

# CURRICULUM VITAE AND LIST OF PUBLICATIONS

*August 9, 2022*

## **I. PERSONAL DETAILS**

Ram BRUSTEIN

Born July 4, 1957, kibbutz Mezer, Israel

Army service: 20/8/1975 until 20/8/1980

Work Address: Department of Physics, Ben-Gurion University, telephone 6472-507.

Home Address: 8 Yaelim St., Metar 85205, telephone 6518-872.

## **II. EDUCATION**

**B.Sc.**, 1979-1982, Tel Aviv University, Physics,  
and 1978-1982, Tel Aviv University, Mathematics.  
Full degree in both, with honors.

**M.Sc.**, 1982-1984, Tel Aviv University, with honors  
under the supervision of Prof. L. P. Horwitz

M.Sc. thesis entitled "From Brownian Motion to Quantum Mechanics".

**Ph.D.**, 1984-1988, Tel Aviv University,  
under the supervision of Prof. Shimon Yankielowicz. Ph.D. thesis entitled  
"String Propagation in Background Fields and Conformal Field Theories in  
Two Dimensions".

### Other professional courses

1984, Schladming Winter School, Schladming, Austria, stochastic processes

1985, Ettore Majorana Summer School, Erice, Italy, particle physics

1985, Jerusalem Winter School, Jerusalem, Israel, string theory

1986, TASI Summer School, Santa Cruz, CA, particle physics and cosmology

1988, Superstring Spring School, Trieste, Italy, string theory.

### Special honors and fellowships awarded during studies

1985 Y. Lavi memorial prize  
1986 Abraham Weinberg graduate scholarship, awarded for outstanding academic achievements, Tel Aviv University  
1987 Wolf Foundation graduate scholarship, awarded for outstanding academic achievements, Tel Aviv University  
1988 Buchman graduate scholarship, awarded for outstanding academic achievements, Tel Aviv University

### **III. EMPLOYMENT HISTORY**

#### (a) Employment

1988 – 1991

Post-doctoral research fellow  
University of Texas at Austin, in Prof. Weinberg's theory group  
Research in theoretical physics

1991 – 1993

Post-doctoral research fellow  
University of Pennsylvania, high energy theory group  
Research in theoretical physics

1993 – 1995

Fellow  
CERN, TH Division  
Research in theoretical physics

1995 – 4/2000

Ben-Gurion University  
Senior Lecturer  
Research in theoretical physics and teaching physics

4/2000 – 4/2004

Ben-Gurion University  
Associate Professor  
Research in theoretical physics and teaching physics

4/2004 – present

Ben-Gurion University  
Professor  
Research in theoretical physics and teaching physics

8/2016 – present  
Ben-Gurion University  
Albert Einstein Chair in Theoretical Physics  
Research in theoretical physics and cosmology

7/97 – 10/97  
Scientific associate  
CERN, TH Division  
Research in theoretical physics

7/99 – 10/99  
Scientific associate  
CERN, TH Division  
Research in theoretical physics

10/01  
Scientific associate  
CERN, TH Division  
Research in theoretical physics

08/03-12/03  
Visitor  
KITP, University of California, Santa Barbara  
Superstring Cosmology Program

09/06-10/06  
Visitor  
KITP, University of California, Santa Barbara  
Superstring Phenomenology Program

10/2010 – 9/2011  
Scientific associate  
CERN, TH Division, Geneva, Switzerland  
Research in theoretical physics and cosmology

9/2011 – 10/2011

Invited visiting Professor

University of Paris 7, Paris, France

Research in theoretical physics and cosmology

10/2011 – 3/2012

Fellow

Center for Advanced Studies, Ludwig Maximilians Univ., Munich, Germany

Research in theoretical physics and cosmology

03/12-05/12

Visitor

KITP, University of California, Santa Barbara

Bits, Branes, Black Holes Program

10/12-11/12

Visiting Professor

CCPP, NYU, New York

Research in theoretical physics and cosmology

9/2013 – 10/2013

Fellow

Center for Advanced Studies, Ludwig Maximilians Univ., Munich, Germany

Research in theoretical physics and cosmology

10/2014

Scientific associate

CERN, TH Division, Geneva, Switzerland

Research in theoretical physics and cosmology

9/2015 -10/2015

Visiting Professor

DAMTP, University of Cambridge, Cambridge, UK

Research in theoretical physics and cosmology

10/2018 – 9/2019

Scientific associate

CERN, TH Division, Geneva, Switzerland

Research in theoretical physics and cosmology

9/2011 – present

Visiting Scientist  
CERN, TH Division, Geneva, Switzerland  
Research in theoretical physics and cosmology

(b) Positions in academic administration

1996 – 2000

Member, teaching committee  
Faculty of Natural Sciences, Ben-Gurion University.  
Representation of the department of physics in planning, supervision, and special decisions in academic matters concerning undergraduate teaching, student affairs, academic programs, academic cooperation with other faculties.

1996 – 2000

Chair, undergraduate teaching committee  
Department of Physics, Ben-Gurion University.  
Planning, supervision, and special decisions in academic matters concerning undergraduate teaching, student affairs, academic programs, academic cooperation with other departments.

1996 – 2000

Chair, undergraduate admission committee  
Department of Physics, Ben-Gurion University.  
Working with student registration office to select and admit new and transferring undergraduate physics students. Conducting admission interviews. Organization of, and participation in, activities to increase student awareness and attract good physics undergraduate students to BGU.

2002 – 2006

Member, academic centers committee. Supervising academic centers at Ben-Gurion University.

2005 – 2010, 2013 – 2018

Member, the physics department appointments committee. Academic appointments of new faculty, promotion of faculty, and other academic decisions concerning academic staff.

2006 – 2010

Dean, Kreitman School of Advanced Graduate Studies. Supervising all academic and administrative activities concerning Ph. D. Students at Ben-

Gurion University. Representing Ben-Gurion University in matters concerning Ph. D studies.

2006 – 2010, 2013 – 2018

Member, Senate of Ben-Gurion University.

2006 – 2010

Member, Academic Executive committee, Ben-Gurion University. The committee is headed by the Rector and supervises all academic matters at Ben-Gurion University.

2009 – 2010

Member, Research committee, Ben-Gurion University. The committee is headed by the vice president and dean for research and development and supervises research activities at Ben-Gurion University.

2015 – 2018

Chair, Department of Physics, Ben-Gurion University.

(d) Professional consulting

2000– 2003, Advisor, US-Israel Binational Science Foundation (BSF).

2006– present , Advisor, Israel Science Foundation.

2008– 2009, Consultant, School of Physics and Astronomy, Tel Aviv University.

(e) Teaching

I have developed, and helped develop a number of joint physics programs with the department of computer science, department of philosophy and others.

I have created the following physics courses for undergraduate and graduate students:

1. Thermodynamics and statistical Mechanics I and II for undergraduate physicists. This is a year long course that starts from the basic concepts and ends with advanced topics.

2. Gravity I and II, for graduate students and advanced undergraduate. A year long course in gravitational physics. The first part covers the physics of weak gravity starting from distances in spacetime and the second part covers topics in strong gravity.

Introduction to particles and fields I, 3 times, undergraduate, department of physics, Ben-Gurion University.

Particle physics I, 2 times, graduate, department of physics, Ben-Gurion University.

Seminar on research topics, 4 times, undergraduate, department of physics, Ben-Gurion University.

Introduction to Environmental Physics, 1 time, undergraduate, department of geography and environmental development, Ben-Gurion University.

Introduction to General Relativity (Gravity I), 6 times, graduate and undergraduate, department of physics, Ben-Gurion University.

String Theory, 2 times, graduate, department of physics, Ben-Gurion University.

Mathematical methods in physics, 3 times, undergraduate, department of physics, Ben-Gurion University.

Colloquium, 4 times, department of physics, graduate, department of physics, Ben-Gurion University.

Gravitational physics for physicists (Gravity II), graduate, 4 times, Ben-Gurion University.

Thermodynamics and statistical Mechanics I for physicists, undergraduate, 3 times, Ben-Gurion University.

Thermodynamics and statistical Mechanics II for physicists, undergraduate, 3 times, Ben-Gurion University.

Physics for physicists - mechanics, undergraduate,  
1 time, Ben-Gurion University.

Physics for engineers - mechanics, undergraduate,  
12 times, Ben-Gurion University.

Advanced quantum mechanics for physicists, graduate,  
5 times, Ben-Gurion University

Quantum mechanics for physicists (teaching assistant), undergraduate  
3 times, Tel Aviv University

Fluid mechanics and elasticity for physicists (teaching assistant), undergrad-  
uate,  
3 times, Tel Aviv University

Applied quantum mechanics for engineers (teaching assistant), undergradu-  
ate,  
1 semester, Tel Aviv University

Optics for Chemists (teaching assistant), undergraduate,  
1 semester, Tel Aviv University

Physics laboratory (instructor), undergraduate,  
2 times, Tel Aviv University

## **V. AWARDS, HONORS, RESEARCH FELLOWSHIPS**

(a) Honors and awards (after completion of studies)

1. 1994, Alon fellowship, National excellence fellowship awarded to young faculty in all fields of study.
2. 1997, Toman academic excellence prize, Ben-Gurion University.
3. 1997 - 2019, Numerous visiting research fellowships, CERN, TH Division, Geneva, Switzerland.
4. 2003, Invited participant, Superstring Cosmology Program, KITP, University of California, Santa Barbara.
5. 2005, paper [41], I. Maor, R. Brustein and P. Steinhardt, Limitations in Using Luminosity Distance to Determine the Equation-of-state of the Universe, Physical Review Letters 86, pp.6-9, 2001 has been declared a highly



cited paper by Thomson ISI for being in the top 1% of highly cited papers in its field.

6. 2006, Invited participant, Superstring Phenomenology Program, KITP, University of California, Santa Barbara.
7. 2007, Dean's Excellence in teaching award, Faculty of Natural Sciences, Ben-Gurion University.
8. 2008, Rector's Excellence in teaching award, Ben-Gurion University.
9. 2010 – 2011, Scientific Associate Sabbatical fellowship, CERN, TH Division, Geneva, Switzerland.
10. 2011, Faculty of natural sciences excellence in research award, Ben-Gurion University.
11. 2011, Invited visiting Professor, University of Paris 7, Paris, France.
12. 2011 – 2012, Fellow, Center for Advanced Studies, Ludwig Maximilians Univ., Munich, Germany.
13. 2012, Invited participant, Bits, Branes, Black Holes Program, KITP, University of California, Santa Barbara.
14. 2012, Visiting Professor CCPP, NYU, New York.
15. 2013, Fellow, Center for Advanced Studies, Ludwig Maximilians Univ., Munich, Germany.
16. 2016, Albert Einstein Chair in Theoretical Physics, Ben-Gurion University
17. 2017, Visiting member, Flatiron Institute, Center for Computational Astrophysics, New York, NY.
18. 2017, Short term member, Institute for Advanced study, Princeton, New Jersey.
19. 2017, Visiting Professor CCPP, NYU, New York.
20. 2018 – 2019, Scientific Associate Sabbatical fellowship, CERN, TH Division, Geneva, Switzerland.

## VI. SCIENTIFIC PUBLICATIONS

### (b) Chapters in collective volumes

1. R. Brustein, “Cosmological entropy bounds,” in “*String theory and fundamental interactions*”, Lecture notes in physics Vol. 737, pp.619-659, Gasperini, M.; Maharana, J. (Eds.), Springer Berlin/Heidelberg, 2008.

### (c) Refereed articles in scientific journals

1. R. Brustein, D. Nemeschansky, S. Yankielowicz, Beta Functions and S-matrix in String theory, Nuclear Physics B301, pp. 224-246, 1988.

2. M. Schwartz, R. Brustein, From Lagrangian to Brownian motion, Journal of Statistical Physics 51, pp. 585-613, 1988.

3. R. Brustein, S. Yankielowicz, J.-B. Zuber, Factorization and Selection Rules in Conformal Field Theories, Nuclear Physics B313, pp. 321-347, 1989.

4. R. Brustein and S. P. De Alwis, The Cluster Expansion for Wormholes, Physics Letters B223, pp. 305-312, 1989.

5. R. Brustein and S. P. De Alwis, Wormholes in the Semi-Classical Approximation, Physics Letters B229, pp. 205-210, 1989.

6. R. Brustein, Y. Ne’eman and S. Sternberg, Duality, Crossing and Mac Lane’s Coherence, Israel Journal of Mathematics 72, pp. 19-37, 1990.

7. L. Brekke and R. Brustein, Constrained Wormholes, Physics Letters B243, pp. 198-206, 1990.

8. R. Brustein and S. P. De Alwis, Non-Perturbative Divergence in Critical String Theory, Physics Letters B247, pp. 31-35, 1990.

9. R. Brustein and S. P. De Alwis, Renormalization Group Equation and Non-Perturbative Effects in String Field Theory, Nuclear Physics B352, pp. 451-468, 1991.

10. R. Brustein, S. Marianer and M. Schwartz, Langevin Memory Kernel and Noise from Lagrangian Dynamics, Physica A175, pp. 47-58, 1991.

11. R. Brustein and S. P. De Alwis, Background Independent Action From D=1 Matrix Model, Physics Letters B272, pp. 285-289, 1991.

12. R. Brustein and K. Roland, Space-time Versus World-sheet Renormalization Group Equation in String Theory, Nuclear Physics B372, pp. 201-217, 1992.
13. J. Gaiete and R. Brustein, Batalin-Vilkoviski Master Equation and Absence of Anomalies in String Field Theory, Physics Letters B319, pp. 110-116, 1993.
14. R. Brustein and B. Ovrut, Stringy Instantons, Physics Letters B309, pp. 45-52, 1993.
15. R. Brustein and P. Steinhardt, Challenges for Superstring Cosmology, Physics Letters B302, pp. 196-201, 1993.
16. R. Brustein, M. Faux and B. Ovrut, Effective d=2 Supersymmetric Lagrangians From d=1 Supermatrix Models, Nuclear Physics B421, pp. 293-342, 1994.
17. R. Brustein and G. Veneziano, The Graceful Exit Problem in String Cosmology, Physics Letters B329, pp. 429-434, 1994.
18. R. Brustein, M. Faux and B. Ovrut, Instanton Effects in Matrix Models and String Effective Lagrangians, Nuclear Physics B433, pp. 67-98, 1995.
19. R. Brustein, M. Gasperini, M. Giovannini, V.F. Mukhanov and G. Veneziano, Metric Perturbations In Dilaton Driven Inflation, Physical Review D51, pp. 6744-6756, 1995.
20. R. Brustein, M. Gasperini, M. Giovannini and G. Veneziano, Relic Gravitational Waves From String Cosmology, Physics Letters B361 pp. 45-51, 1995.
21. R. Brustein, M. Gasperini and G. Veneziano, Peak and Endpoint of the Relic Graviton Background in String Cosmology, Physical review D55, pp. 3882-3885, 1997.
22. B. Allen and R. Brustein, Detecting Relic Gravitational Radiation from String Cosmology with LIGO, Physical review D55, pp. 3260-3264, 1997.
23. R. Brustein and B. Ovrut, Non-perturbative Effects in 2-d String Theory or Beyond the Liouville Wall, Int. Jour. Mod. Phys. A12, pp. 3477-3515, 1997.

24. R. Brustein and R. Madden, Graceful Exit and Energy Conditions in String Cosmology, *Physics Letters B*410, pp. 110-118, 1997.
25. R. Brustein and R. Madden, A Model of Graceful Exit in String Cosmology, *Physical Review D*57, pp.712-724, 1998.
26. R. Brustein and M. Hadad, Particle Production in String Cosmology Models, *Physical Review D*57, pp.725-740, 1998.
27. R. Brustein, M. Gasperini and G. Veneziano, Duality in Cosmological Perturbation Theory, *Physics Letters B*431, pp.277-285, 1998.
28. R. Brustein, M. Hadad, Dark Matter Axions in String Cosmology Models, *Physics Letters B*442, pp.74-81, 1998.
29. R. Brustein, Production and Detection of Relic Gravitational Waves from String Cosmology, invited paper, *Chaos, Solitons and Fractals* "Superstrings, M, F, S...Theory", vol. 10, pp.283-294, 1999.
30. R. Brustein and D. H. Oaknin, Electroweak Baryogenesis Induced by a Scalar Field, *Physical Review Letters* 82, pp. 2628-2631, 1999.
31. R. Brustein and M. Hadad, Cold and Hot Dark Matter from a Single NonThermal Relic, *Physical Review Letters* 82, pp. 3016-3019, 1999.
32. R. Brustein and D. Oaknin, Amplification of Hypercharge Electromagnetic Fields by a Cosmological Pseudoscalar, *Physical Review D*60, 023508, 9 pages, 1999.
33. R. Brustein and I. Maor, Moduli and Monopoles, *Physical Review D*60, 083510, 5 pages, 1999.
34. R. Brustein and R. Madden, Classical Corrections in String Cosmology, *Journal of High Energy Physics* 07, pp. U118-U143, 1999.
35. R. Brustein, S. Foffa and R. Sturani, The Generalized Second Law of Thermodynamics in String Cosmology, *Physics Letters B*471, pp.352-357, 2000.
36. R. Brustein, Generalized second law in cosmology from causal boundary entropy, *Physical Review Letters* 84, pp. 2072-2075, 2000.
37. R. Brustein and D. Oaknin, Signatures of Hypercharge Axions in Collid-

- ers, Physical Review D 62, 15001, 4 pages, 2000.
38. R. Brustein and M. Hadad, Fermion Production in Models of String Cosmology, Physics Letters B477, pp. 263-268, 2000.
  39. R. Brustein and G. Veneziano, Causal Entropy Bound for a Spacelike Region, Physical Review Letters 84, pp.5695-5698, 2000.
  40. R. Brustein and D. Oaknin, Candidates for Hypercharge Axions in Extensions of the Standard Model, Physical Review D63, 055002, 7 pages, 2001.
  41. I. Maor, R. Brustein and P. Steinhardt, Limitations in Using Luminosity Distance to Determine the Equation-of-state of the Universe, Physical Review Letters 86, pp.6-9, 2001.
  42. R. Brustein, Causal Boundary Entropy From Horizon Conformal Field Theory, Physical Review Letters 86, pp.576-579, 2001.
  43. R. Brustein, S. Foffa, and G. Veneziano, CFT, Holography and Causal Entropy Bound, Physics Letters B507, pp.270-276, 2001
  44. R. Brustein and S. P. De Alwis, String Universality, Physical Review D64, 046004, 18 pages, 2001.
  45. I. Maor, R. Brustein and P. Steinhardt, Erratum: Limitations in Using Luminosity Distance to Determine the Equation-of-state of the Universe, Physical Review Letters 87, 049901(E),1 page, 2001.
  46. R. Brustein and S. P. De Alwis, Moduli Stabilization and Supersymmetry Breaking in Effective Theories of Strings, Physical Review Letters, 87, 231601, 4 pages, 2001
  47. R. Brustein, S. Foffa, and A. E. Mayo, Causal Entropy Bound For Non-Singular Cosmologies, Physical Review D65, 024004, 6 pages, 2002.
  48. R. Brustein, D. Eichler, S. Foffa and D. Oaknin, The Shortest Scale of Quantum Field Theory, Physical Review D65, 105013, 4 pages, 2002.
  49. R. Brustein, D. Eichler and S. Foffa, Probing the Planck Scale with Neutrino Oscillations, Physical Review D65, 105006, 5 pages, 2002.
  50. I. Maor, R. Brustein, J. McMahon and P. Steinhardt, Measuring the Equation-of-state of the Universe: Pitfalls and Prospects, Physical Review

D65, 123003, 10 pages, 2002.

51. R. Brustein, D. Oaknin, Classical Dynamics of Quantum Fluctuations, Physical Review D67, 025010, 11 p., 2003.

52. I. Maor and R. Brustein, Distinguishing among scalar field models of dark energy, Physical Review D67, 103508, 7 pages, 2003.

53. R. Brustein, S. P. De Alwis, E. G. Novak, Inflationary Cosmology in the Central Region of String/M-theory Moduli Physical Review D68, 023517, 5 pages, 2003.

54. R. Brustein, S. P. De Alwis, E. G. Novak, M-theory Moduli Space and String Cosmology, Physical Review D68, 043507, 18 pages, 2003.

55. R. Brustein and A. Yarom, Thermodynamics and area in Minkowski space: Heat capacity of entanglement, Physical Review D69, 064013, 8 pages, 2004.

56. R. Brustein, D. Oaknin, and A. Yarom, Implications of area scaling of quantum fluctuations, Physical Review D70, 044043, 6 pages, 2004.

57. R. Brustein and S. P. de Alwis, Moduli potentials in string compactifications with fluxes: Mapping the discretuum, Physical Review D69, 126006, 14 pages, 2004.

58. R. Brustein and S. P. de Alwis, and P. Martens, Cosmological stabilization of moduli with steep potentials, Physical Review D70, 126012, 6 pages, 2004.

59. A. Yarom and R. Brustein, Area scaling of quantum fluctuations, Nuclear Physics B709, pp.391-408, 2005.

60. R. Brustein and A. Yarom, Dimensional reduction in Minkowski space, Journal of High Energy Physics 01(2005) 046, 10 pages, 2005.

61. R. Brustein, D. Eichler, and S. Foffa, A braneworld puzzle about entropy bounds and a maximal temperature, Physical Review D71, 124015, 8 pages, 2005.

62. R. Brustein, M. B. Einhorn, and A. Yarom, Entanglement interpretation of black hole entropy in string theory, Journal of High Energy Physics 0601:098, 18 pages, 2006.

63. R. Brustein and S. P. de Alwis, The string landscape and the wave function of the universe, *Physical Review D* 73, 046009, 12 pages, 2006.
64. R. Brustein, M. B. Einhorn, and A. Yarom, Entanglement and Nonunitary Evolution, *Journal of High Energy Physics* 0704:086, 13 pages, 2007.
65. I. Ben-Dayan, R. Brustein and S. P. de Alwis, “Models of Modular Inflation and Their Phenomenological Consequences,” *Journal of Cosmology and Astroparticle Physics* 0807:011, 32 pages, 2008.
66. R. Brustein and A. Yarom, “Entanglement induced fluctuations of cold bosons”, *Journal of Statistical Mechanics: Theory and Experiment* 0807:P07025, 13 pages, 2008.
67. R. Brustein and A. J. M. Medved, “The shear diffusion coefficient for generalized theories of gravity,” *Physics Letters B* 671, pp. 119-122, 2009.
68. R. Brustein and A. J. M. Medved, “The ratio of shear viscosity to entropy density in generalized theories of gravity,” *Physical review D* 79 Rapid Communications, 021901(R), 5 pages, 2009.
69. R. Brustein, D. Gorbonos and M. Hadad, “Wald’s entropy is equal to a quarter of the horizon area in units of the effective gravitational coupling,” *Physical Review D* 79, 044025, 9 pages, 2009.
70. R. Brustein and D. Gorbonos, “The Noether charge entropy in anti-deSitter space and its field theory dual”, *Physical Review D* 79, 126003, 9 pages, 2009.
71. D. Levy and R. Brustein, “Expressing the equation of state parameter in terms of the three dimensional cosmic shear”, *Journal of Cosmology and Astroparticle Physics* 0906 (2009) 026 , 21 pages, 2009.
72. R. Brustein and A. J. M. Medved, “The sound damping constant for generalized theories of gravity”, *Physical Review D* 79, 126012, 6 pages, 2009.
73. R. Brustein and M. Hadad, “The Einstein equations for generalized theories of gravity and the thermodynamic relation  $\delta Q = T\delta S$  are equivalent,” *Physical Review Letters* 103, 101301, 4 pages, 2009.
74. R. Brustein, G. Dvali and G. Veneziano, “A bound on the effective gravitational coupling from semiclassical black holes,” *Journal of High Energy*

Physics 10(2009)085, 14 pages, 2009.

75. R. Brustein and A. J. M. Medved, “Bounds on Black Hole Entropy in Unitary Theories of Gravity,” *Journal of High Energy Physics* 04(2010)103, 12 pages, 2010.

76. R. Brustein and A. J. M. Medved, “Proof of a universal lower bound on the shear viscosity to entropy density ratio,” *Physics Letters B* 691, pp. 87-90, 2010.

77. D. Levy and R. Brustein, “Constraining the expansion history of the universe from the red shift evolution of cosmic shear”, *Journal of Cosmology and Astroparticle Physics* 1009 (2010) 003, 14 pages, 2010.

78. I. Ben-Dayan and R. Brustein, “Cosmic Microwave Background Observables of Small Field Models of Inflation,” *Journal of Cosmology and Astroparticle Physics* 1009 (2010) 007, 13 pages, 2010.

79. R. Brustein and M. Hadad, Erratum: Einstein equations for generalized theories of gravity and the thermodynamic relation  $\delta Q = T\delta S$  are equivalent, *Physical Review Letters* 105, 239902, 1 page, 2010.

80. R. Brustein and J. Kupferman, “Black hole entropy divergence and the uncertainty principle,” *Physical Review D* 83, 124014 (2011), 10 pages, 2011.

81. R. Brustein and A. J. M. Medved, “Unitarity constraints on the ratio of shear viscosity to entropy density in higher derivative gravity,” *Physical review D* 83, 126005 (2011) 13 pages, 2011

82. R. Brustein, D. Gorbonos, M. Hadad, A. J. M. Medved, “Evaluating the Wald Entropy from two-derivative terms in quadratic actions,” *Physical Review D* 84, 064011 (2011), 12 pages, 2011.

83. R. Brustein and A. Riotto, “Evolution Equation for Non-linear Cosmological Perturbations,” *Journal of Cosmology and Astroparticle Physics* 11(2011) 006, 23 pages, 2011.

84. R. Brustein and A. J. M. Medved, “Non-perturbative unitarity constraints on the ratio of shear viscosity to entropy density in UV complete theories with a gravity dual”, *Physical Review D* 84, 126005 (2011), 12 pages, 2011.



85. R. Brustein, D. Semikoz, “Apparent superluminal neutrino propagation caused by nonlinear coherent interactions in matter,” *Physics Letters B* 706 (2012), pp. 462-464, 2012.
86. R. Brustein and A. J. M. Medved, “Graviton n-point functions for UV-complete theories in Anti-de Sitter space,” *Physical Review D* 85, 084028 (2012), 9 pages, 2012.
87. R. Brustein and A. J. M. Medved, “Gravitational entropy and thermodynamics away from the horizon,” *Physics Letters B* 715 (2012,) pp. 267-270, 2012.
88. R. Brustein and M. Hadad, “Wave function of the quantum black hole,” *Physics Letters B* 718 (2012), pp. 653-656, 2012.
89. R. Brustein and J. Kupferman, “The Creation of the World - According to Science,” *History and Philosophy of the Life Sciences*, 34, pp. 361-372, 2012.
90. R. Brustein and A. J. M. Medved, “Graviton multi-point functions at the AdS boundary,” *Physical Review D* 87 (2013) 024005, 22 pages, 2013.
91. R. Brustein and A. J. M. Medved, “Universal stress-tensor correlation functions of strongly coupled conformal fluids,” *Physics Letters B* 724, pp. 144-149, 2013.
92. R. Brustein and M. Schmidt-Sommerfeld, “Universe Explosions,” *Journal of High Energy Physics* 1307 (2013) 047, 30 pages, 2013.
93. R. Brustein and A. J. M. Medved, “Lovelock gravity is equivalent to Einstein gravity coupled to form fields,” *Physical Review D* 88, 064010 (2013), 6 pages, 2013.
94. R. Brustein and A. J. M. Medved, “Semiclassical black holes expose forbidden charges and censor divergent densities,” *Journal of High Energy Physics* 1309 (2013) 108, 25 pages, 2013.
95. R. Brustein and A. J. M. Medved, “Restoring predictability in semiclassical gravitational collapse,” *Journal of High Energy Physics*, 1309 (2013) 015, 21 pages, 2013.
96. R. Brustein, “Origin of the blackhole information paradox,” *Fortschritte*

- der Physik (Progress of Physics) 62 (2014), pp. 255–265, 2014.
97. R. Brustein and A. J. M. Medved, “Phases of information release during black hole evaporation,” *Journal of High Energy Physics*, 02 (2014) 116, 31 pages, 2014.
  98. R. Brustein and A. J. M. Medved, “Horizons of semiclassical black holes are cold,” *Journal of High Energy Physics* 06 (2014) 057, 28 pages, 2014.
  99. E. Avraham and R. Brustein, “Canonical structure of higher derivative theories,” *Physical Review D* 90 (2014) 024003, 7 pages, 2014.
  100. R. Brustein and A. J. M. Medved, “Black hole firewalls, smoke and mirrors,” *Physical Review D* 90 (2014) 024040, 6 pages, 2014.
  101. R. Brustein and A. J. M. Medved, “How Black Holes Burn,” *Physical Review D* 91 (2015) 084062, 5 pages, 2015.
  102. L. Alberte, R. Brustein, A. Khmelnitsky and A. J. M. Medved, “Density matrix of black hole radiation,” *Journal of High Energy Physics* 1508 (2015), 015, 37 pages, 2015.
  103. R. Brustein and A. J. M. Medved, “Constraints on the quantum state of pairs produced by semiclassical black holes,” *Journal of High Energy Physics* 07 (2015) 012, 17 pages, 2015.
  104. R. Brustein and A. J. M. Medved, “Falling through the black hole horizon,” *Journal of High Energy Physics* 06 (2015) 089, 19 pages, 2015.
  105. R. Brustein and A. J. M. Medved, “Quantum state of the black hole interior,” *Journal of High Energy Physics* 1508 (2015) 082, 16 pages, 2015.
  106. R. Brustein and A. J. M. Medved, “Teleporting entanglement during black hole evaporation,” *Journal of High Energy Physics*, 1610 (2016) 028, 12 pages, 2016.
  107. R. Brustein and A. J. M. Medved, “Black holes as collapsed polymers,” *Fortschritte der Physik (Progress of Physics)* 65: 1600114, 7 pages, 2017.
  108. R. Brustein and A. J. M. Medved, “Emergent horizon, Hawking radiation and chaos in the collapsed polymer model of a black hole,” *Fortschritte der Physik (Progress of Physics)* 65: 1600116, 14 pages, 2017.

109. R. Brustein, A. J. M. Medved and K. Yagi, “When black holes collide: Probing the interior composition by the spectrum of ringdown modes and emitted gravitational waves,” *Physical Review D* **96** 064033, 15 pages, 2017.
110. R. Brustein and A. J. M. Medved, K. Yagi, “Discovering the interior of black holes,” *Physical Review D* **96** 124021, 11 pages, 2017.
111. R. Brustein, A. J. M. Medved and Y. Zigdon, “The state of Hawking radiation is non-classical,” *Journal of High Energy Physics*, 1801, 136 (2018), 24 pages, 2018.
112. R. Brustein and A. J. M. Medved, “Quantum hair of black holes out of equilibrium,” *Physical Review D* **97**, 044035, 7 pages, 2018.
113. R. Brustein and Y. Sherf, “Causality Violations in Lovelock Theories,” *Physical Review D* **97**, 084019, 11 pages, 2018.
114. I. Wolfson and R. Brustein, “Scale dependence of the CMB power spectrum in small field models of inflation with a high tensor to scalar ratio,” *PLoS ONE* **13**, 1, 22 pages, 2018.
115. R. Brustein and Y. Raveh, “Signatures of HyperCharge Axions at Contemporary and Future Colliders,” *Physical Review D* **98**, 055010, 10 pages, 2018.
116. R. Brustein and Y. Zigdon, “Revealing the interior of black holes out of equilibrium in the SYK model,” *Physical Review D* **98**, 066013, 8 pages, 2018.
117. I. Wolfson and R. Brustein, “Likelihood analysis of small field polynomial models of inflation yielding a high Tensor-to-Scalar ratio,” *PLoS ONE* **14**, 4, 12 pages, 2019.
118. R. Brustein and A. J. M. Medved, “Resisting collapse: How matter inside a black hole can withstand gravity,” *Physical Review D* **99** (2019) no.6, 064019, 6 pages, 2019.
119. R. Brustein, A. J. M. Medved, “Non-singular black holes interiors need physics beyond the standard model”, *Fortschritte der Physik (Progress of Physics)* **67**: 1900058, 10 pages, 2019.
120. I. Wolfson and R. Brustein, “Small field models of inflation that predict

a tensor-to-scalar ratio  $r=0.03$ ”, Physical Review D100 (2019) no.4, 043522, 5 pages, 2019.

121. R. Brustein, A. J. M. Medved and K. Yagi, “Lower limit on the entropy of black holes as inferred from gravitational wave observations,” Physical Review D100 (2019) no.10, 104009, 12 pages, 2019.

122. R. Brustein and Y. Sherf, “Emission Channels from Perturbed Quantum Black Holes,” Physical Review D, D100 (2019) no.12, 124005, 10 pages, 2019.

123. R. Brustein and A. J. M. Medved, “A maximal-entropy initial state of the Universe as a microscopic description of inflation,” Physical Review D101 (2020) no. 12, 123502, 14 pages, 2020.

124. R. Brustein and A. J. M. Medved, “A correspondence between strings in the Hagedorn phase and asymptotically de Sitter space,” Physical Review D102 (2020) 8, 086002, 16 pages, 2020.

125. R. Brustein and Y. Zigdon, “Effective field theory for closed strings near the Hagedorn temperature,” Journal of High Energy Physics 107 (2021), 27 pages, 2021.

126. R. Brustein and Y. Zigdon, “Black Hole Entropy Sourced by String Winding Condensate,” Journal of High Energy Physics, **10**, 219 (2021), 14 pages, 2021.

127. R. Brustein and Y. Sherf, “Tidal deformation of quantum black holes,” International Journal of Modern Physics D Vol. 30, No. 14 (2021) 2142011, 7 pages, 2021.

128. R. Brustein and Y. Sherf, “Quantum Love,” Physical Review D 105 (2022) 2, 024043, 2022.

129. R. Brustein and Y. Sherf, “Classical Love for Quantum Blackholes,” Physical Review D 105 (2022) 2, 024044, 2022.

130. R. Brustein, A. J. M. Medved and T. Simhon, “Black holes as frozen stars,” Physical Review D105 (2022) 2, 024019, 11 pages, 2022.

131. R. Brustein, A. Giveon, N. Itzhaki and Y. Zigdon, “A Puncture in the Euclidean Black Hole,” Journal of High Energy Physics 04 (2022), 20 pages, 2022.

132. R. Brustein and Y. Zigdon, “Thermal Equilibrium in String Theory in the Hagedorn Phase,” Journal of High Energy Physics, 05 (2022) 031, 20 pages, 2022.

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133. J. Westerweck, Y. Sherf, C. D. Capano and R. Brustein, “Sub-atomic constraints on the Kerr geometry of GW150914,” [arXiv:2108.08823 [gr-qc]].

134. I. Wolfson, U. Kumar, I. Ben-Dayan and R. Brustein, “Small Field models with ACTPol and BICEP3 data - Likelihood analysis,” [arXiv:2207.03150 [astro-ph.CO]].

(d) Unrefereed articles in scientific journals

None

(e) Unpublished/classified articles and reports

134. I. Ben-Dayan and R. Brustein, “Hypercharge Axion and the Diphoton 750 GeV Resonance,” arXiv:1601.07564 [hep-ph].

## **VII. LECTURES AND PRESENTATIONS AT MEETINGS**

### **AND INVITED SEMINARS**

(a1) Invited plenary lectures at conferences/meetings

1. 1997, R. Brustein, String Cosmology: An Update, plenary invited talk, published in proceedings of the first International Workshop on Particle Physics and The Early Universe, 15-19 September 1997, Ambleside, Lake District, England, COSMO-97, pp.535-542, L. Roszkowski, ed., World Scientific, 1998.

2. 1999, R Brustein and D. Oaknin, Hypercharge Axions for Baryogenesis, plenary invited talk presented by R. Brustein, published in proceedings of the third International Workshop on Particle Physics and The Early Universe COSMO-99, 27 September - 2 October 1999, Trieste, Italy, pp.412-411, U. Cotti, R. Jeannerot, G. Senjanovic, A. Smirnov, eds., World Scientific, 2000.

3. 1999, R. Brustein, Entropy, Holography, and Generalized Second law in Cosmology, plenary invited talk, published in proceedings of the 7th International Symposium on Particles, Strings and Cosmology PASCOS99, Granlibakken, Lake Tahoe, California, December 10-16, 1999, pp. 75-81, K. Cheung, J. F. Gunion, S. Mrenna, eds., World Scientific, 2000.
4. 2003, R. Brustein, Quantum entanglement, thermodynamics and area, Lectures at the third international school on field theory and gravitation, Vitoria, ES, Brazil, 22-25 April 2003.
5. 2003, R. Brustein, Determining the nature of dark energy, plenary invited talk, XV Rencontres de Blois, Physical Cosmology, New results in cosmology and the coherence of the standard model, Blois, Loir-et-Cher, France, June 15-20, 2003.
6. 2004, R. Brustein, Moduli potentials in flux compactifications, plenary invited talk, String Phenomenology 2004, University of Michigan, Ann Arbor, Michigan, August 1-6, 2004.
7. 2007, R. Brustein, Cosmology and Fundamental Physics, Invited review talk, 53<sup>rd</sup> annual meeting of the Israel physical society, The Weizmann Institute for Science, December 9, 2007, abstract published in bulletin of the Israel Physical Society vol. 53, 2008.
8. 2011, R. Brustein, Faster than light neutrinos, an optical illusion?, evening lecture, Science week Universe Cluster, November 29, Max Planck Institute for Plasma Physik, Garching, Germany, 2011.
9. 2014, R. Brustein, Black hole paradoxes: The clash of quantum mechanics and gravity, lectures in the Arnold Sommerfeld Center for Theoretical Physics summer PhD school on "Strings and fundamental physics", August 11-22, Ludwig Maximilians University, Munich, Germany, 2014.
10. 2015, R. Brustein, The quantum state of the black hole, The Planck Scale II, XXXV Max Born Symposium, 7 - 12 September, Wroclaw, Poland, 2015

(a2) Invited lectures at conferences/meetings

1. 1992, R. Brustein and B. Ovrut, Non-perturbative Interactions in String Theory, invited talk presented by B. Ovrut, published in proceedings of the

26th International Conference on High Energy Physics (ICHEP 92), Dallas, TX, 6-12 Aug 1992, Dallas HEP 1992, pp. 1485-1490, James R. Sanford ed., American Inst. Phys., 1993.

2. 1995, R. Brustein, Dilaton Driven Inflation in String Cosmology, published in proceedings of the International Conference on Unified Symmetry In the Small and in the Large, Coral Gables, FL, 2-5 Feb 1995, Unified Symmetry In the Small and in the Large 2: proceedings, pp. 111-117, B.N. Kursunoglu, S. Mintz, A. Perlmutter, ed., Plenum, New York, USA, 1995.

3. 1995, R. Brustein and B. A. Ovrut, Towards Evaluation of Stringy Non-perturbative Effects, invited talk presented by R. Brustein, published in proceedings of the International Workshop on Supersymmetry and Unification of Fundamental Interactions (SUSY 95), Palaiseau, France, 15-19 May 1995, Susy 95, pp.485-490, I. Antoniadis and H. Videau ed., Editions Frontieres, 1996.

4. 1995, R. Brustein, Gravitational Radiation From String Cosmology, workshop on Inflation, from theory to observation and back, Aspen center for physics, Aspen, Colorado, Aug 28 - Sep 4, 1995.

5. 1995, R. Brustein, Production and Detection of Gravitational Radiation From String Cosmology, workshop on unification from the Planck scale to the electroweak scale, Oct 22-28, 1995, Institute for Theoretical Physics, Santa Barbara, California.

6. 1996, R. Brustein, Spectrum of Relic Gravitational Radiation In String Cosmology Models, workshop on detection of high-frequency gravitational waves, CERN, Geneva, Switzerland, Jan 29-30, 1996.

7. 1996, R. Brustein, Superstring Cosmology, presented at 42<sup>nd</sup> meeting of the Israel physical society, Jerusalem, Apr 1, 1996, abstract published in bulletin of the Israel Physical Society vol. 42, 1996.

8. 1997, R. Brustein, Detection of Gravitational Radiation from String Cosmology, 43<sup>rd</sup> meeting of the Israel physical society, Beer Sheva, Apr 17, 1997, abstract published in bulletin of the Israel Physical Society vol. 43, 1997.

9. 1997, R. Brustein and R. Madden, Graceful Exit in String Cosmology, invited talk presented by R. Brustein, published in proceedings of workshop on Modern Modified Theories of Gravitation and Cosmology, 29-30 June

1997, Ben Gurion University, Beer Sheva, Israel, E. I. Guendelman, ed., Hadronic Journal 21, pp.202-208, 1998.

10. 1997, R. Brustein and R. Madden, A Model of Graceful exit in String Cosmology, invited talk presented by R. Madden, published in proceedings of International Europhysics Conference on High Energy Physics (HEP 97), Jerusalem, Israel, 19-26 Aug 1997, pp 999-1002, D. Lellouch, G. Mikenberg and E. Rabinovici, eds., Springer-Verlag, 1998.

11. 1998, R. Brustein, Cosmic Gravitational Wave Background in String Cosmology, published in proceedings of 33<sup>rd</sup> Rencontres de Moriond: Fundamental Parameters in Cosmology 17-24 Jan 1998, Les Arcs, France, pp. 59-65, J. Tran Thanh Van, et al, eds., Editions Frontiers, 1998.

12. 1998, R. Brustein, Duality in String Cosmology, 44<sup>th</sup> meeting of the Israel physical society, Rehovot, Apr 8, 1998, abstract published in bulletin of the Israel Physical Society vol. 44, 1998.

13. 1998, R. Brustein, Duality in String Cosmology, published in proceedings of International Conference on High Energy Physics (ICHEP 98), 23-29 July 1998, Vancouver, BC, Canada, vol.2, pp. 1754-1759, A. Astbury, D. Axen, and J. Robinson, eds., World Scientific, 1999.

14. 1998, R. Brustein, Duality in String Cosmology, published in proceedings of Second Conference of the TMR European Network "Quantum Aspects of Gauge Theories, Supersymmetry and Unification", September 21-26, 1998, Corfu, Greece, Lecture Notes in Physics; Vol. 525, pp. 446-455, A. Ceresole, C. Kounnas, D. Lust and S. Theisen, eds., Springer, 1999.

15. 1998, R. Brustein and M. Hadad, Dark Matter In Models Of String cosmology, invited talk presented by R. Brustein, published in proceedings of COSMO-98, 15-20 Nov 1998, Asilomar, California, pp. 388-391, D. O. Caldwell ed., American Institute of Physics, 1999.

16. 1999, R. Brustein, Graceful Exit In String Cosmology, Pritzker Workshop, 1-3 Feb 1999, Chicago, Illinois.

17. 1999, R. Brustein and D. H. Oaknin, A New Model of Baryogenesis, invited talk presented by R. Brustein, 45<sup>th</sup> meeting of the Israel physical society, Tel Aviv, March 18, 1999, abstract published in bulletin of the Israel Physical Society vol. 45, 1999.



18. 1999, R. Brustein, Generalized Second Law of Thermodynamics in Cosmology, workshop on recent issues in string cosmology, 21-25 June 1999, IHES Bures sur Yvette, France.
19. 1999, R. Brustein, Generalized Second Law of Thermodynamics in Cosmology, EC summer school workshop - connecting fundamental physics and cosmology, 23-27 August 1999, Newton Institute, Cambridge, England.
20. 2000, R. Brustein, 46<sup>th</sup> meeting of the Israel physical society, Entropy, Holography, and Generalized Second law in Cosmology, Technion, May 11, 2000, abstract published in bulletin of the Israel Physical Society vol. 46, 2000.
21. 2004, R. Brustein, Putting error bars on cosmological measurements, workshop on cosmological acceleration, Aspen center for physics, Aspen, Colorado, Aug 15 - Sep 12, 2004.
22. 2005, Understanding quantum black holes, lecture at A Mini-School on Quantum Black holes, Tel Aviv University and the Technion, January 23-25, Tel Aviv, Israel.
23. 2005, R. Brustein, Models of modular inflation, String cosmology 2005, April 25-29, 2005, Uppsala, Sweden.
24. 2005, R. Brustein, Entanglement interpretation of black hole entropy, third mideast string workshop, June 23-30, 2005, Kolymbari, Crete, Greece.
25. 2006, R. Brustein, Quantum and classical cosmology in the string landscape, Batsheva de Rothschild Seminar on Innovative Aspects of String Theory, February 28 - March 6, 2006, Ein Boqueq, Dead Sea, Israel.
26. 2007, R. Brustein, Wald's Entropy, Area and Entanglement, Einstein's Gravity in Higher dimensions Workshop, February 18-23, 2007, Jerusalem, Israel.
27. 2007, R. Brustein, Models of modular inflation and their observable predictions, Fourth Regional Meeting In String Theory, 10-17 June, 2007, Patras, Greece.
28. 2008, R. Brustein, Models of modular inflation and their phenomenological Consequences, String Theory: From Theory To Experiment, 6-11 April 2008, Jerusalem, Israel.

29. 2008, R. Brustein, Models of modular inflation and their phenomenological Consequences, Workshop on Cosmological Frontiers in Fundamental Physics, APC, 19-23 May, 2008, Paris, France.
30. 2009, R. Brustein, Thermodynamics and Hydrodynamics of black branes in anti-deSitter space, String Theory and Fundamental Physics workshop, The Krishna Jungle Resort, 11 - 17 February, 2009 Kanha National Park, India.
31. 2009, R. Brustein, : Impact of future cosmological observations on fundamental physics, String Theory and Fundamental Physics workshop, The Krishna Jungle Resort, 11 - 17 February, 2009 Kanha National Park, India.
32. 2009, R. Brustein, Lessons from black holes – Equations of motion and effective coupling of quantum gravity, Fifth Mideast String Workshop, June 28- July 6, 2009, Kolymbari, Crete, Greece.
33. 2009, R. Brustein, Proof of a universal lower bound on the shear viscosity to entropy density ratio , The ASC Workshop on the Fluid-Gravity Correspondence, September 2-7, Munich, Germany, 2009.
34. 2009, R. Brustein, Proof of a universal lower bound on the shear viscosity to entropy density ratio, Shining Light on Black Holes Workshop, September 21-25, University of Michigan, Ann Arbor, Michigan, 2009.
35. 2009, R. Brustein, Cosmological Parameters, Minerva-Gentner Symposium Experiment Confronts String Theory, October 12-15, the Harnack-Haus, Berlin, Germany, 2009.
36. 2010, R. Brustein, Cosmic Microwave observables of small field models of inflation, Workshop on light fields in particles, strings and cosmology, February 2-3, 2010, DESY Laboratory, Hamburg, Germany.
37. 2010, R. Brustein, Cosmic Microwave observables of small field models of inflation, Seventh Workshop on Particle Physics and Cosmology, February 3-6, 2010, University of Warsaw, Warsaw Poland.
38. 2010, R. Brustein, Review of small field models of inflation, Workshop on frontiers of Cosmology, March 28- April 4, 2010, University of Crete, Heraklion, Crete.
39. 2010, R. Brustein, “Unitarity constraints on the ratio of shear viscosity to

entropy density, Seminar in the Integrability in String and Gauge Theories; AdS/CFT Duality and its Applications workshop, May 31 - July 9, 2010, Nordita, Stockholm, Sweden.

40. 2011, R. Brustein, “Evolution equation for non-linear cosmological perturbations”, PTChat workshop, September 20 - 22, 2011, CEA, Saclay, France.

41. 2012, R. Brustein, “Origin of the black hole information paradox”, Forty years of black hole thermodynamics workshop, September 3-7, 2012, IAS, Hebrew University, Jerusalem, Israel.

42. 2012, R. Brustein, “Origin of the black hole information paradox”, GeNeZiSS Mini-Conference Series, November 30, 2012, Ecole Polytechnique Federal Lausanne, Lausanne, Switzerland.

43. 2013, R. Brustein, “Black hole paradoxes: Origin and proposed resolution”, Seventh Crete Regional Meeting on String Theory, 16-23 June 2013, Kolymbari, Crete.

44. 2014, R. Brustein, “Firewalls, Smoke and Mirrors”, Black Holes and Quantum Information, January 12-17, 2014, The Weizmann Institute of Science, Rehovot, Israel

45. 2014, R. Brustein, “Fundamental Physics”, Student conference of the Israel Physical Society, April 9-10, Sde Boker, Israel.

46. 2015, R. Brustein, “Quantum State of the Black Hole”, Eighth Crete Regional Meeting on String Theory, 5-11 July 2015, Napflio, Greece.

47. 2015, R. Brustein, “Black Holes as collapsed polymers”, 4th Indian-Israeli conference on string theory, 21-26 December 2015, Goa, India.

48. 2016, R. Brustein, “Entropy bounds”, Inaugural meeting of The Emmy Noether Centre of Theoretical of Physics at Mitzpe Ramon, The Life And Science Of Jacob D. Bekenstein, 3-8 July 2016, Mitzpe Ramon, Israel.

49. 2017, R. Brustein “Probing the interior of black holes with gravity waves”, Workshop on Recent Developments in General Relativity, May 21-23 2017, The Hebrew University, Jerusalem, Israel.

50. 2017, R. Brustein “Probing the interior of black holes with gravity

waves”, Ninth Crete regional meeting on string theory, July 9-16 2017, Kolymbari, Crete.

51. 2017, R. Brustein, “What’s inside a black hole?”, Quantum black holes in the sky workshop, November 8-10 2017, Perimeter Institute, Waterloo ON, Canada.

52. 2018, R. Brustein, “What’s inside a black hole?”, Meeting on Quantum Gravity, January 9 2018, Hebrew University, Jerusalem, Israel.

53. 2018, R. Brustein, “What’s inside a black hole?”, 7th Bangkok Workshop on High-Energy Theory, January 29 -February 2 2018, Chulalongkorn University, Bangkok, Thailand.

54. 2019, R. Brustein, “Non-singular black holes interiors need physics beyond the standard model”, 8th Bangkok Workshop on High-Energy Theory, January 6-11 2019, Chulalongkorn University, Bangkok, Thailand.

55. 2019, R. Brustein, The black hole interior, The vacuum of the Universe IV: the physics of black holes, ICC, University of Barcelona, June 11-13 2019, Barcelona, Spain

56. 2019, R. Brustein “Towards a string deSitter correspondence”, Tenth Crete regional meeting on string theory, September 15-21 2019, Kolymbari, Crete.

57. 2019, R. Brustein “Black hole love story”, QCD meets gravity workshop, December 9-13, 2019, UCLA 2019, Los Angeles, California.

58. 2020, R. Brustein “Black hole love story”, Gravity workshop, January 21, 2020, HUJI 2020, Jerusalem, Israel.

59. 2021, R. Brustein “(asymptotic) deSitter space in string theory”, Geometry, Strings and the Swampland workshop. November 8 - 12, 2021. Ringberg Castle, Tegernsee. Germany.

60. 2022, R. Brustein, “What’s inside a black hole?”, New horizons for (no-)horizon physics: from gauge to gravity and back Mini-Workshop, April 4 -April 8, 2022, Galileo Galilei Institute for Theoretical Physics, Florence, Italy.

61. 2022, R. Brustein, “Black hole entropy sourced by string winding conden-

sate: outside and inside views”, Black Hole Micro-structure IV conference, Jun 6 – 17, 2022, IPhT, CEA Saclay, France.

62. 2022, R. Brustein “(asymptotic) deSitter space in string theory”, 12th Crete Regional Meeting in String Theory, July 4 - 10, 2022, Kolymbari, Crete.

(b) Presentation of papers at conferences/meetings

1. 1987, R. Brustein, D. Nemeschansky, S. Yankielowicz, Equations of Motion, Beta Functions and Scattering Amplitudes in String Theory, talk presented by S. Yankielowicz, published in proceedings of Perspectives in String Theory, Niels Bohr Institute / Nordita Meeting, Copenhagen, Denmark, Oct 12-16, 1987, pp. 138-166, P. Di Vecchia and J.L. Petersen ed., World Scientific, 1988.

2. 1989, R. Brustein, Skyrms-holes–Wormholes in effective gravity, talk, ‘Wormshop’ Fermilab workshop on wormholes, Fermilab, Batavia, Illinois, May 1989.

3. 1989, R. Brustein, Y. Ne’eman and S. Sternberg, Two Dimensional Conformal Field Theory, Duality and Mac Lane’s Coherence, talk presented by Y. Ne’eman, published in proceedings of CCSAT World Laboratory Symposium/Workshop, Beijing, China, May 29-June 10, 1989, Fields, Strings and Quantum Gravity, pp. 151-173, H.-Y. Guo, Q. Zhao-ming, H. Tye ed., Gordon and Breach, 1990.

4. 1989, R. Brustein, Y. Ne’eman and S. Sternberg, Conformal Field Theories and Category Theory, talk presented by R. Brustein, published in Proceedings of the 18th International Conference on Differential Geometric Methods in Theoretical Physics, Physics and Geometry, Lake Tahoe, CA, Jul 2-8, 1988, Differential Geometric Methods in Theoretical Physics, Physics and Geometry, pp. 271-278, L.-L. Chau and W. Nahm ed., Plenum Press, New York, 1990.

5. 1991, R. Brustein and S. P. De Alwis, Renormalization Group Equation for String Field Theory and Matrix Models, talk presented by R. Brustein, published in proceedings of the Second International Symposium, Particles, Strings and Cosmology, North Eastern University, Boston, Mar 25-30, 1991, Particles, Strings and Cosmology, pp. 781-793, Pran Nath and Stephen Reucroft ed., World Scientific, 1992.

6. 1992, R. Brustein, Non-perturbative Interactions in String Theory, HEP mini-symposium, department of physics, University of Pennsylvania, Philadelphia, Pennsylvania, Dec 4-5, 1992.
7. 1993, R. Brustein, M. Faux and B. Ovrut, Non-perturbative Interactions in Two Dimensional (Super) String Theory, talk presented by R. Brustein at International Workshop on Supersymmetry and Unification of Fundamental Interactions (SUSY 93), Boston, MA, 29 Mar - 1 Apr 1993, preprint UPR-578-T (hep-th/9310143).
8. 1993, R. Brustein, M. Faux and B. Ovrut, Non-perturbative Effective Lagrangian for Super-matrix Models, talk presented by B. Ovrut, published in proceedings of the International Europhysics Conference on High Energy Physics, Marseilles, France, Jul 22-28, 1993, Marseilles EPS HEP 1993, pp. 260-264, J. Carr and M. Perrottet ed., Edition Frontieres, 1994.
9. 1994, R. Brustein, Cosmology and Models of Supersymmetry Breaking in String Theory, published in proceedings of International workshop on supersymmetry and unification of fundamental interactions (SUSY 94), Ann Arbor, Michigan, 14-17 May 1994, SUSY '94 Workshop, pp. 72-75, C. Kolda and J. D. Wells ed., University of Michigan Press, 1994.
10. 1994, R. Brustein, M. Faux and B. Ovrut, Effective Field Theory From Matrix Models, talk presented by R. Brustein, contribution to the proceedings of IV'th International conference on mathematical physics, string theory, and quantum gravity, Rakhov, Ukraine, 12-20 Feb 1994.
11. 1994, R. Brustein, M. Faux and B. Ovrut, The Strength of Non-perturbative Effects in Matrix Models and String Effective Lagrangians, talk presented by B. Ovrut, published in proceedings of International workshop on supersymmetry and unification of fundamental interactions (SUSY 94), Ann Arbor, Michigan, 14-17 May 1994, SUSY '94 Workshop, pp. 395-402, C. Kolda and J. D. Wells ed., University of Michigan Press, 1994.
12. 1994, R. Brustein, M. Faux and B. Ovrut, A Systematic Analysis Of Non-Perturbative Effects In Matrix Models And String Effective Lagrangians, talk presented by B. Ovrut, published in Joint U.S.-Polish Workshop on Physics from Planck Scale to Electro-Weak Scale, Warsaw, Poland, Sep 21-24, 1994, Physics from Planck Scale to Electro-Weak Scale: proceedings, pp. 303-318, Pran Nath, Tomasz Taylor, Stefan Pokorski ed., World Scientific, 1995.

13. 1994, R. Brustein, The Role of the Superstring Dilaton in Cosmology and Particle Physics, published in proceedings of XXIX'th Rencontres de Moriond, Electroweak interactions and unified theories, Meribel, France, Mar 12-19, 1994, '94 Electroweak interactions and unified theories, pp. 301-310, J. Tran Thanh Van ed., Editions Frontieres, 1994.

14. 1995, R. Brustein, M. Gasperini, M. Giovannini and G. Veneziano, Gravitational Radiation from String Cosmology, talk presented by R. Brustein, published in proceedings of the International Europhysics Conference on High Energy Physics, Brussels, Belgium, Jul 27-31, 1995, Brussels EPS HEP 1995, pp. 408-409, J. Lemonne, C. Vander Velde, F. Verbeure, eds., World Scientific, 1996.

15. 1996, R. Brustein, Spectrum of Cosmic Gravitational Wave Background, published in proceedings of International Conference on Gravitational Waves: Sources and Detectors, Pisa, Italy, Mar 19-23 1996, pp. 149-152, I. Ciufolini, F. Fidicaro, eds, World Scientific, 1997.

16. 2002, I. Maor, R. Brustein, J. McMahon and P. Steinhardt, The Nature of Dark Energy, to be published in proceedings of 37 Rencontres de Moriond: The Cosmological Model, 16-23 March 2002, Les Arcs, France, J. Tran Thanh Van, et al, eds., Editions Frontieres, 2002.

17. 2002, R. Brustein, Inflation in the central region of string/M-theory moduli space, Blaise Pascal Conference: String/Brane Cosmology, 23-27 September 2002, IHES Bures sur Yvette, France.

(c) Seminars at universities/institutions

1. 1985, Mathematical physics seminar, dynamical analysis of Nelson's Stochastic mechanics, department of physics, Technion, Haifa, Israel.

2. 1986, High energy theory seminar, series of 3 lectures on string theory, department of physics, Tel Aviv University, Tel Aviv, Israel.

3. 1989, Brown bag theory seminar, d=1 matrix models, department of physics, University of Texas at Austin, Austin, Texas.

4. 1989, High energy theory seminar, constrained wormholes, department of physics, University of Pennsylvania, Philadelphia, Pennsylvania.

5. 1990, Brown bag theory seminar, non-perturbative divergence in string theory, department of physics, University of Texas at Austin, Austin, Texas.

6. 1990, High energy theory seminar, renormalization group equation for string field theory, department

- of physics, Tel Aviv University, Tel Aviv, Israel.
7. 1991, High energy seminar, renormalization group equation for string field theory, department of physics, Hebrew University, Jerusalem, Israel.
  8. 1991, High energy theory seminar, renormalization group approach to matrix models, department of physics, Tel Aviv University, Tel Aviv, Israel.
  9. 1991, High energy theory seminar,  $d=1$  matrix models, department of physics, Technion, Haifa, Israel.
  10. 1992, High energy theory seminar, stringy instantons, department of physics, Brown University, Providence, Rhode Island.
  11. 1992, Algebra seminar, conformal field theories and category theory, department of mathematics, University of Pennsylvania, Philadelphia, Pennsylvania.
  12. 1992, High energy theory seminar, non-perturbative interactions in string theory, department of physics, University of Pennsylvania, Philadelphia, Pennsylvania.
  13. 1993, Brown bag seminar, stringy instantons, department of physics, University of Texas at Austin, Austin, Texas.
  14. 1993, High energy theory seminar, challenges for superstring cosmology, department of physics, University of Pennsylvania, Philadelphia, Pennsylvania.
  15. 1993, High energy theory seminar, challenges for superstring cosmology, department of physics, University of Texas at Austin, Austin, Texas.
  16. 1993, High energy theory seminar, challenges for superstring cosmology, Institute for theoretical physics, University of California, Santa Barbara, California.
  17. 1993, High energy theory seminar, challenges for superstring cosmology, physics department, Brookhaven National Laboratory, Upton, New York.
  18. 1993, High energy theory seminar, challenges for superstring cosmology, MIT, Boston, Massachusetts.
  19. 1993, High energy theory seminar, challenges for superstring cosmology, Institute for Advanced Study, Princeton, New Jersey.
  20. 1993, Theory seminar, challenges for superstring cosmology, CERN, Geneva, Switzerland.
  21. 1994, High energy theory seminar, non-perturbative interactions in string theory, department of physics, Technion, Haifa, Israel.
  22. 1994, High energy theory seminar, graceful exit in string cosmology, department of physics, Hebrew University, Jerusalem, Israel.
  23. 1994, Theory seminar, string cosmology, Institute for Theoretical and Experimental Physics (ITEP), Moscow, Russia.
  24. 1994, High energy theory seminar, graceful exit in string cosmology, department of physics, University of Pennsylvania, Philadelphia, Pennsylvania.
  25. 1995, High energy theory seminar, inflation in string cosmology, department of physics, Technical University, Munich, Germany.
  26. 1995, Theory seminar, inflation in string cosmology, Institute for Theoretical Physics, Uppsala University, Uppsala, Sweden.
  27. 1995, High energy theory seminar, gravitational radiation from string cosmology, department of



physics, University of Colorado, Boulder, Colorado.

28. 1995, Theoretical astrophysics seminar, gravitational radiation from string cosmology, CALTECH, Los Angeles, California.

29. 1995, Department colloquium, gravitational radiation from string cosmology, University of Southern California, Los Angeles, California.

30. 1995, High energy theory seminar, gravitational radiation from string cosmology, department of physics, Technion, Haifa, Israel.

31. 1995, Department colloquium, gravitational radiation from string cosmology, department of physics, Ben Gurion University, Beer-Sheva, Israel.

32. 1995, High energy theory seminar, gravitational radiation from string cosmology, department of physics, Hebrew University, Jerusalem, Israel.

33. 1995, Department colloquium, gravitational radiation from string cosmology, department of physics, University of Roma II "Tor Vergata", Rome, Italy.

34. 1996, High energy theory seminar, superstring cosmology, department of physics, Ben Gurion University, Beer-Sheva, Israel.

35. 1996, Israel's joint high energy physics seminar, gravitational radiation from string cosmology, Neve Shalom, Israel.

36. 1997, Main theory seminar (theory colloquium), detection of relic gravitational radiation from string cosmology, Theory Division, CERN, Geneva, Switzerland.

37. 1997, General relativity and theoretical seminar, string cosmology, department of physics, Hebrew University, Jerusalem, Israel.

38. 1998, Astrophysics and cosmology seminar, review of the Moriond conference: fundamental parameters in cosmology, department of physics, Ben Gurion University, Beer-Sheva, Israel.

39. 1998, High energy theory seminar, dark matter axions in models of string cosmology, department of physics, Technion, Haifa, Israel.

40. 1998, Theory seminar, cosmic gravitational wave background department of physics, University of Roma II "Tor Vergata", Rome, Italy.

41. 1998, Joint institute for theoretical physics and physics department field theory and relativity seminar, models of string cosmology, University of California, Santa Barbara, California.

42. 1998, High energy theory seminar, electroweak baryogenesis induced by a scalar field, department of physics, University of Colorado, Boulder, Colorado.

43. 1998, Department colloquium, string cosmology, department of physics, University of Colorado, Boulder, Colorado.

44. 1998, High energy theory seminar, models of string cosmology, department of physics, University of Pennsylvania, Philadelphia, Pennsylvania.

45. 1998, High energy theory seminar, electroweak baryogenesis induced by a scalar field, department of physics, Ben Gurion University, Beer-Sheva, Israel.

46. 1999, Theoretical astrophysics seminar, electroweak baryogenesis induced by a scalar field, Fermilab, Batavia, Illinois.

47. 1999, High energy theory seminar, models of string cosmology, department of physics, University of

Michigan, Ann Arbor, Michigan.

48. 1999, Princeton/IAS high energy theory seminar, models of string cosmology, Institute for Advanced Study, Princeton, New Jersey.
49. 1999, High energy theory seminar, cosmology and particle physics of the hypercharge axion, department of physics, Technion, Haifa, Israel.
50. 2000, Second department of physics minisymposium, high energy physics and cosmology in the near future, Sde Boker, Israel.
51. 2000, Astrophysics seminar, entropy bounds in systems of strong gravity, Technion, Haifa, Israel.
52. 2001, High energy theory seminar, the shortest scale of quantum field theory, department of physics, University of Colorado, Boulder, Colorado.
53. 2001, Astrophysics lunch seminar, dark energy: theoretical expectations confront experimental data, JILA, University of Colorado, Boulder, Colorado.
54. 2001, Joint Tufts/MIT/Harvard cosmology seminar, dark energy: theoretical expectations confront experimental data, MIT, Boston, Massachusetts.
55. 2001, High energy theory seminar, CFT, holography and causal entropy bound, department of physics, Princeton University, Princeton, New Jersey.
56. 2001, Quantum computation seminar, Entropy and entanglement, Faculty of natural sciences, Ben Gurion University, Beer-Sheva, Israel.
57. 2002, Israel's national astrophysics seminar, Probing the Planck scale with neutrino oscillations, Neve Shalom, Israel.
58. 2002, High energy theory seminar, Moduli stabilization and supersymmetry breaking in effective theories of strings, department of physics, Technion, Haifa, Israel.
59. 2003, Department colloquium, the accelerating universe: a challenge to fundamental physics, department of physics, Ben-Gurion University, Beer-Sheva, Israel.
60. 2003, Faculty colloquium, the accelerating universe: a challenge to fundamental physics, Faculty of physics, Technion, Haifa, Israel.
61. 2003, Israel's joint seminar, the accelerating universe: a challenge to fundamental physics, two lectures, Neve Shalom, Israel.
62. 2003, High energy theory seminar, Evidence for the accelerated expansion of the universe and its implications for fundamental physics, Tel Aviv University, Tel Aviv, Israel.
63. 2003, High energy theory seminar, Moduli stabilization, SUSY breaking, and cosmology, Tel Aviv University, Tel Aviv, Israel.
64. 2003, Astrophysics seminar, dark energy: is it really out there, Department of physics Ben-Gurion University, Beer-Sheva, Israel.
65. 2003, Exceptional Colloquium, The accelerating Universe, LPTHE, Orsay, France.
66. 2003, Department colloquium, the accelerating universe: a challenge to fundamental physics, department of physics, McGill University, Montreal, Quebec, Canada.
67. 2003, Theory seminar, determining the nature of dark energy, Theory group, department of physics, University of Texas at Austin, Austin, Texas.

68. 2005, Theoretical astrophysics seminar, Using the CMB to constrain models of inflation in String theory, The Weizmann institute of Science, Rehovot, Israel.
69. 2005, Department colloquium, determining the nature of dark energy, School of Physics and Astronomy, Tel Aviv University, Tel Aviv, Israel.
70. 2005, Theory seminar, The entanglement entropy interpretation of black hole entropy, Perimeter institute for theoretical physics, Waterloo, Canada.
71. 2006, Theory seminar, Expressing the equation of state parameter in terms of the three dimensional cosmic shear, Perimeter institute for theoretical physics, Waterloo, Canada.
72. 2006, Gravity seminar, Imposing the thermal boundary condition on the wave function of the universe, Racah institute of physics, The Hebrew University, Jerusalem, Israel.
73. 2007, Department colloquium, Black holes challenge basic principles of quantum mechanics, department of physics, Ben-Gurion University, Beer-Sheva, Israel.
74. 2007, Astrophysics seminar, The prospects of determining the expansion history of the Universe with the 3D cosmic shear, IAP, Paris, France.
75. 2007, Informal high energy theory seminar, Wald's entropy is equal to a quarter of the horizon area in units of the effective gravitational coupling, University of Paris IV, Paris, France.
76. 2007, Department Colloquium, Inflation in Superstring Cosmology, Hebrew University, Jerusalem, Israel.
77. 2007, High energy theory seminar, Wald's entropy is equal to a quarter of the horizon area in units of the effective gravitational coupling, Ben-Gurion University, Beer-Sheva, Israel.
78. 2007, Astrophysics seminar, The prospects of determining the expansion history of the Universe with the 3D cosmic shear, Tel Aviv University, Tel Aviv, Israel.
79. 2007, Israel's joint seminar, Wald's entropy is equal to a quarter of the horizon area in units of the effective gravitational coupling, Neve Shalom, Israel.
80. 2008, Strings and Fields seminar, Models of modular inflation and their phenomenological Consequences, Department of Physics, Ludwig-Maximilians-Universitat, Munich, Germany
81. 2008, Chemical physics seminar, Quantum entanglement, quantum fluctuations and the Uncertainty principle, Ben-Gurion university, Beer-Sheva, Israel.
82. 2009, Israel's joint seminar, Hydrodynamics of black branes, Neve Shalom, Israel.
83. 2009, Department Seminar, String theory and fundamental physics (in Hebrew), Department of Mechanical Engineering, Ben-Gurion University, Beer-Sheva, Israel.
84. 2009, Department colloquium, Black holes challenge basic principles of quantum mechanics, School of Physics and Astronomy, Tel Aviv University, Tel Aviv, Israel.
85. 2009, Theoretical astrophysics seminar, Cosmic microwave background observables of small field models of inflation, CITA, University of Toronto, Toronto, Canada.
86. 2009, Particle physics seminar, Lessons from black holes – Equations of motion and effective coupling of quantum gravity, Perimeter Institute, Waterloo, Ontario, Canada.
87. 2009, Cosmology seminar, Cosmic microwave background observables of small field models of inflation, Perimeter Institute, Waterloo, Ontario, Canada.
88. 2009, Cosmology seminar, Cosmic microwave background observables of small field models of inflation,

Princeton University, Princeton, New Jersey.

89. 2010, Theoretical seminar, Lessons from blackholes about quantum gravity, University of Geneva, Geneva, Switzerland.
90. 2010, Theory colloquium, Lessons from blackholes about quantum gravity, CERN, Geneva, Switzerland.
91. 2010, High energy theory seminar, Cosmic microwave background observables of small field models of inflation, Institute of theoretical physics, Ecole Polytechnique Federal Lausanne, Lausanne, Switzerland.
92. 2010, String theory journal club, The ratio of shear viscosity to entropy in AdS/CFT, CERN, Geneva, Switzerland.
93. 2011, Theory seminar, Evolution equation for non-linear cosmological perturbations, APC, University Paris 6, Paris, France
94. 2011, Paris string seminar, Unitarity constraints on the ratio of shear viscosity to entropy, Institute Henri Poincare, Paris, France
95. 2011, String group informal seminar, Faster than light neutrinos, Dept. of Physics, Ludwig Maximilians University, Munich, Germany.
96. 2012, High energy theory seminar, Faster than light neutrinos, an optical illusion?, Technical University Munich, Munich, Germany.
97. 2012, High energy theory seminar, Universe explosions, New York University, New York, New York.
98. 2013, Israel's joint high energy physics seminar, Semiclassical black holes expose forbidden charges and censor divergent densities, Neve Shalom, Israel.
99. 2013, Particles and fields seminar, Restoring predictability in gravitational collapse, Ben-Gurion University, Beer-Sheva, Israel.
100. 2013, High energy theory seminar, Phases of information release during blackhole evaporation, Dept. of Physics, Ludwig Maximilians University, Munich, Germany.
101. 2014, High energy theory seminar, How black holes burn: Firewalls, smoke and mirrors, Dept. of Physics, The Ohio state University, Columbus Ohio.
102. 2014, High energy theory seminar, How black holes burn: Firewalls, smoke and mirrors, KITP, UCSB, Santa Barbara, California.
103. 2014, Theoretical seminar, How black holes burn: Firewalls, smoke and mirrors, Faculty of Physics, Technion, Haifa, Israel.
104. 2014 Colloquium, Gravity waves in the cosmic microwave background radiation: A revolutionary discovery? , department of physics, Ben Gurion University, Beer-Sheva, Israel.
105. 2014, Cosmology seminar, Entanglement entropy evolution for an evaporating black hole, Physics section, University of Geneva, Geneva, Switzerland.
106. 2014, Theory colloquium, How black holes burn, CERN, Geneva, Switzerland.
107. 2015, String theory seminar, Quantum state of the black hole, Center for Mathematical Sciences, University of Southampton, Southampton, UK.
108. 2015, Colloquium, Quantum black holes: Dissolving confusions and resolving paradoxes, Higgs Center for Theoretical Physics, University of Edinburgh, Edinburgh, Scotland, UK.

109. 2015, Theory seminar, Quantum state of the black hole, Department of Theoretical Physics, Imperial College, London, UK.
110. 2015, High energy theory seminar, Quantum state of the black hole, Department of Physics, Kings College London, London, UK.
111. 2015, General relativity seminar, Black hole information paradox: Origin and proposed resolution, Department of Applied Maths and Theoretical Physics, Cambridge University, Cambridge, UK.
112. 2016, Israel's joint high energy physics seminar, Black holes as collapsed living polymers, Neve Shalom, Israel.
113. 2016, Particles and fields seminar, Black holes as collapsed living polymers, BGU, Beer-Sheva, Israel.
114. 2017, Theoretical high energy seminar, When black holes collide: Probing the interior composition by the emitted gravitational waves, Tel Aviv University, Tel Aviv, Israel.
115. 2017, Theory seminar, What's inside a black hole? Probing the interior of black holes with gravity waves, CCCP, NYU, New York, USA.
116. 2017, Theory seminar, What's inside a black hole? Probing the interior of black holes with gravity waves, Columbia University, New York, USA.
117. 2017, Theoretical seminar, Black holes as collapsed living polymers, University of Rome 2, Tor Vergata, Italy.
118. 2017, Colloquium, What's inside a black hole? Probing the interior of black holes with gravitational waves, University of Rome 2, Tor Vergata, Italy.
119. 2017, Theoretical seminar, A relationship between long, closed strings and lattice gauge theory, University of Rome 2, Tor Vergata, Italy.
120. 2018, High-energy theory seminar, What's inside a black hole? Probing the interior of black holes with gravitational waves, ICTP, Trieste, Italy.
121. 2018, CBC group seminar, Probing the interior of black holes with gravitational waves, Max Planck institute for gravitational physics, Hannover, Germany.
122. 2018, Observational relativity and cosmology seminar, Lower limit on the entropy of black holes as set by absence of echo signals in gravitational wave observations, Max Planck institute for gravitational physics, Hannover, Germany.
123. 2018, Theory seminar, Probing the interior of black holes with gravitational waves, Ludwig Maximilians University, Munich, Germany.
124. 2019, High-energy theory seminar, When black holes collide: Probing the quantum state of black holes by the spectrum of emitted gravitational waves, King College London, London, UK.
125. 2019, High-energy theory seminar, When black holes collide: Probing the quantum state of black holes by the spectrum of emitted gravitational waves, Ecole Polytechnique Federal Lausanne, Lausanne, Switzerland.
126. 2019, Theoretical physics seminar, What's inside a black hole? Probing the interior of black holes with gravitational waves, Institute for theoretical physics, University of Bern, Bern, Switzerland.
127. 2019, CosmoCoffee seminar, A microscopic theory of inflation, CERN Theory department, Geneva, Switzerland.
128. 2019, LIGO seminar, Probing the interior of black holes with gravitational waves, CALTECH, Los Angeles, California.

129. 2019, Department colloquium, What's inside a black hole? Probing the interior of black holes with gravitational waves, department of physics, Ben Gurion University, Beer-Sheva, Israel.

130. 2020, Particles and fields seminar, The black hole interior, department of physics, Ben Gurion University, Beer-Sheva, Israel.

131. 2022 ARCO seminar, Black hole Love story, Israel Open University, Raanana, Israel

(d) Participation in formal international seminars and workshops

Les Rencontres de Physique de la Vallee d'Aosta, La Thuile, Italy, Mar 3-6, 1996.

Second Eduardo Amaldi Conference on Gravitational Waves, Geneva, Switzerland, Jul 1-4, 1997.

Gravitational Scattering, Black Holes and The Information Paradox, Institut Henri Poincare, Paris, France, May 26 - 28, 2008.

From the Renormalization Group to Quantum Gravity, KITP, UCSB, Santa Barbara, California, Feb 27-28, 2014

ICTP 50th Anniversary, International Center of Theoretical Physics, Trieste, Italy, October 6-9, 2014.

(e) Invited public and popular lectures

1. 2005, The accelerating universe, a challenge to the science of the 21'st century, lecture in a course for a general audience, Ben-Gurion university.

2. 2005, The accelerated expansion of the universe, Science and Imagination Conference, Sde Boker, Israel, March 3-4.

3. 2007, Is the expansion of the universe accelerated by dark energy?, The Shomo Shamayim lecture series, The Hebrew University, Jerusalem, Israel.

4. 2007, The Creation of the Universe, in a course for a general audience, Ben-Gurion university, Beer-Sheva, Israel.

5. 2010, The Creation of the Universe, a public lecture, The Ilan Ramon Center, Ben-Gurion university, Beer-Sheva, Israel.

6. 2010, The Creation of the Universe, a public lecture, Annual executive conference, production division, Dead Sea Works, Beer-Sheva, Israel.

7. 2011, Creation of the Universe, lecture in Origin of Life workshop, Jacques Loeb Center, Ben-Gurion University, Beer-Sheva, Israel.
8. 2011, Science at CERN - the Modern Babel, Exploring the Border Line of Particles and Space, part of the lecture series “New Challenges for Scholarship”, Center for Advanced Studies, Ludwig Maximilians University, Munich, Germany.
9. 2012, The Higgs boson - The discovery of the God particle in the Large Hadron Collider in Geneva, a public lecture, The Ilan Ramon Center, Ben-Gurion university, Beer-Sheva, Israel.
10. 2016, Gravitational waves as predicted by Einstein – Detection of ripples in space-time generated by black holes at the edge of the Universe, a public lecture, The Ilan Ramon Center, Ben-Gurion university, Beer-Sheva, Israel.
11. 2018, Gravitational waves as predicted by Einstein: signals from black holes collisions in the distant universe, Basic Notions Seminar, International Center for Theoretical Physics, Trieste, Italy.
12. 2018, The great discoveries at the CERN LHC accelerator in Geneva, popular lecture to Israeli high school students, Beer Sheva, Israel.
13. 2019, Black holes: beyond the horizon into the quantum twilight zone, public lecture, Chulalongkorn University, Bangkok, Thailand.
14. 2019, The great discoveries at the CERN LHC accelerator in Geneva, popular lecture to Israeli high school students, CERN, Geneva, Switzerland

## **X. RESEARCH GRANTS**

1. 1994, Alon fellowship and grant, The committee for budgeting and planning of Israel’s higher education (VATAT) , R. Brustein, fellowship period 1994-1997 pays salary costs for three years, grant period 1994–1995, \$10,000.
2. 1995, Israel Science Foundation equipment grant, R. Brustein, superstring cosmology, \$15,000 for one year.
3. 1995, Israel Science Foundation grant, R. Brustein, superstring cosmology, for 3 years, annual amount \$18,400, total \$55,200.
4. 1996, Ben-Gurion University development grant, R. Brustein, the early superstring universe, for 1 year, total \$5,000.

5. 1997, Toman academic excellence grant, R. Brustein, for 1 year, total \$20,000.
6. 1997, Ben-Gurion University development grant, R. Brustein, graceful exit in string cosmology, for 1 year, total \$4,500.
7. 1999, Ben-Gurion University development grant, R. Brustein, axions in supersymmetric standard models and string/M-theory, for 1 year, total \$5,000.
8. 2000-2003, US Israel Binational Science foundation (BSF) grant, R. Brustein and S. P. de Alwis, String Universality, for 3 years, annual amount \$17,500, total \$52,500.
9. 2000-2003, Israel Science Foundation grant, R. Brustein, entropy and holography in gravitation and cosmology, for 3 years, annual amount \$23,500, total \$70,500.
10. 2001-2003, Israel higher education funding committee (VATAT) post-doctoral grant, R. Brustein and E. Novac, 64,000 NIS (\$15,000).
11. 2003, Ben-Gurion University development grant, R. Brustein, quantum entanglement and non-extensive thermodynamics, for 1 year, total 32,000 NIS (\$7,000).
12. 2006-2010, Israel Science Foundation grant, R. Brustein, aspects of the interface between string theory and cosmology, for 4 years, annual amount 160,000 NIS (\$36,000), total 640,000 NIS (\$160,000).
13. 2006 – 2010, participant, PICS French-Israel Collaboration grant, Holography, Cosmology and Black Holes, B. Pioline and E. Rabinovici coordinators, for 2 years, annual amount 12,000 Euro.
14. 2007 – 2009 Israel open university internal research grant, PI Dr. Merav Hadad, Black hole entropy in generalized theories of gravity, 28,000 NIS.
15. 2010 – 2015 Israel Science Foundation grant, R. Brustein, The interface between fundamental physics under extreme conditions, cosmology and black holes, for 4 years, annual amount 175,000 NIS (\$46,000), total 700,000 NIS (\$184,000).
16. 2011, Faculty of Natural Sciences excellence in research award, 25,000 NIS (\$7,000).



17. 2016 – 2021 Israel Science Foundation grant, R. Brustein, Quantum black holes and Cosmology sourced by highly excited strings , for 5 years, annual amount 240,000 NIS (\$63,000), total 960,000 NIS (\$252,000).

18. 2022 – 2027 Co-Investigator, German Research Foundation (DFG, German-Israeli Project Cooperation (DIP) grant "Holography and the Swampland", My part, 70K Euro, Total amount 1.6M Euro.

## **XI. RESEARCH STUDENTS and POST-DOCS**

### A. Post-docs and research assistants

1. 1996–1998, Dr. Richard Madden, post-doctoral research fellow, department of physics, Ben Gurion University, Beer-Sheva, Israel. Graduated from the university of Minnesota, U.S.A.. last known position: post-doctoral research fellow, I.H.E.S. Paris, France. Previous position: post-doctoral research fellow, theory division, CERN, Geneva, Switzerland.

2. 1997–2002, Dr. David Oaknin, post-doctoral research fellow, department of physics, Ben-Gurion University, Beer-Sheva, Israel. Graduated from Madrid university, Spain. Dr. Oaknin was a post-doc at UBC, Vancouver, Canada. Currently at RAFAEL, Haifa.

3. 1999 – 2001, Dr. Stefano Foffa, Kreitman post-doctoral fellow, department of physics, Ben-Gurion University, Beer-Sheva, Israel. Dr. Foffa was a Kreitman fellow from 10/2000. Graduated from the university of Pisa, Italy. Current position: tenured faculty, department of physics, University of Geneva, Geneva, Switzerland.

4. 2001 – 2003, Dr. Eric Novak, VATAT post-doctoral research fellow, department of physics, Ben-Gurion University, Beer-Sheva, Israel. Graduated from Pennsylvania State university, U.S.A.. Subsequent position: post-doctoral research fellow, I.H.E.S. Paris, France. Last known position: Hutchin Hill Capital, USA.

5. 2006– 2014, Dr. Merav Hadad, Israel's open University, research assistant. Graduated from Tel-Aviv University, under my supervision. Dr Hadad is currently a physics course coordinator at the Israel Open University.

6. 2011 – 2012, Dr. Michele Levi, Kreitman fellow. Graduated from The

Hebrew University. Currently, STFC fellow, Queen Mary University, London, UK.

7. 2014 – 2015, Dr. Lasma Alberte, Pratt fellow, Minerva fellow. Graduated from Ludwig Maximilians University, Munich, Germany. Currently a post-doc fellow at Imperial College, London, UK.

8. 2014 – 2015, Dr. Andrei Khmel'nitsky, Kreitman fellow. Graduated from the Institute for Nuclear Research of the Russian Academy of Sciences, Moscow, Russia. Currently a post-doc fellow at Imperial College, London, UK.

9. 2015 – 2017, Dr. Ido Ben-Dayana, Pratt fellow. Currently, senior lecturer at Ariel University, Israel.

10. 2019 – 2019, Mr. Ira Wolfson, post-doc short duration, department of physics, Ben-Gurion University, Beer-Sheva, Israel. Ira was a Minerva post-doctoral fellow, Max Planck Institute for astrophysics, Munich, Germany and is currently a post-doc at SISSA, Trieste, Italy.

## B. Research Students

1. 1996–2001, Ms. Merav Hadad, Ph. D. student, Dr. Hadad has graduated in 2001 at the department of physics, Tel Aviv University, Tel Aviv, Israel. Dr Hadad is currently a physics instructor at the Israel Open University.

2. 1997–2002, Ms. Irit Maor, direct Ph. D. student, department of physics, Ben-Gurion University, Beer-Sheva, Israel. Ms. Maor was a Chlore foundation fellow from 10/2001. Dr. Maor won a Rothschild post-doctoral fellowship, was a post-doc at DAMTP, Cambridge, U.K., then a post-doc at Case Western Reserve University, Cleveland, Ohio, USA. Last known position: assistant professor of physics at the University of Louisiana, Lafayette, Louisiana.

3. 2001 – 2006, Mr. Amos Yarom, Kreitman Ph. D. fellow, department of physics, Ben-Gurion University, Beer-Sheva, Israel. Prof. Yarom has joined in 2011 the faculty of the Technion and was awarded the Alon fellowship.

4. 2003 – 2010, Mr. Daniel Levy, direct Ph. D. student, department of physics, Ben-Gurion University, Beer-Sheva, Israel. Currently working at a

high-tech company.

5. 2006 – 2011, Mr. Ido Ben-Dayana, Ph. D. student, department of physics, Ben-Gurion University, Beer-Sheva, Israel. Ido is currently a senior lecturer at Ariel University, Israel.

6. 2008– 2014, Ms. Judith Kupferman, Ph. D. student, department of physics, Ben-Gurion University, Beer-Sheva, Israel. Judy was a Kreitman post-doc fellow at BGU and is currently a long term research assistant and administrator at the BGU Quantum Science and Technology center.

7. 2009 – 2013, Mr. Eran Avraham, M. Sc. student, department of physics, Ben-Gurion University, Beer-Sheva, Israel. Eran is currently a Ph. D. student at the Technion.

8. 2012 – 2019, Mr. Ira wolfson, Ph. D. student in combined track, department of physics, Ben-Gurion University, Beer-Sheva, Israel. Ira was a Minerva post-doctoral fellow, Max Planck Institute for astrophysics, Munich, Germany and is currently a post-doc at SISSA, Trieste, Italy.

9. 2015 – 2017, Mr. Yotam Sherf, M. Sc. Student, department of physics, Ben-Gurion University, Beer-Sheva, Israel. Currently, a Ph. D. student at BGU.

10. 2015 – present, Mr. Itay Raveh, M. Sc. Student, joint supervision with Prof. Uri Keshet, department of physics, Ben-Gurion University, Beer-Sheva, Israel.

11. 2015 – 2017, Ms. Yael Raveh, M. Sc. Student, department of physics, Ben-Gurion University, Beer-Sheva, Israel. Currently, a Ph. D. student at the Technion.

12. 2016 – 2018, Mr. Yoav Zigdon, M. Sc. Student, department of physics, Ben-Gurion University, Beer-Sheva, Israel. Currently, a Ph. D. student at BGU.

13. 2018 – present, Mr. Yotam Sherf, Ph. D. Student, department of physics, Ben-Gurion University, Beer-Sheva, Israel.

14. 2019 – 2022, Ms. Tamar Simhon, M. Sc. Student, department of physics, Ben-Gurion University, Beer-Sheva, Israel.

15. 2019 – present, Ms. Anne Hausman, M. Sc. Student, department of physics, Ben-Gurion University, Beer-Sheva, Israel.

16. 2019 – present, Mr. Yoav Zigdon, Ph. D. Student, department of physics, Ben-Gurion University, Beer-Sheva, Israel.

17. 2020 – present, Ms. Lilian Saiegh, M. Sc. Student, department of physics, Ben-Gurion University, Beer-Sheva, Israel.

18. 2020 – present, Ms. Shani Avitan, M. Sc. Student, department of physics, Ben-Gurion University, Beer-Sheva, Israel.

19. 2021 – present, Ms. Tom Shindelman, Ph. D. Student, department of physics, Ben-Gurion University, Beer-Sheva, Israel.

20. 2021 – present, Ms. Hagar Meir, M. Sc. Student, department of physics, Ben-Gurion University, Beer-Sheva, Israel.

21. 2022 – present, Ms. Tamar Simhon, Ph. D. Student, department of physics, Ben-Gurion University, Beer-Sheva, Israel.

## **XI. PRESENT ACTIVITIES**

My research is mainly in two subfields, i) Interface of early universe cosmology and astroparticle physics with fundamental physics. ii) Quantum gravity, quantum black holes, quantum cosmology. I am mostly interested in problems that have, or may have, some connection to current and future experiments and observations.

## **XII. ADDITIONAL INFORMATION**

Member, local organizing committee, Israel Physical Society 43rd annual meeting, Ben-Gurion University, Beer-Sheva, Israel, Apr 17, 1997.

Organizer, Particles and Fields parallel sessions, Israel Physical Society 43rd annual meeting, Ben-Gurion University, Beer-Sheva, Israel, Apr 17, 1997.

Member, organizing committee, Israel Physical Society 47 annual meeting, Tel Aviv, Israel, Dec 17, 2001.

Member, organizing committee, first Moshe Flato memorial lecture, Ben-Gurion University, Beer-Sheva, Israel, November 28, 2002.

Member, organizing committee, third Physics Fete, Sde Boker, Israel, 2003.

Member, organizing committee, second Moshe Flato memorial lecture, Ben-Gurion University, Beer-Sheva, Israel, 2004.

Member, organizing committee, third Moshe Flato memorial lecture, Ben-Gurion University, Beer-Sheva, Israel, 2007.

Member, organizing committee, fourth Moshe Flato memorial lecture, Ben-Gurion University, Beer-Sheva, Israel, 2008.

Member, Organizing committee, Strings 2017 Conference, Tel Aviv, June 2017.

Chair, Organizing committee, Israel Physical Society meeting, Beer-Sheva, February 2022.

Referee, Physical Review D, Physical Review Letters, Nuclear Physics B, Physics Letters B, Journal of High Energy Physics, The Astrophysical Journal.

Referee, Israel Science Foundation.

Referee, Ph. D. Thesis, V. Elkonin, School of Physics and Astronomy, Tel Aviv University, 1997.

Chair, candidacy Ph. D. exam committee, David Karasik, Department of Physics, Ben Gurion University, 1998.

Member, candidacy Ph. D. exam committee, Merav Hadad, Department of Physics, Tel Aviv University, 1998.

Referee, Ph. D. Thesis, S. Foffa, Department of Physics, Pisa University, 1999.

Member, candidacy Ph. D. exam committee, Guy Ramon, Department of Physics, Technion, 2000.

Member, candidacy Ph. D. exam committee, Irit Maor, Department of Physics, Ben-Gurion, 2001.

Member, candidacy Ph. D. exam committee, Israel Klich, Department of Physics, Technion, 2001.

Member, candidacy Ph. D. exam committee, Eran Rosenthal, Department of Physics, Technion, 2002.

Member, candidacy Ph. D. exam committee, Amos Yarom, Department of Physics, Ben-Gurion, 2003.

Member, candidacy Ph. D. exam committee, Daniel Levy, Department of Physics, Ben-Gurion, 2006.

Chair, candidacy Ph. D. exam committee, Ilya Gurwich, Department of Physics, Ben-Gurion, 2008.

Chair, M. Sc. exam committee, Igor Krakover, Department of Physics, Ben-Gurion, 2008.

Chair, M. Sc. exam committee, Arthur Shulkin, Department of Physics, Ben-Gurion, 2014.

Member, M. Sc. exam committee, Eran Avraham, Department of Physics, Ben-Gurion, 2014.

Member, M. Sc. exam committee, Adam Reichental, Department of Physics, Ben-Gurion, 2014.

Chair, Ph. D. exam committee, Yair Mulian, Department of Physics, Ben-Gurion, 2014.

Member, Ph. D. exam committee, Yigal Arav, School of Physics and astronomy, Tel Aviv University, 2015.

Member, Ph. D. exam committee, Roy Ben-Israel, School of Physics and astronomy, Tel Aviv University, 2015.

Member, Ph. D. exam committee, Maurizio Firrota, University of Roma II, 2021.