G. Todd Springer

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Illinois Institute of Technology
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Citizenship: USA
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Education

University of Minnesota – Twin Cities
Degree: Ph.D. in physics 2009
Thesis: *"Hydrodynamics of Strongly Coupled Nonconformal Fluids from Gauge/Gravity Duality"*
Advisor: Prof. Joseph I Kapusta

Carleton College
Degree: B.A. in physics *magna cum laude* 2002

Academic Appointments

Senior Lecturer 2021 – Present
Illinois Institute of Technology – Chicago, Illinois
Department of Physics

Assistant Professor – Limited Term Faculty 2016 – 2020
Ryerson University – Toronto, Ontario
Department of Physics

Visiting Assistant Professor 2013 – 2016
Colgate University – Hamilton, New York
Department of Physics and Astronomy

Postdoctoral Researcher 2011 – 2013
University of Illinois, Chicago
Department of Physics
Supervisor: Prof. Mikhail Stephanov

Postdoctoral Fellow 2009 – 2011
McGill University – Montréal, Québec
Department of Physics
Supervisor: Prof. Sangyong Jeon

Non-Academic Appointments

Associate Editor 2020 – Present
American Journal of Physics
A publication of the American Association of Physics Teachers

Awards and Honors

Dean's Teaching Award	Ryerson University	2019
Torch Medal Recipient	Colgate University	2014, 2016
Aneesur Rahman Prize	Physics Dept., Minnesota	2009
Doctoral Dissertation Fellowship	Graduate School, Minnesota	2008-2009
W. H. Wetzel Fellowship	Physics Dept., Minnesota	2006
Outstanding Teaching Assistant	Physics Dept., Minnesota	2006
Distinction in Major	Carleton College	2002

Teaching Experience

Primary Instructor / Lecturer (in order of course level)

CORE104A – Fundamental Quests in Science (Liberal Arts Core curriculum, for non-science majors. Concepts in particle physics, cosmology, fusion scientific method).	Colgate University 1 semester
PCS107 – The Natural Context (Algebra based course for first year architecture students, mechanics, statics, energy transfer)	Ryerson University 3 semesters
PCS120 – Physics I (Algebra based course for first year science students, mechanics, electric and gravitational fields)	Ryerson University 1 semester
Physics 111/112 - Fundamentals of Physics I and II (Mechanics, thermodynamics, fluid dynamics, electricity and magnetism, optics, waves, modern physics. Algebra based course for life science majors)	Colgate University 2 semesters (each)
PCS211 – Physics: Mechanics (Calculus based mechanics for first year engineering students. Emphasis on 3D vectors, statics and dynamics)	Ryerson University 4 semesters
PCS125 – Waves and Fields (Calculus based Oscillations, Waves, Electromagnetism for first year engineering students.)	Ryerson University 2 semesters
Physics 131 - Atoms and Waves (Introductory course on 20th century physics)	Colgate University 1 semester
PCS224 – Solid State Physics (For second year electrical engineering students. Electrostatics, statistical physics, p-n junction, optical devices, MOSFET)	Ryerson University 5 semesters
PCS335 – Thermal and Statistical Physics (Course for third year physics majors. Laws of thermodynamics, engines, quantum statistical physics)	Ryerson University 4 semesters

Physics 202/203/204 - Mathematical Methods for Physics (Complex variables, Fourier analysis, differential equations)	Colgate University 2 semesters
PCS521/PCS622 - Mathematical Physics (2nd year course for physics majors. Differential equations in physical systems, complex variables, numerical methods, MATLAB, Fourier analysis)	Ryerson University 2 semesters (each)
Physics 456 - General Relativity and Cosmology (4th year course for physics majors Special/general relativity and cosmological applications)	Colgate University 1 semester

Co-Lecturer

Physics 673 - Quantum field theory II (non-Abelian gauge theories, quantum chromodynamics, deep inelastic scattering and parton evolution).	McGill University ½ semester

Laboratory/recitation instructor

Physics 111/112 - Fundamentals of Physics I and II	Colgate University 2 semesters
Physics 131 - Atoms and Waves	Colgate University 3 semesters
Physics 1301/1302 - Physics for scientists and engineers (Mechanics, Electricity/Magnetism calculus based)	University of Minnesota 3 semesters
Physics 1201/1202 - Physics for life science majors (Mechanics, Electricity/Magnetism, Optics, calculus based)	University of Minnesota 1 semester
Physics 1101 - Introductory physics for non-science majors (Mechanics, algebra based)	University of Minnesota 1 semester

Evidence of effective teaching

Average normalized gains in Force Concept Inventory (FCI) and Conceptual Survey in Electricity and Magnetism (CSEM) assessments.

Algebra based introductory physics for life science majors: lecture + clicker questions:

Mechanics - Fall 2013 (29 students):	0.47
Mechanics - Fall 2014 (70 students):	0.44
Electricity and Magnetism - Spring 2016 (65 students):	0.35

The normalized "Hake" gain is a measure of conceptual learning in introductory physics courses. Studies have shown that students in courses employing interactive engagement techniques have significantly higher scores (0.48 ± 0.14) as compared to traditional lecture (0.23± 0.04) **Hake, Am. J. Phys. 66,64–74 (1998)**

Research and Publications

Statistics (as of Fall 2021)
Citations: 191
h-Index: 8
i10 Index: 7

List of Publications/Preprints
Conserved Charge Susceptibilities in a Chemically Frozen Hadronic Gas
arXiv:1508.02409, 2015, (with J. Ang'ong'a*)

Hydrodynamics of charge fluctuations and balance functions
Phys. Rev. C **89**, 064901 (2014), (with B. Ling and M. Stephanov),
Editor's Suggestion in Phys. Rev. C.

Hydrodynamic fluctuations and two-point correlations
Nucl. Phys. A **904-905**, 1027c-1030c (2013)
Proceedings of the XXIII International Conference on Ultrarelativistic Nucleus-Nucleus Collisions, (with M. Stephanov)

Bulk correlation functions in single and multi-scalar gravity duals
Phys Rev. D **82,** 126011 (2010), (with C. Gale and S. Jeon)

Shear spectral sum rule in a non-conformal gravity dual
Phys Rev. D **82**, 106005 (2010), (with C. Gale, S. Jeon and S.H. Lee)

Potentials for soft wall AdS/QCD
Phys. Rev. D **81,** 086009 (2010), (with J. I. Kapusta)

Second order hydrodynamics for a special class of gravity duals
Phys. Rev. D **79,** 086003 (2009), (single author)

Sound mode hydrodynamics from bulk scalar fields
Phys. Rev. D **79,** 046003 (2009) , (single author)

Shear transport coefficients from gauge/gravity correspondence
Phys. Rev. D **78,** 066017 (2008) (with J. I. Kapusta)

C*osmological black hole formation due to QCD and electroweak phase transitions*
arXiv [0706.1111] (2007) (with J. I. Kapusta)

*Undergraduate student author

Presentations

Developing a Mathematical Methods Course with an Integrated Computation Lab — July 2020
Conference: AAPT Summer Meeting

Thermodynamics of Hadron gas
Invited Talk: A symposium on Light, Color, and Dense Matter — June 2017

Hydrodynamic Fluctuations and Correlations
Colloquium: SUNY Geneseo — May 2013
(Geneseo, NY)

International Conference: "Quark Matter 2012" — Aug. 2012
(Washington DC)
Selected as one of the seven best posters overall

"Symposium on Contemporary Subatomic Physics" — Jun. 2012
(McGill University: Montréal, QC, Invited Talk)

Sum Rules and Two-Point Correlation Functions
"INT Summer School on the Applications of String Theory" — Jul. 2011
(Institute for Nuclear Theory: Seattle, WA)

Conference: "Strong and Electroweak Matter" — Jul. 2010
(McGill University: Montréal, QC)

Potentials and AdS/QCD
Conference: Canadian Assn. of Physicists Congress 2010 — Jun. 2010
(University of Toronto: Toronto, ON)

Gauge/Gravity Duality and Hydrodynamics
Workshop: "Nearly Perfect Fluids" — Apr. 2009
(Duke University, NC)

Seminar: University of Maryland — Feb. 2009
(College Park, MD)

Seminar: Perimeter Institute for Theoretical Physics — Dec. 2008
(Waterloo, ON)

Workshop: "AdS/CFT, Condensed Matter, and QCD" — Oct. 2008
(McGill University: Montreal, QC)

Seminar: Institute for Nuclear Theory — May 2008
(University of Washington: Seattle, WA)

Primordial Black Holes and QCD/Electroweak Phase Transitions
Workshop: "The Dark Side of the Universe" — Jun. 2007
(University of Minnesota: Minneapolis, MN)

Workshop: "Black Holes VI" — May 2007
(White Point, Nova Scotia;
Sponsored by University of New Brunswick)

Conference: April Meeting of The American Physical Society — Apr. 2006
(Dallas, TX)

Mentoring and Service

Mentoring and Directed Study

- Mentored Anna Leckman (‘19) in a 1 credit course on introductory cosmology and relativity at Ryerson University
- Senior capstone projects (Colgate University)
  - Jackson Ang'ong'a ('15), “Thermodynamics of the Hadron Gas Phase of the Early Universe”
  - Arjun Bhuptani ('16), “The Effect of Viscosity on the Expansion of the Universe.”
  - Gary Mucci, ('16) “Signatures of Thermal Fluctuations in the Cosmic Microwave Background”
  - Brad Miles ('16) “Baryon number fluctuations from a Hadron-Resonance gas model including chemical freeze-out”
- Mentored Lindsay Dimarchi (‘16) in an independent ½ credit course on introductory cosmology at Colgate University.
- Member of the Supervisory Committee for Richa Tuteja’s M.Sc. project at Ryerson University.

Lab Development

- Member of an 8-person “Virtual Lab Task Force” to address the issue of moving laboratory activities online in the midst of the COVID-19 crisis.
- Member of a 3-person committee to create and implement new introductory labs at Ryerson University.
- Developed two new introductory labs at Colgate University – one on the subject of kinematical motion (using Tracker video analysis) and one covering geometrical optics
- Developed three new introductory labs at Ryerson University – Video Analysis of Kinematics, Electric Potential, Conservation of Momentum.
- Created and implemented an online system for the submission and marking of lab reports at Ryerson University.
- Created specific marking rubrics for each experiment to enhance TA marking consistency at Ryerson University.

Department/Faculty/University Service

• Undergraduate Scholarship and Awards Standing Committee	2018-2020
• Undergraduate Affairs Standing Committee	2019-2020
• Undergraduate Research Opportunities Review Committee	2019
• Undergraduate Interdisciplinary Research Opportunities Review Committee	2019
• Seminar Organizer (McGill University)	2011 – 2013
• Journal Club Organizer (Univ. of IL at Chicago)	2010 – 2011

Service to the Broader Physics Community

Assistant Editor – American Journal of Physics	June 2020 – Present
Referee – Physical Review C and D	Sept 2009 – Present

References

Professor Ana Pejovic-Milic	Ryerson University
Professor Pedro Goldman	Ryerson University
Professor Tetyana Antimirova	Ryerson University
Professor Beth Parks	Colgate University
Professor Mikhail Stephanov	University of Illinois, Chicago
Professor Joseph Kapusta	University of Minnesota