William Divine Linch III
C.N. Yang Institute for Theoretical Phyisics
and
Department of Mathematics
State University of New York at Stony Brook
631.632.4168 wdlinch3@math.sunysb.edu

Graduate Education

Ph.D. in Physics, University of Maryland at College Park, 2005
University of Maryland (1999-2005)
California Institute of Technology (2002)[1]
Universidade Estadual Paulista, São Paolo, Brazil (2002-2003)[2]

B. of Sc. in Physics, University of Maryland at College Park, 1999
University of Maryland (1994-1999)

Doctoral Thesis

"On Superspace Dimensional Reduction"
Thesis advisor: S. James Gates, Jr.

Employment

Post-doctoral Research Assistant and RTG Fellow (2005-present)
C.N. Yang Institute for Theoretical Physics and Department of Mathematics
State University of New York at Stony Brook

Graduate Research Assistant (2001-2005)
Center for String and Particle Theory
University of Maryland at College Park

Workshops, Schools, and Conferences

VI Simons Workshop in Mathematics and Physics (2008)
State University of New York at Stony Brook

[1] I spent two quarters as a visiting special student under the patronage of John H. Schwarz.
[2] I spent three months at the Instituto de Física Teórica under the patronage of Nathan Berkovits.

V Simons Workshop in Mathematics and Physics (2007)
State University of New York at Stony Brook

The Stony Brook Dialogues in Mathematics and Physics
State University of New York at Stony Brook

IV Simons Workshop in Mathematics and Physics (2006)
State University of New York at Stony Brook

Geometry and the Universe: A Symposium on General Relativity
State University of New York at Stony Brook

III Simons Workshop in Mathematics and Physics (2005)
State University of New York at Stony Brook

Prospects in Theoretical Physics (2004)
Summer school in String Theory
Institute for Advanced Studies

Conference on String Geometry (2004)
AMS-IMS-SIAM Summer Research Conference
Snowbird, Utah

Theoretical Advanced Studies Institute (2003)
Summer School on String and Particle Theory
University of Colorado at Boulder

XII Jorge André Swieca Summer School on Particles and Fields (2003)
Campos do Jordão, Brazil

String Field Theory Workshop (2003)
USC/Caltech joint String Theory Center
University of Southern California and California Institute of Technology

Prospects in Theoretical Physics (2002)
Summer school in String Theory
Institute for Advanced Studies

Publications and Pre-prints

1. Wm. D. Linch and B. C. Vallilo, "Integrability of the Gauged Linear Sigma Model for $AdS_5 \times S^5$," [arXiv:0804.4507].
2. Wm. D. Linch III, J. McOrist, and B. C. Vallilo, "Type IIB Flux Vacua from the String Worldsheet," [arXiv:0804.0613].
3. Wm. D. Linch III and B. C. Vallilo, "Covariant N = 2 heterotic string in four dimen-

sions," JHEP **0703**, 082 (2007) [arXiv:hep-th/0611105].

4. Wm. D. Linch III and B. Carlini Vallilo, "Hybrid formalism, supersymmetry reduction, and Ramond-Ramond fluxes," JHEP **0701**, 099 (2006) [arXiv:hep-th/0607122].

5. S. M. Kuzenko and Wm. D. Linch III, "On five-dimensional superspaces," JHEP **0602**, 038 (2006) [arXiv:hep-th/0507176].

6. M. Becker, D. Constantin, S. J. Gates, Wm. D. Linch III, W. Merrell and J. Phillips, "M-theory on Spin(7) manifolds, fluxes and 3D, N = 1 supergravity," Nucl. Phys. B **683**, 67 (2004) [arXiv:hep-th/0312040].

7. S. J. Gates, Wm. D. Linch III, and J. Phillips, "Field strengths of linearized 5D, N = 1 superfield supergravity on a 3-brane," JHEP **0502**, 036 (2005) [arXiv:hep-th/0311153].

8. I. L. Buchbinder, S. J. Gates, H. S. J. Goh, Wm. D. Linch III, M. A. Luty, S. P. Ng and J. Phillips, "Supergravity loop contributions to brane world supersymmetry breaking," Phys. Rev. D **70**, 025008 (2004) [arXiv:hep-th/0305169].

9. S. J. Gates, Wm. D. Linch III, and J. Phillips, "When superspace is not enough," [arXiv:hep-th/0211034].

10. S. J. Gates, Wm. D. Linch III, J. Phillips and V. G. J. Rodgers, "Short distance expansion from the dual representation of infinite dimensional Lie algebras," [arXiv:hep-th/0211021].

11. Wm. D. Linch III, M. A. Luty and J. Phillips, "Five dimensional supergravity in N = 1 superspace," Phys. Rev. D **68**, 025008 (2003) [arXiv:hep-th/0209060].

12. I. L. Buchbinder, S. J. Gates, Wm. D. Linch III, and J. Phillips, "Dynamical superfield theory of free massive superspin-1 multiplet," Phys. Lett. B **549**, 229 (2002) [arXiv:hep-th/0207243].

13. I. L. Buchbinder, S. J. Gates, Wm. D. Linch III, and J. Phillips, "New 4D, N = 1 superfield theory: Model of free massive superspin-3/2 multiplet," Phys. Lett. B **535**, 280 (2002) [arXiv:hep-th/0201096].

14. A. Boveia, B. A. Larson, V. G. J. Rodgers, S. J. Gates, Wm. D. Linch III, J. A. Phillips and D. M. Kimberly, "Chiral supergravitons interacting with a 0-brane N-extended NSR super-Virasoro group," Phys. Lett. B **529**, 222 (2002) [arXiv:hep-th/0201094].

15. S. J. Gates, Wm. D. Linch III, J. Phillips and L. Rana, "The fundamental supersymmetry challenge remains," Grav. Cosmol. **8**, 96 (2002) [arXiv:hep-th/0109109].

Current Research Topics

Strings in Ramond-Ramond backgrounds I am interested in superstring quantization in background Ramond-Ramond fields. As demonstrated explicitly with B. Vallilo, the study of such backgrounds is possible from the worldsheet within the framework of Berkovits' hybrid description of the superstring on Calabi-Yau manifolds. In recent work

with J. McOrist and B. Vallio, we go on to show that this supposedly difficult problem is, in fact, easily solved. We further showed that, somewhat surprisingly, the only subtleties arise in the Neveu-Schwarz-Neuveu-Schwarz sector, and we connect the resulting physics to the recent studies of generalized geometry. This line of research has its logical culmination in the study of strings in non-geometrical backgrounds which are intrinsically string-scale having no large-radius limit. Such "rigid" backgrounds are of interest to string phenomenologists since since they stabilize all moduli.

Superstring Field Theory I am interested in covariant superstring field theory with a variety of degrees of supersymmetry manifest. Current work with B. Vallilo has resulted, based on earlier work by Berkovits, Okawa, and Zwiebach, on the first closed string field theory with eight supercharges realized linearly.

Integrability in String Theory The type IIB superstring on $AdS_5 \times S^5$ should be integrable as a two-dimensional conformal field theory. Very recently I have shown, in collaboration with B. Vallilo, that the gauged linear sigma model for the pure spinor string on $AdS_5 \times S^5$ has hidden symmetries generated by non-local currents which are conserved both classically and quantum mechanically. This proves the quantum integrability of the superstring on $AdS_5 \times S^5$.

Teaching and Service

I am in charge of coordinating the RTG program in Geometry and Physics. This includes organizing the weekly seminar, teaching (MAT 560 and 561), mentoring and advising graduate and undergraduate students, and guest lecturing in a variety of mathematics classes and seminars. I currently teach the first class in a pilot program in theoretical physics for intermediate level mathematics Ph.D. candidates. The class attempts to familiarize young mathematicians with as much theoretical physics as possible in two semesters, with the goal of integrating them into the new program in Geometry and Physics. Due to the unusual nature of the class, it was necessary for me to design the course from the ground up. The results have been quite satisfactory with the students now participating in theoretical physics symposia and conferences. Finally, I also serve as the Faculty Liaison for the Stony Brook Undergraduate Mathematics Society.