedules (ROPS)," *SGI Reflections International Journal of Science, Technology & Management* **2** (2), 15-20 (2010). [Invited paper. URL <http://sgi.ac.in/colleges/newsletters/1146080820111637301.pdf>]
- L. Ingber and P.L. Nunez, "Neocortical Dynamics at Multiple Scales: EEG Standing Waves, Statistical Mechanics, and Physical Analogs," *Mathematical Biosciences* **229**, 160-173 (2010). [URL https://www.ingber.com/smni10_multiple_scales.pdf]
- L. Ingber, "Statistical mechanics of neocortical interactions: Portfolio of physiological indicators," *The Open Cybernetics Systemics Journal* **3** (14), 13-26 (2009). [URL <https://dx.doi.org/10.2174/1874110x00903010013>]
- L. Ingber, "Statistical mechanics of neocortical interactions: Columnar EEG," Report 2009:CEEG, Lester Ingber Research, Ashland, OR, (2009). [URL https://www.ingber.com/smni09_columnar_eeg.pdf]
- L. Ingber, "Statistical mechanics of neocortical interactions: Nonlinear columnar electroencephalography," *NeuroQuantology Journal* **7** (4), 500-529 (2009). [URL https://www.ingber.com/smni09_nonlin_column_eeg.pdf]
- L. Ingber, "AI and Ideas by Statistical Mechanics (ISM)," in *Encyclopedia of Artificial Intelligence*, edited by J.R. Rabunal, J. Dorado, and A.P. Pazos (Information Science Reference, New York, 2008), p. 58-64. [ISBN 978-1-59904-849-9]
- L. Ingber, "Statistical mechanics of neocortical interactions (SMNI): Testing theories with multiple imaging data," *NeuroQuantology Journal* **6** (2), 97-104 (2008). [URL Invited paper. https://www.ingber.com/smni08_tt.pdf]
- L. Ingber, "Real Options for Project Schedules (ROPS)," Report 2007:ROPS, Lester Ingber Research, Ashland, OR, (2007). [URL https://www.ingber.com/markets07_rops.pdf]
- L. Ingber, "Statistical mechanics of neocortical interactions: Time delays," Report 2007:TD, Lester Ingber Research, Ashland, OR, (2007). [URL https://www.ingber.com/smni07_timedelays.pdf]
- L. Ingber, "Ideas by Statistical Mechanics (ISM)," *Journal Integrated Systems Design and Process Science* **11** (3), 31-54 (2007). [Special Issue: Biologically Inspired Computing.]

- L. Ingber, "Ideas by statistical mechanics (ISM)," Report 2006:ISM, Lester Ingber Research, Ashland, OR, (2006). [URL https://www.ingber.com/smni06_ism.pdf]
- L. Ingber, "Statistical mechanics of neocortical interactions: Portfolio of physiological indicators," Report 2006:PPI, Lester Ingber Research, Ashland, OR, (2006). [URL https://www.ingber.com/smni06_ppi.pdf]
- L. Ingber, "Trading in Risk Dimensions (TRD)," Report 2005:TRD, Lester Ingber Research, Ashland, OR, (2005). [URL https://www.ingber.com/markets05_trd.pdf]
- L. Ingber and R.P. Mondescu, "Automated internet trading based on optimized physics models of markets," in *Intelligent Internet-Based Information Processing Systems*, edited by R.J. Howlett, N.S. Ichalkaranje, L.C. Jain, and G. Tonfoni (World Scientific, Singapore, 2003), p. 305-356. [Invited paper. URL https://www.ingber.com/markets03_automated.pdf]
- A.F. Atiya, A.G. Parlos, and L. Ingber, "A reinforcement learning method based on adaptive simulated annealing," in *Proceedings International Midwest Symposium on Circuits and Systems (MWCAS), December 2003* (IEEE CAS, Cairo, Egypt, 2003). [URL https://www.ingber.com/asa03_reinforce.pdf]
- L. Ingber, "Statistical mechanics of portfolios of options," Report 2002:SMPO, Lester Ingber Research, Chicago, IL, (2002). [URL https://www.ingber.com/markets02_portfolio.pdf]
- L. Ingber and R.P. Mondescu, "Optimization of trading physics models of markets," *IEEE Transactions Neural Networks* **12** (4), 776-790 (2001). [Invited paper for special issue on Neural Networks in Financial Engineering. URL https://www.ingber.com/markets01_optim_trading.pdf]
- L. Ingber, C. Chen, R.P. Mondescu, D. Muzzall, and M. Renedo, "Probability tree algorithm for general diffusion processes," *Physical Review E* **64** (5), 056702-056707 (2001). [URL https://www.ingber.com/path01_pathtree.pdf]
- L. Ingber, "Statistical Mechanics of Combat (SMC): Mathematical Comparison of Computer Models to Exercise Data," SMC Lecture Plates, Lester Ingber Research, Chicago, IL, (2001). [URL https://www.ingber.com/combat01_lecture.pdf and https://www.ingber.com/combat01_lecture.html]
- L. Ingber, "Statistical Mechanics of Neocortical Interactions (SMNI): Multiple Scales of Short-Term Memory and EEG Phenomena," SMNI Lecture Plates, Lester Ingber Research, Chicago, IL, (2001). [Invited talk U Calgary, Canada, April 2001. URL https://www.ingber.com/smni01_lecture.pdf and https://www.ingber.com/smni01_lecture.html]
- L. Ingber, "Adaptive Simulated Annealing (ASA) and Path-Integral (PATHINT) Algorithms: Generic Tools for Complex Systems," ASA-PATHINT Lecture Plates, Lester Ingber Research, Chicago, IL, (2001). [Invited talk U Calgary, Canada, April 2001. URL https://www.ingber.com/asa01_lecture.pdf and https://www.ingber.com/asa01_lecture.html]
- L. Ingber, "Statistical Mechanics of Financial Markets (SMFM): Applications to Trading Indicators and Options," SMFM Lecture Plates, Lester Ingber Research, Chicago, IL, (2001). [Invited talk U Calgary, Canada, April 2001. Invited talk U Florida, Gainesville, April 2002. Invited talk Tulane U, New Orleans, January 2003. URL https://www.ingber.com/markets01_lecture.pdf and https://www.ingber.com/markets01_lecture.html]
- L. Ingber, "High-resolution path-integral development of financial options," *Physica A* **283** (3-4), 529-558 (2000). [URL https://www.ingber.com/markets00_highres.pdf]
- L. Ingber, "Keri No Kata," *Shotokan Research Society International (SRSI)* **1** (4)(2000). [URL https://www.ingber.com/karate00_keri_no_kata.html]
- L. Ingber, "Statistical mechanics of neocortical interactions: EEG correlates of reaction times," in *Proceedings World Congress on Medical Physics and Biomedical Engineering, July 23-28, 2000* (World Congress on Medical Physics and Biomedical Engineering, Chicago, IL, 2000). [URL https://www.ingber.com/smni00_eeg_rt.pdf]
- L. Ingber, "Statistical mechanics of neocortical interactions: EEG eigenfunctions of short-term memory," *Behavioral and Brain Sciences* **23** (3), 403-405 (2000). [Invited commentary on Toward a Quantitative Description of Large-Scale Neocortical Dynamic Function and EEG, by P.L. Nunez. URL https://www.ingber.com/smni00_eeg_stm.pdf]
- L. Ingber and J.K. Wilson, "Statistical mechanics of financial markets: Exponential modifications to Black-Scholes," *Mathematical Computer Modelling* **31** (8/9), 167-192 (2000). [URL https://www.ingber.com/markets00_black_scholes.pdf]

- https://www.ingber.com/markets00_exp.pdf]
- L. Ingber, "A simple options training model," *Mathematical Computer Modelling* **30** (5-6), 167-182 (1999). [URL https://www.ingber.com/markets99_spread.pdf]
- L. Ingber, "Statistical mechanics of neocortical interactions: Reaction time correlates of the g factor," *Psychology* **10** (068)(1999). [Invited commentary on The g Factor: The Science of Mental Ability by Arthur Jensen. URL https://www.ingber.com/smni99_g_factor.pdf and <http://www.cogsci.ecs.soton.ac.uk/cgi/psyc/newpsy?10.068>]
- L. Ingber and J.K. Wilson, "Volatility of volatility of financial markets," *Mathematical Computer Modelling* **29** (5), 39-57 (1999). [URL https://www.ingber.com/markets99_vol.pdf]
- L. Ingber, "Data mining and knowledge discovery via statistical mechanics in nonlinear stochastic systems," *Mathematical Computer Modelling* **27** (3), 9-31 (1998). [URL https://www.ingber.com/path98_datamining.pdf]
- L. Ingber, "Some Applications of Statistical Mechanics of Financial Markets," LIR-98-1-SASFMF, Lester Ingber Research, Chicago, IL, (1998). [URL https://www.ingber.com/markets98_smfm_appl.pdf]
- L. Ingber, "Statistical mechanics of financial markets (SMFM)," SMFM Lecture Plates, Lester Ingber Research, Chicago, IL, (1998). [Updated invited talk to U of Chicago Financial Mathematics Seminar, 20 Nov 1998. URL https://www.ingber.com/markets98_lecture.pdf]
- L. Ingber, "Statistical mechanics of neocortical interactions: Training and testing canonical momenta indicators of EEG," *Mathematical Computer Modelling* **27** (3), 33-64 (1998). [URL https://www.ingber.com/smni98_cmi_test.pdf]
- M. Bowman and L. Ingber, "Canonical momenta of nonlinear combat," in *Proceedings of the 1997 Simulation Multi-Conference, 6-10 April 1997, Atlanta, GA* (Society for Computer Simulation, San Diego, CA, 1997). [URL https://www.ingber.com/combata97_cmi.pdf]
- L. Ingber, "Statistical mechanics of neocortical interactions (SMNI)," SMNI Lecture Plates, Lester Ingber Research, Chicago, IL, (1997). [URL https://www.ingber.com/smni97_lecture.pdf]
- L. Ingber, "Statistical mechanics of neocortical interactions: Applications of canonical momenta indicators to electroencephalography," *Physical Review E* **55** (4), 4578-4593 (1997). [URL https://www.ingber.com/smni97_cmi.pdf]
- L. Ingber, *EEG Database* (UCI Machine Learning Repository, Irvine, CA, 1997). [URL <http://archive.ics.uci.edu/ml/datasets/EEG+Database>]
- L. Ingber, "Adaptive simulated annealing (ASA): Lessons learned," *Control and Cybernetics* **25** (1), 33-54 (1996). [Invited paper to Control and Cybernetics on Simulated Annealing Applied to Combinatorial Optimization. URL https://www.ingber.com/asa96_lessons.pdf]
- L. Ingber, "Canonical momenta indicators of financial markets and neocortical EEG," in *Progress in Neural Information Processing*, edited by S.-I. Amari, L. Xu, I. King, and K.-S. Leung (Springer, New York, 1996), p. 777-784. [Invited paper to the 1996 International Conference on Neural Information Processing (ICONIP'96), Hong Kong, 24-27 September 1996. ISBN 981-3083-05-0. URL https://www.ingber.com/markets96_momenta.pdf]
- L. Ingber, "Nonlinear nonequilibrium nonquantum nonchaotic statistical mechanics of neocortical interactions," *Behavioral and Brain Sciences* **19** (2), 300-301 (1996). [Invited commentary on Dynamics of the brain at global and microscopic scales: Neural networks and the EEG, by J.J. Wright and D.T.J. Liley. URL https://www.ingber.com/smni96_nonlinear.pdf]
- L. Ingber, "Statistical mechanics of neocortical interactions: Multiple scales of EEG," in *Frontier Science in EEG: Continuous Waveform Analysis (Electroencephal. clin. Neurophysiol. Suppl. 45)*, edited by R.M. Dasheiff and D.J. Vincent (Elsevier, Amsterdam, 1996), p. 79-112. [Invited talk to Frontier Science in EEG Symposium, New Orleans, 9 Oct 1993. ISBN 0-444-82429-4. URL https://www.ingber.com/smni96_eeg.pdf]
- L. Ingber, "Statistical mechanics of nonlinear nonequilibrium financial markets: Applications to optimized trading," *Mathematical Computer Modelling* **23** (7), 101-121 (1996). [URL https://www.ingber.com/markets96_trading.pdf]
- L. Ingber, "Trading markets with canonical momenta and adaptive simulated annealing," Report 1996:TMCMASA, Lester Ingber Research, McLean, VA, (1996). [Solicited by AI in Finance prior to cessation of publication. URL https://www.ingber.com/markets96_brief.pdf]

- L. Ingber, R. Srinivasan, and P.L. Nunez, "Path-integral evolution of chaos embedded in noise: Duffing neocortical analog," *Mathematical Computer Modelling* **23** (3), 43-53 (1996). [URL https://www.ingber.com/path96_duffing.pdf]
- L. Ingber, "Multiple scales of brain-mind interaction," *Behavioral and Brain Sciences* **18** (2), 360-362 (1995). [Invited commentary on Images of Mind, by M.I. Posner and M.E. Raichle. URL https://www.ingber.com/smni95_images.pdf]
- L. Ingber, "Path-integral calculation of multivariate Fokker-Planck systems," *Mathematical Computer Modelling* **21** (11), 61-67 (1995).
- L. Ingber, "Path-integral evolution of multivariate systems with moderate noise," *Physical Review E* **51** (2), 1616-1619 (1995). [URL https://www.ingber.com/path95_nonl.pdf]
- L. Ingber, "Statistical mechanics of multiple scales of neocortical interactions," in *Neocortical Dynamics and Human EEG Rhythms*, edited by P.L. Nunez (Oxford University Press, New York, NY, 1995), p. 628-681. [ISBN 0-19-505728-7. URL https://www.ingber.com/smni95_scales.pdf]
- L. Ingber, "Statistical mechanics of neocortical interactions: Constraints on 40 Hz models of short-term memory," *Physical Review E* **52** (4), 4561-4563 (1995). [URL https://www.ingber.com/smni95_stm40hz.pdf]
- L. Ingber and P.L. Nunez, "Statistical mechanics of neocortical interactions: High resolution path-integral calculation of short-term memory," *Physical Review E* **51** (5), 5074-5083 (1995). [URL https://www.ingber.com/smni95_stm.pdf]
- L. Ingber, "Statistical mechanics of neocortical interactions: Path-integral evolution of short-term memory," *Physical Review E* **49** (5B), 4652-4664 (1994). [URL https://www.ingber.com/smni94_stm.pdf]
- L. Ingber, "Adaptive Simulated Annealing (ASA)," Global optimization C-code, Caltech Alumni Association, Pasadena, CA, (1993). [URL <https://www.ingber.com/#ASA-CODE>]
- L. Ingber, "Simulated annealing: Practice versus theory," *Mathematical Computer Modelling* **18** (11), 29-57 (1993). [URL https://www.ingber.com/asa93_sapvt.pdf]
- L. Ingber, "Statistical mechanics of combat and extensions," in *Toward a Science of Command, Control, and Communications*, edited by C. Jones (American Institute of Aeronautics and Astronautics, Washington, D.C., 1993), p. 117-149. [ISBN 1-56347-068-3. URL https://www.ingber.com/combata93_c3sci.pdf]
- L. Ingber and B. Rosen, "Genetic algorithms and very fast simulated reannealing: A comparison," *Operations Research Management Science* **33** (5), 523 (1993).
- L. Ingber, "Generic mesoscopic neural networks based on statistical mechanics of neocortical interactions," *Physical Review A* **45** (4), R2183-R2186 (1992). [URL https://www.ingber.com/smni92_mnn.pdf]
- L. Ingber, "GNU aids small science in a big way," *GNU Bulletin* **1** (12), 9-10 (1992).
- L. Ingber and B. Rosen, "Genetic algorithms and very fast simulated reannealing: A comparison," *Mathematical Computer Modelling* **16** (11), 87-100 (1992). [URL https://www.ingber.com/asa92_saga.pdf]
- L. Ingber, "Statistical mechanical measures of performance of combat," in *Proceedings of the 1991 Summer Computer Simulation Conference 22-24 July 1991, Baltimore, MD*, edited by D. Pace (Society for Computer Simulation, San Diego, CA, 1991), p. 940-945.
- L. Ingber, "Statistical mechanics of neocortical interactions: A scaling paradigm applied to electroencephalography," *Physical Review A* **44** (6), 4017-4060 (1991). [URL https://www.ingber.com/smni91_eeg.pdf]
- L. Ingber, H. Fujio, and M.F. Wehner, "Mathematical comparison of combat computer models to exercise data," *Mathematical Computer Modelling* **15** (1), 65-90 (1991). [URL https://www.ingber.com/combata91_data.pdf]
- L. Ingber and D.D. Sworder, "Statistical mechanics of combat with human factors," *Mathematical Computer Modelling* **15** (11), 99-127 (1991). [URL https://www.ingber.com/combata91_human.pdf]
- L. Ingber, M.F. Wehner, G.M. Jabbour, and T.M. Barnhill, "Application of statistical mechanics methodology to term-structure bond-pricing models," *Mathematical Computer Modelling* **15** (11), 77-98 (1991). [URL https://www.ingber.com/markets91_interest.pdf]

- L. Ingber, "Statistical mechanical aids to calculating term structure models," *Physical Review A* **42** (12), 7057-7064 (1990). [URL https://www.ingber.com/markets90_interest.pdf]
- L. Ingber and P.L. Nunez, "Multiple scales of statistical physics of neocortex: Application to electroencephalography," *Mathematical Computer Modelling* **13** (7), 83-95 (1990).
- L. Ingber, "Mathematical comparison of computer models to exercise data," in *Symposium on Data Efficiency Using Pre-Processing*, edited by T.K. Gardenier (TKG Consultants, Vienna, VA, 1989), p. 72-115.
- L. Ingber, "Mathematical comparison of computer models to exercise data," in *1989 JDL C2 Symposium: National Defense University, Washington, DC, 27-29 June 1989* (SAIC, McLean, VA, 1989), p. 169-192.
- L. Ingber, "Mathematical comparison of JANUS(T) simulation to National Training Center," in *The Science of Command and Control: Part II, Coping With Complexity*, edited by S.E. Johnson and A.H. Levis (AFCEA International, Washington, DC, 1989), p. 165-176.
- L. Ingber, "Very fast simulated re-annealing," *Mathematical Computer Modelling* **12** (8), 967-973 (1989). [URL https://www.ingber.com/asa89_vfsr.pdf]
- L. Ingber, "Applications of biological intelligence to Command, Control and Communications," in *Computer Simulation in Brain Science: Proceedings, University of Copenhagen, 20-22 August 1986*, edited by R. Cotterill (Cambridge University Press, London, 1988), p. 513-533. [ISBN 0-521-34179-5]
- L. Ingber, "Mathematical comparison of computer models to exercise data: Comparison of JANUS(T) to National Training Center data," in *1988 JDL C2 Symposium: Naval Postgraduate School, Monterey, CA, 7-9 June 1988* (SAIC, McLean, VA, 1988), p. 541-549.
- L. Ingber, "Mesoscales in neocortex and in command, control and communications (C3) systems," in *Systems with Learning and Memory Abilities: Proceedings, University of Paris 15-19 June 1987*, edited by J. Delacour and J.C.S. Levy (Elsevier, Amsterdam, 1988), p. 387-409.
- L. Ingber, "Statistical mechanics of mesoscales in neocortex and in command, control and communications (C3): Proceedings, Sixth International Conference, St. Louis, MO, 4-7 August 1987," *Mathematical Computer Modelling* **11**, 457-463 (1988).
- J. Connell, L. Ingber, and C. Yost, "Statistical mechanical virtual neural computer," in *1987 Symposium on C3 Research: National Defense University, Washington, DC, 16-18 June 1987* (National Defense University, Washington, DC, 1987), p. 65-68.
- L. Ingber, "Modeling C3 of a regional battle-manager: Statistical mechanics application of biological intelligence," Report 1987:MCRBM, ANSER, Arlington, VA, (1987).
- L. Ingber, "C3 decision aids: Statistical mechanics application of biological intelligence," in *1987 Symposium on C3 Research: National Defense University, Washington, DC, 16-18 June 1987* (National Defense University, Washington, DC, 1987), p. 49-57.
- L. Ingber and T.R. Moore, "Proposal for real-time use of C3 models using optical associative memories," Report 1987:PRTC MOAM, Naval Postgraduate School, Monterey, CA, (1987).
- L. Ingber and S. Upton, "Stochastic model of combat," in *1987 Symposium on C3 Research: National Defense University, Washington, DC, 16-18 June 1987* (National Defense University, Washington, DC, 1987), p. 59-63.
- L. Ingber, "Noise-induced extrema in time-dependent Ginsburg-Landau systems," *Mathematical Modelling* **7**, 525-528 (1986). [URL https://www.ingber.com/path86_GinsburgLandau.pdf]
- L. Ingber, "Nonlinear nonequilibrium statistical mechanics approach to C3 systems," in *9th MIT/ONR Workshop on C3 Systems: Naval Postgraduate School, Monterey, CA, 2-5 June 1986* (MIT, Cambridge, MA, 1986), p. 237-244. [URL https://www.ingber.com/combat86_approach.pdf]
- L. Ingber, "Riemannian contributions to short-ranged velocity-dependent nucleon-nucleon interactions," *Physical Review D* **33**, 3781-3784 (1986). [URL https://www.ingber.com/nuclear86_riemann.pdf]
- L. Ingber, "Riemannian contributions to velocity-dependent nucleon-nucleon interaction," *Bulletin American Physical Society* **31**, 869 (1986).
- L. Ingber, "Statistical mechanics of neocortical interactions," *Bulletin American Physical Society* **31**, 868 (1986).
- L. Ingber, *Elements of Advanced Karate* (Ohara, Burbank, CA, 1985). [ISBN 0-89750-127-6. URL https://www.ingber.com/karate85_book.html]

- L. Ingber, "Statistical mechanics algorithm for response to targets (SMART)," in *Workshop on Uncertainty and Probability in Artificial Intelligence: UC Los Angeles, 14-16 August 1985* (American Association for Artificial Intelligence, Menlo Park, CA, 1985), p. 258-264. [URL https://www.ingber.com/combat85_smart.pdf]
- L. Ingber, "Statistical mechanics of neocortical interactions. EEG dispersion relations," *IEEE Transactions in Biomedical Engineering* **32**, 91-94 (1985). [URL https://www.ingber.com/smni85_eeg.pdf]
- L. Ingber, "Statistical mechanics of neocortical interactions: Stability and duration of the 7+2 rule of short-term-memory capacity," *Physical Review A* **31**, 1183-1186 (1985). [URL https://www.ingber.com/smni85_stm.pdf]
- L. Ingber, "Towards clinical applications of statistical mechanics of neocortical interactions," *Innovations Technology Biology Medicine* **6**, 753-758 (1985).
- L. Ingber, "Path-integral Riemannian contributions to nuclear Schrodinger equation," *Physical Review D* **29**, 1171-1174 (1984). [URL https://www.ingber.com/nuclear84_riemann.pdf]
- L. Ingber, "Statistical mechanics of neocortical interactions. Derivation of short-term-memory capacity," *Physical Review A* **29**, 3346-3358 (1984). [URL https://www.ingber.com/smni84_stm.pdf]
- L. Ingber, "Statistical mechanics of nonlinear nonequilibrium financial markets," *Mathematical Modelling* **5** (6), 343-361 (1984). [URL https://www.ingber.com/markets84_statmech.pdf]
- J. Bryant, L. Ingber, K. Rosi, and L. Seitchik, "Tennis Dynamics," Book No. TD-83, Physical Studies Institute, Solana Beach, CA, (1983).
- L. Ingber, "Nearest-neighbor frustrated magnetic domains," Report 1983:NNFMD, Physical Studies Institute, Solana Beach, CA, (1983).
- L. Ingber, "Riemannian corrections to velocity-dependent nuclear forces," *Physical Review C* **28**, 2536-2539 (1983). [URL https://www.ingber.com/nuclear83_riemann.pdf]
- L. Ingber, "Statistical mechanics of neocortical interactions. Dynamics of synaptic modification," *Physical Review A* **28**, 395-416 (1983). [URL https://www.ingber.com/smni83_dynamics.pdf]
- L. Ingber, "The OXY cornerstone," in *Legends of Caltech*, edited by W.A. Dodge, Jr., R.B. Moulton, H.W. Sigworth, and A.C. Smith, Jr. (Alumni Association, California Institute of Technology, Pasadena, CA, 1982), p. 28. [ISBN 0-215-12345-X. URL https://www.ingber.com/ingber82_LegendsOfCaltech.pdf]
- L. Ingber, "Statistical mechanics of neocortical interactions. I. Basic formulation," *Physica D* **5**, 83-107 (1982). [URL https://www.ingber.com/smni82_basic.pdf]
- L. Ingber, "Prediction of neural implants," in *The Reader* (Del Mar, CA, 1982). [URL https://www.ingber.com/smni82_reader.pdf]
- L. Ingber, "Attention, physics and teaching," *Journal Social Biological Structures* **4**, 225-235 (1981). [URL https://www.ingber.com/smni81_attention.pdf]
- L. Ingber, *Karate: Kinematics and Dynamics* (Unique, Hollywood, CA, 1981). [ISBN 0-86568-025-6. URL https://www.ingber.com/karate81_book.txt]
- L. Ingber, "Towards a unified brain theory," *Journal Social Biological Structures* **4**, 211-224 (1981). [URL https://www.ingber.com/smni81_unified.pdf]
- L. Ingber, "Urn of the Universe," Book No. UU-77, Physical Studies Institute, Solana Beach, CA, (1977).
- L. Ingber, *The Karate Instructor's Handbook* (Physical Studies Institute-Institute for the Study of Attention, Solana Beach, CA, 1976). [URL https://www.ingber.com/karate76_book.html]
- S. Bryant and L. Ingber, "College Algebra Problem Supplement," Book No. CAPS-74, Physical Studies Institute, Solana Beach, CA, (1974).
- S. Bryant, L. Ingber, and M. Mariani, "Activities in Probability," Book No. AP-74, Physical Studies Institute, Solana Beach, CA, (1974).
- E. Clark and L. Ingber, "Foundations in Chemistry Problem Supplement," Book No. FCPS-74, Physical Studies Institute, Solana Beach, CA, (1974).
- I. Assimov, A. Baker, M. Bickford, G. Burbidge, G. Choppin, M. Chriss, D. Eisenberg, J. Fowler, H. Gray, A. Holden, L. Ingber, R. Kolenkow, C. Lee, P. Lonsdale, G. Morgan, M. Rotenberg, M. Sands, A. Schawlow, V. Weisskopf, and G. Wetherill, *Physical Science Today* (CRM Books, Del Mar, CA, 1973). [ISBN 0-394-30281-8]

- Z. Barkat, J.R. Buchler, and L. Ingber, "Equation of state of neutron star matter at subnuclear densities," *Astrophysical Journal* **176**, 723-738 (1972).
- W.R. Frazer, L. Ingber, C.H. Mehta, C.H. Poon, D. Silverman, K. Stowe, and H. Yessian, "High energy multiparticle reactions," *Reviews Modern Physics* **44**, 284-319 (1972).
- L. Ingber, "Editorial: Learning to learn," *Explore* **7**, 5-8 (1972). [URL https://www.ingber.com/smni72_learning.pdf]
- J.R. Buchler and L. Ingber, "Properties of the neutron gas and applications to neutron stars," *Nuclear Physics A* **170**, 1-11 (1971).
- L. Ingber and R. Potenza, "Nuclear forces and nuclear energetics," *Physical Review C* **1**, 112-122 (1970).
- L. Ingber, "Nuclear forces," *Physical Review* **174**, 1250-1263 (1968). [URL https://www.ingber.com/nuclear68_forces.pdf]
- L. Ingber, "Physics of karate techniques," Instructor's Thesis, Japan Karate Association, Tokyo, Japan, (1968).
- K.A. Brueckner and L. Ingber, "Nuclear Forces," *Journal of the Physical Society of Japan* **S24**, 616 (1968).
- L. Ingber, "Realistic nuclear forces," *Reviews Modern Physics* **39**, 648 (1967).
- L. Ingber, "One-meson-exchange potentials and properties of nucleon-nucleon scattering and of nuclear matter," Ph.D. Thesis, UC San Diego, La Jolla, CA, (1967). [URL https://www.ingber.com/nuclear67_ThesisPhD.pdf]
- L. Ingber, "Collective interactions between light and matter," Report 1966:CIBLM, RAND, Santa Monica, CA, (1966).
- L. Ingber, "Non-adiabatic corrections to the method of stationary states," *Physical Review A* **139**, 35-39 (1965). [URL https://www.ingber.com/nuclear65_nonadiabatic.pdf]
- L. Ingber, "Velocity-dependent potentials," *American Physical Society Bulletin* **10**, 737 (1965).
- L. Ingber, "Electroluminescence," Report 1957:BTBS, Brooklyn Technical High School, Brooklyn, NY, (1957). [Award, American Physical Society]

Teaching

Caltech, UCSD, UCB, Stanford, UCLA, SUNY SB, PSI, NPS 1960-1988

Founded and Instructed Karate Classes and Clubs

Caltech 1960-1962

Reader, Modern Algebra

Reader, Methods of Mathematical Physics, Graduate Course

Caltech Alumni Advisors Network 2018-

Advisor, <https://alumniadvisors.caltech.edu>

UC Berkeley 1967

Advanced Quantum Mechanics, Graduate Course

SUNY Stony Brook 1969-1970

Freshman and Sophomore Physics

Methods of Mathematical Physics, Graduate Course

UC San Diego 1970-1972

Natural Science

UC San Diego Extension 1972-1973

Application of Karate to Physics and Attention

Developing Intuition for Physics

UC San Diego Summer Session 1973-1976

Concepts in Physics

ISA Alternative School 1972-1978

Physical Sciences, Mathematics, Karate, T'ai Chi

Naval Postgraduate School (NPS) 1986-1989

Advanced Statistical Physics, reading course

Advanced Stochastic Physics, reading course

Combat Simulation Analysis

Mechanics

Path Integrals, reading course

Special Assistance Lectures

Statistical Mechanical Computations, reading course

Statistical Physics

Theoretical Physics

Theses, M.S. (7)

Guru Nanak Dev University (India) 2012-

Thesis, Ph.D. (1)

Reviewing

Some of my reviews are listed on:

<https://publons.com/a/708022>

<http://www.reviewerpage.com/Lester-Ingber>

Reviewer for Technical Papers

Abstract and Applied Analysis 2013-
Algorithms (mdpi.com) 2018-
Applied Soft Computing 2013-
Athens Institute for Education and Research 2016-
Axioms (mdpi.com) 2018-
Behavioral and Brain Sciences 1994-
Bio Accent Journal (BOAJ) General Physics 2016-
Brain Research Bulletin 2011-
Brain Sciences (mdpi.com) 2016-
Clinical Neurophysiology 2002-
Computational Intelligence and Security (CIS'07) 2007
Computational Optimization and Applications 1994
Computational Statistics 2011-
Computer 1991-
Control and Cybernetics 1995-
Encyclopedia of Artificial Intelligence 2007-
Entropy (mdpi.com) 2017-
European Journal of Finance 2006-
European Research Council 2012-
European Science Foundation (ESP) College of Expert Reviewers 2018-
Fractal and Fractional (mdpi.com) 2017-
Future Physics (mdpi.com), Editor 2018
Institute of Electrical and Electronics Engineers (IEEE) 1992-
International Conference on Neural Information Processing (ICONIP) 1996
International Journal of Applied Cryptography 2010-
International Journal of Applied Intelligence 1994-
International Journal of Artificial Intelligence, Editorial Board 1994-
International Journal of Psychophysiology 2014-
International Journal of Science, Technology and Management, Editorial Board 2010-
International Multiconference on Engineering and Technological Innovation (IMETI) 2008-
International Symposium on Academic Globalization 2010-
Journal of AIDS and HIV Research 2013-
Journal of Computational Chemistry 1995-
Journal of Engineering Science and Technology (JESTEC) 2010-
Journal of Entrepreneurship and Business Innovation (JEBI), Editorial Board 2014-
Journal of Neuroscience Methods 2012-
Journal of Nonlinear Science 2001-
Journal of Statistical Computation and Simulation 2006-
Maejo International Journal of Science and Technology 2011-
Mathematical and Computer Modelling 1989-
Medical Research Archives 2015-
Medical Science Monitor 2004-
Neural Networks 1996-
Neural Regeneration Research 2012-
Neuropsychiatric Disease and Treatment 2017-
NeuroQuantology Journal 2008-2018
Optical Engineering 2010-
Physical Review and Physical Review Letters 1966-

Physics (mdpi.com), Editor 2018-
 Psychophysiology 1994
 Research Publisher, Editor-in-Chief Current Progress Journal and e-conferences 2012
 Research Publisher, Editor-in-Chief Graduate Journal of Research and e-conferences 2012
 Research Publisher, Editor-in-Chief Undergraduate Journal of Research and e-conferences 2012
 Samalkha Group of Institutions (SGI) Int'l J. Science, Tech. & Manag., Editorial Board 2010-
 Scholarpedia.org 2006-
 Sci (mdpi.com), Advisory Board 2018-
 Sciences of Electronics, Technologies of Information and Telecommunications 2016-
 Scientific Online Publishing, Editor (scipublish.com) 2013-
 Sensors (mdpi.com) 2015-
 Sports (mdpi.com) 2018-
 The 6th International Conference on Biomedical Engineering and Biotechnology (ICBEB) 2017
 Society for Industrial and Applied Mathematics (SIAM) 1995-
 Statistics and Computing 1992-1993
 Symmetry (mdpi.com) 2018-
 Systemics, Cybernetics and Informatics Conferences 2009-
 TargetMeeting, Chair and Presenter, Cellular & Molecular Neuroscience-III, 18 June 2013
 The Open Cybernetics and Systemics Journal, Editorial Board 2007-2018
 Webmed Central, Scholarly Reviewer, 2012-
 Workshop on Physics of Computation 1993-1994
 World Multiconference on Systemics, Cybernetics and Informatics (WMSCI) 2007-
 World Scientific and Engineering Academy and Society (WSEAS) 2006-

Review Panels, Associations, Consulting, Contracts/Grants

Review Panels

American Society for Engineering Education 1989-1991
 Eighth International Conference on Mathematical and Computer Modelling 1-4 April 1991
 Chair, *Statistical Physics Modelling of Nonlinear Stochastic Systems*
 Frontier Science in EEG Symposium: Continuous Waveform Analysis
 October 9 1993, New Orleans LA
 Joint Directors of Laboratories (JDL) 1986-1989
 Naval Postgraduate School (NPS) 1986-1989
 Member, Command, Control and Communications (C³) Group
 Technical Panel on Command, Control and Communications (C³), Basic Research Group
 Naval Air Development Center 1985-1987
 Review Panel for SDI Architectures
 Workshop on Physics and Computation
 PhysComp '94, This Decade and Beyond
 November 17-20 1994, Dallas TX

Associations/Consulting

Academia (Academia.edu), Editor 2009-
 American Institute of Physics (AIP.org) 1962-
 American Physical Society (APS.org) 1962-
 ANSER, Arlington VA, Consultant C³ SDI 1986-1988
 Brooklyn Tech Alumni Foundation (www.bthsalumni.org) 1958-
 Brooklyn Technical High School LinkedIn Group, Founder, Manager 2008-2014
 Caltech Alumni Association 1962-
 Community Emergency Response Team/CERT (ashlandcert.org) 2006-2018
 Gerson Lehrman Group (GLG.it), Consultant 2008-

Global Association of Risk Professionals (GARP.com) 1999-
 GARP Blockchain Risk Research Group, Steering Committee 2016
 Institute of Physics IOP.org) 2012-
 Institute of Electrical and Electronics Engineers (IEEE.org) 2012-
 Intellectual Ventures (intven.com), Consultant 2007
 Lifeboat (lifeboat.com/ex/bios.lester.ingber), Scientific Advisory Boards: Complex Systems, Economics,
 Human Trajectories, Information Sciences, Neuroscience, Physics 2012-
 LinkedIn (www.linkedin.com/in/ingber) 2005-
 Maven.co, Consultant 2010-
 “Future of Money 2017”
 NeuroRoboticsMagazine.com, Advisor 2017-
 Professional Risk Managers’ International Association (PRMIA.org) 2001-
 PRMIA Subject Matter Expert (SME) Advisory Group 2013-
 RAND, Santa Monica CA, Consultant 1965-1966
 Scholarpedia (Scholarpedia.org) 2006-
 Sea Panel (seapanel.com) Board of Directors 2010-2012
 TechCastGlobal (techcastglobal.com), Expert 2006-
 Thomson Reuters Expert Witness Services (Round Table Group) 1996-
 UC San Diego Alumni (alumni.ucsd.edu) 1967-
 Wikistrat.com, Expert 2016-
 “Blockchain Meets Insurance 2016”

Contracts/Grants

Principal Investigator, Army Contract RLF6L, 1988-1989
 “Mathematical Comparison of Computer Models to Exercise Data: Comparison of JANUS(T) to
 National Training Center Data”
 subcontracts:
 UC Lawrence Livermore National Laboratory (2)
 BDM (1)
 TRAC-MNTRY Army officers (3)
 Principal Investigator, National Science Foundation (NSF) Pittsburgh Supercomputing Center (PSC)
 Grant DMS940009P, 1994-1995
 “Porting Adaptive Simulated Annealing and Path Integral Calculations to the Cray; Parallelizing ASA
 and PATHINT Project (PAPP)”
 selected (8) internet volunteers from many applicants
 Principal Investigator, National Science Foundation (NSF) resource The Extreme Science and
 Engineering Discovery Environment (XSEDE.org), 20 Feb 2013 - 31 Dec 2018
 20 Feb 2013 - 30 Jun 2015: “Electroencephalographic field influence on calcium momentum waves”
 1 Jul 2015 - 31 Dec 2017: “Quantum path-integral qPATHTREE and qPATHINT algorithm”
 1 Jan 2018 - 31 Dec 2018: “Quantum Path-Integral qPATHINT Algorithm”

Honors and Awards

Brooklyn Technical High School

Chief Justice, Student Court 1955-1958
 American Institute of Physics Special Award for paper, "Electroluminescence" 1957
 Honorable Mention, New York Science Exam 1957
 New York State Merit Scholar 1957

Caltech

Kelman Scholar 1958-1962
 Captain, Karate Club 1960-1962
 Sigma Pi Sigma, Physics Honor Society 1961-
 Sigma Pi Sigma, Adopt-a-Physicist Program 2016-
 Sigma Xi, Scientific Research Society 1963-
 UC San Diego
 President, Organization of Organizations 1965
 Chancellor's advisory committee of student organization officers
 Research Associate, Honorary Researcher
 Music Department 1972-1974
 Institute Pure & Applied Physical Sciences 1980-1986
 National Science Foundation (NSF), Postdoctoral Fellow
 UC Berkeley 1967-1968
 UC Berkeley 1968-1969
 Japan Karate Association (JKA) & All America Karate Federation
 First Westerner to receive Instructor's degree 1968
 National Research Council (NRC), Senior Research Associate
 Naval Postgraduate School (NPS) 1985-1986
 Naval Ocean Systems Center (NOSC) 1989
 U.S. Senior Executive Service (SES) 1988
 Selected as JTC3A/DCA Asst. Director Washington Operations (declined)
 Mensa 2008-2013
 Facebook HighIQWorld (closed group) 2013-

Clearances

SECRET

RAND/U.S. Air Force, 1965-1966
 National Academy of Sciences, 1986-1987, 3 July 1989 - 6 October 1989
 SAIC, 1 February 1990 - 7 June 1990

TOP SECRET/NATO/CNWDI

NPS, 4 May 1987 - 30 June 1989
 SAIC, 23 August 1989 - 1 February 1990

TOP SECRET/Special Compartmented Information (TS/SCI)

NPS, 22 January 1988 - 6 July 1989