

# Lester Ingber

physicist with interdisciplinary expertise and interests importance-sampling life

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## Summary

<https://www.linkedin.com/in/ingber> has 30,000 Direct (Degree 1) Connections. (30,000 is the max presently permitted by LinkedIn.)

Since 1965, I have published over 100 papers and books in the disciplines of: theoretical nuclear physics, neuroscience, finance, general optimization, combat analysis, karate, and education. A brief summary of my projects is in [http://www.ingber.com/ingber\\_projects\\_brief.pdf](http://www.ingber.com/ingber_projects_brief.pdf).

<http://www.ingber.com> contains papers and code on topics:

ASA: Adaptive Simulated Annealing, Optimization, Importance Sampling, Nonlinear Systems, Stochastic Systems.

COMBAT: Statistical Mechanics of Combat and Simulations.

KARATE: The Art and Science of Karate, Applications to Learning.

MARKETS: Statistical Mechanics of Financial Markets, Options, Risk, Portfolios, Trading.

NEOCORTEX: Statistical Mechanics of Neocortical Interactions, Applications to Memory, EEG, Intelligent Systems.

NUCLEAR: Nucleons, Nuclear Matter, Riemannian Interactions.

PATH-INTEGRAL: Path Integrals in Stochastic Systems with Nonlinear Diffusion.

More information is on LIR Products is on pages <https://www.linkedin.com/company/lester-ingber-research-lir-/products> and <http://google.com/+Ingber>.

Specialties: My projects have been in theoretical nuclear physics, statistical mechanics of neocortical interactions (short-term memory and EEG correlates, AI), statistical mechanics of combat (baselining simulations to training), and statistical mechanics of financial markets (options, bond futures, risk management, and trading systems).

I have developed algorithms for nonlinear stochastic systems, including ASA/VFSR & PATHINT/PATHTREE, a full suite of options code, and copula risk management.

Some context for my work in neuroscience is given in my 18 Oct 2016 posting on Free Will, <https://www.linkedin.com/pulse/free-lester-ingber>.

Since July 2016, I have been Principal Investigator (PI) on an XSEDE.org project, "Quantum path-integral qPATHTREE and qPATHINT algorithms".

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## Experience

### **Principal Investigator (PI)**

February 2013 - Present

I am Principal Investigator (PI), of the National Science Foundation (NSF.gov) collaborative supercomputer resource, The Extreme Science and Engineering Discovery Environment (XSEDE.org).

A previous project was "Electroencephalographic field influence on calcium momentum waves". Work performed under an initial grant spanning 20 Feb 2013 - 19 Aug 2014 passed peer review for a second research grant spanning 1 Jul 2014 - 30 Jun 2015. In June 2015 my Renewal Request passed peer review, extending this grant through June 2016.

My new current XSEDE.org grant through 30 Jun 2017, "Quantum path-integral qPATHTREE and qPATHINT algorithms", has shifted focus from previous grants for computational neuroscience to broader contexts across computational physics, e.g., including problems in physics, neuroscience and blockchain derivatives. Volunteers to these projects may apply as described in [https://www.ingber.com/lir\\_computational\\_physics\\_group.html](https://www.ingber.com/lir_computational_physics_group.html) .

Some context for my work in neuroscience is given in my 18 Oct 2016 posting on Free Will, <https://www.linkedin.com/pulse/free-lester-ingber> .

### **Physicist at Lester Ingber Research (LIR)**

1989 - Present

See the LIR page <https://www.linkedin.com/company/lester-ingber-research-lir-/products>

I have worked through LIR intermittently between various positions in academia, government and business, as described in [http://www.ingber.com/ingber\\_CV.pdf](http://www.ingber.com/ingber_CV.pdf) .

See the LIR page <https://www.linkedin.com/company/lester-ingber-research-lir-/products>

My Statistical Mechanics of Neocortical Interactions (SMNI) work since 1981 has detailed short-term memory and local generators of EEG. My 1983 Physical Review paper was the first paper accepted on the brain in this premier physics journal. 30+ SMNI papers have been published since then.

I have published several papers in finance using algorithms I developed in computational physics. My 1990 Physical Review paper was the first paper accepted on finance in this premier physics journal.

Tools have been developed to price complex projects as financial options with alternative schedules and strategies, in Real Options for Project Schedules (ROPS), [http://www.ingber.com/markets07\\_rops.pdf](http://www.ingber.com/markets07_rops.pdf) . Risk management codes have been developed in Trading in Risk Dimensions (TRD) in [http://www.ingber.com/markets\\_trd.pdf](http://www.ingber.com/markets_trd.pdf) , published in Handbook of Trading, McGraw-Hill (2010).

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.

### **Partner**

June 2011 - December 2013 (2 years 6 months)

Pion Capital was a hedge-fund Partnership of Caltech Alumni (<http://pioncapital.com>). 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.

### **Editor-in-Chief**

February 2012 - December 2012 (10 months)

I was EiC of three journals for Research Publisher, and recruited and formed their Editorial Boards:

Current Progress Journal with associated e-conferences, on various selected topics

Graduate Journal of Research with associated e-conferences

Undergraduate Journal of Research with associated e-conferences

### **Director R&D**

January 2002 - July 2003 (1 year 6 months)

I developed copula risk-management algorithms, and helped with analysis of other trading-related projects.

### **Director R&D at DRW Trading**

1997 - December 2001 (4 years 11 months)

I led teams developing multi-factor nonlinear stochastic models of markets, directly applied to options, bond futures, and various trading systems.

I formulated "volatility of volatility" of markets and, using Eurodollars as an example, I developed PATHINT to explicitly calculate all Greeks for options, based on my 2-variable price-volatility model.

### **Research Professor of Mathematics at George Washington University (GWU)**

1989 - 1990 (1 year)

Research

### **Professor of Physics at US Army Concepts Analysis Agency (CAA)**

1989 - 1989 (less than a year)

Research

### **Senior Research Associate**

1989 - 1989 (less than a year)

Research

### **Professor of Physics at Naval Postgraduate School (NPS)**

1986 - 1989 (3 years)

[http://www.ingber.com/combat93\\_c3sci.pdf](http://www.ingber.com/combat93_c3sci.pdf) summarizes a series of papers started in 1985, which led to the baselining of JANUS(T) simulation to National Training Center (NTC) data. I was Principal Investigator (PI) of an Army contract, leading a team of scientists and officers to develop mathematical comparisons of Janus computer combat simulations with exercise data from NTC, developing a testable theory of combat successfully baselined to empirical data.

### **Consultant at ANSER**

1986 - 1988 (2 years)

Research

### **Senior Research Associate**

1985 - 1986 (1 year)

Research

### **Research Associate, Physics**

1980 - 1986 (6 years)

Research with Physics Department and Institute for Pure and Applied Physical Sciences (IPAPS)

### **President**

1970 - 1986 (16 years)

PSI, a CA nonprofit corporation, via UCSD/IPAPS agency account 1970-1986: Published research in physics, neuroscience, and finance. Paper in 1981 led to Physical Review's (premier physics journal's) first paper on the brain in 1983. Paper in 1984 led to Physical Review's first paper in finance in 1990.

Institute for Study of Attention (ISA) (educational branch of PSI) alternative school 1970-1978: Founded, funded, directed, instructed, and managed instructors in over 30 courses (see "Attention, physics and teaching," [http://www.ingber.com/smni81\\_attention.pdf](http://www.ingber.com/smni81_attention.pdf)). ISA karate classes 1970-1986: Instructed thousands of students and wrote three karate texts.

Conservatory of Ballet Arts Company (CBAC) from 1976-1985 was another branch of PSI directed by Louise Ingber (<http://louise.ingber.com>).

### **Research Associate, Music**

1972 - 1974 (2 years)

Research with Music Department with Pauline Oliveros

### **Director Learning To Learn**

1973 - 1973 (less than a year)

See ``Editorial: Learning to learn," [http://www.ingber.com/smni72\\_learning.pdf](http://www.ingber.com/smni72_learning.pdf)

### **Asst Professor of Physics**

1969 - 1970 (1 year)

Research and Teaching

### **National Science Foundation Postdoc Fellow**

1968 - 1969 (1 year)

Research

### **Sensei**

January 1968 - December 1968 (11 months)

I was the first graduate of the Japan Karate Association (JKA)/All America Karate Federation (AAKF) Sensei/Instructor's School, taught by Hidetaka Nishiyama in 1968. My thesis was Physics of Karate Techniques. A photo taken in 1972 is at [http://www.ingber.com/karate72\\_encinitas.jpg](http://www.ingber.com/karate72_encinitas.jpg) .

### **National Science Foundation Postdoc Fellow at UC Berkeley (UCB)**

1967 - 1968 (1 year)

Research

### **Consultant at RAND Corporation**

1965 - 1966 (1 year)

I worked with friend and colleague Hal T. Yura on Collective Interactions Between Light and Matter.

### **Reader, Mathematical Physics (graduate level) at California Institute of Technology (Caltech)**

1961 - 1962 (1 year)

I graded homeworks and exams.

### **Research Assistant Metallurgy at California Institute of Technology (Caltech)**

1960 - 1961 (1 year)

I conducted experiments in metallurgy.

### **Reader, Algebra (undergraduate level) at California Institute of Technology (Caltech)**

1960 - 1961 (1 year)

I graded homeworks and exams.

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## Education

**University of California, San Diego**

PhD, Theoretical Nuclear Physics, 1962 - 1967

**Activities and Societies:** President, Organization Of Organizations. Founder, Karate Club/Classes. Karate Instructor: Hidetaka Nishiyama.

**Niels Bohr Institute**

Theoretical Nuclear Physics, 1964 - 1964

**Activities and Societies:** N/A

**Caltech**

B.S., Physics, 1958 - 1962

**Activities and Societies:** Kelman Scholar, 4 years. Captain, Caltech Karate Club. Karate Instructors: Tsutomu Ohshima and Hidetaka Nishiyama.

**Brooklyn Technical High School (BTHS)**

Diploma, college prep, 1954 - 1958

**Activities and Societies:** Chief Justice, Student Court. New York State Merit Scholar. Senior Project: Electroluminescence, special award from American Institute of Physics. I am the Founder of the Brooklyn Technical High School LinkedIn Group, for alumni and friends of BTHS, and served as Manager 2008-2014. Go to <http://www.linkedin.com/e/gis/53791> to join.

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[Contact Lester on LinkedIn](#)