Stanford

Stephen Shenker

Richard Herschel Weiland Professor in the School of Humanities and Sciences

Physics

Bio

BIO

Professor Shenker's contributions to Physics include:

- Basic results on the phase structure of gauge theories (with Eduardo Fradkin)

- Basic results on two dimensional conformal field theory and its relation to string theory (with Daniel Friedan, Emil Martinec, Zongan Qiu, and others)

- The nonperturbative formulation of matrix models of low-dimensional string theory, the first nonperturbative definitions of string theory (with Michael R. Douglas)

- The discovery of distinctively stringy nonperturbative effects in string theory, later understood to be caused by D-branes. These effects play a major role in string dynamics

- The discovery of Matrix Theory, the first nonperturbative definition of String/M theory in a physical number of dimensions. Matrix Theory (see Matrix string theory) is an example of a gauge/gravity duality and is now understood to be a special case of the AdS/CFT correspondence (with Tom Banks, Willy Fischler and Leonard Susskind)

- Basic results on the connection between quantum gravity and quantum chaos (with Douglas Stanford, Juan Maldacena and others)

ACADEMIC APPOINTMENTS

- Professor, Physics

ADMINISTRATIVE APPOINTMENTS

- Faculty, University of Chicago, (1981-1989)
- Professor, Rutgers University, (1989-1998)
- Professor, Stanford University, (1998- present)
- Director, Stanford Institute for Theoretical Physics, (1998-2009)

HONORS AND AWARDS

- Member, National Academy of Sciences (2015)
- Lars Onsager Prize, American Physical Society (2010)
- Dean's Award for Distinguished Achievements in Teaching, Stanford University (2007)
- Fellow, American Academy of Arts and Sciences (2006)
- Fellow, American Physical Society (2003)
- Undergraduate Teaching Award, Rutgers Society of Physics Students (1992)
- Fellow, MacArthur Foundation (1987)

- Presidential Young Investigator Award, NSF (1985)
- Fellow, Sloan Foundation (1983)

PROFESSIONAL EDUCATION

- Ph.D., Cornell University (1980)
- B.A., Harvard University (1975)

LINKS

- Publications on INSPIRE: http://inspirehep.net/search?ln=en&ln=en&p=find+a+stephen+shenker
- Publications on arXiv: http://arxiv.org/find/all/1/au:+shenker_stephen/0/1/0/all/0/1

Research & Scholarship

CURRENT RESEARCH AND SCHOLARLY INTERESTS

How can ideas from nonperturbative approaches to quantum gravity be applied to cosmology and the interiors of black holes?

Professor Shenker’s research focuses on string theory and M theory, with an emphasis on nonperturbative aspects, including matrix formulations.

Teaching

COURSES

2018-19

- Graduate Quantum Mechanics II: PHYSICS 231 (Spr)
- Statistical Mechanics: PHYSICS 212 (Win)

2017-18

- Graduate Quantum Mechanics II: PHYSICS 231 (Spr)
- Statistical Mechanics: PHYSICS 212 (Win)

2016-17

- Graduate Quantum Mechanics II: PHYSICS 231 (Spr)
- Statistical Mechanics: PHYSICS 212 (Win)

2015-16

- Quantum Chaos and Quantum Gravity: PHYSICS 450 (Aut)
- Statistical Mechanics: PHYSICS 212 (Win)

STANFORD ADVISEES

Doctoral Dissertation Reader (AC)

Edward Mazenc, Brandon Rayhaun

Postdoctoral Faculty Sponsor

Louise Anderson, Onkar Parrikar

Publications

PUBLICATIONS

- **A bound on chaos** *JOURNAL OF HIGH ENERGY PHYSICS*
  Maldacena, J., Shenker, S. H., Stanford, D.
  2016
- **Chaos in classical D0-brane mechanics** *JOURNAL OF HIGH ENERGY PHYSICS*
  Gur-Ari, G., Hanada, M., Shenker, S. H.
  2016
- **Stringy effects in scrambling** *JOURNAL OF HIGH ENERGY PHYSICS*
  Shenker, S. H., Stanford, D.
  2015
- **Multiple shocks** *JOURNAL OF HIGH ENERGY PHYSICS*
  Shenker, S. H., Stanford, D.
  2014
- **Black holes and the butterfly effect** *JOURNAL OF HIGH ENERGY PHYSICS*
  Shenker, S. H., Stanford, D.
  2014
- **Smoothed transitions in higher spin AdS gravity** *CLASSICAL AND QUANTUM GRAVITY*
  Banerjee, S., Castro, A., Hellerman, S., Hijano, E., Lepage-Jutier, A., Maloney, A., Shenker, S.
  2013; 30 (10)
- **Light states in Chern-Simons theory coupled to fundamental matter** *JOURNAL OF HIGH ENERGY PHYSICS*
  Banerjee, S., Hellerman, S., Maltz, J., Shenker, S. H.
  2013
- **Tree-like structure of eternal inflation: A solvable model** *PHYSICAL REVIEW D*
  Harlow, D., Shenker, S. H., Stanford, D., Susskind, L.
  2012; 85 (6)
- **Topological phases of eternal inflation** *PHYSICAL REVIEW D*
  Sekino, Y., Shenker, S., Susskind, L.
  2010; 81 (12)
- **Future foam: Nontrivial topology from bubble collisions in eternal inflation** *PHYSICAL REVIEW D*
  Bousso, R., Freivogel, B., Sekino, Y., Shenker, S., Susskind, L., Yang, I., Yeh, C.
  2008; 78 (6)
- **Viscosity bound violation in higher derivative gravity** *PHYSICAL REVIEW D*
  Brigante, M., Liu, H., Myers, R. C., Shenker, S., Sho Yaida, Y. D.
  2008; 77 (12)
- **Viscosity bound and causality violation** *PHYSICAL REVIEW LETTERS*
  Brigante, M., Liu, H., Myers, R. C., Shenker, S., Yaida, S.
  2008; 100 (19)
- **Volume weighted measures of eternal inflation in the Bousso-Polchinski landscape** *JOURNAL OF HIGH ENERGY PHYSICS*
  Clifton, T., Shenker, S., Sivanandam, N.
  2007
- **Colliding with a crunching bubble** *JOURNAL OF HIGH ENERGY PHYSICS*
  Freivogel, B., Horowitz, G. T., Shenker, S.
  2007

- **Inflation in AdS/CFT** *JOURNAL OF HIGH ENERGY PHYSICS*
  Freivogel, B., Hubeny, V. E., Maloney, A., Myers, R. C., Rangamani, M., Shenker, S.
  2006
- **Comments on cosmic censorship in AdS/CF** *JOURNAL OF HIGH ENERGY PHYSICS*
  Hubeny, V. E., Liu, X., Rangamani, M., Shenker, S.
  2004
- **The black hole singularity in AdS/CFT** *JOURNAL OF HIGH ENERGY PHYSICS*
  Fidkowski, L., Hubeny, V., Kleban, M., Shenker, S.
  2004
- **Inside the horizon with AdS/CFT** *PHYSICAL REVIEW D*
  KRAUS, P., Ooguri, H., Shenker, S.
  2003; 67 (12)
- **Signatures of short distance physics in the cosmic microwave background** *PHYSICAL REVIEW D*
  Kaloper, N., Kleban, M., Lawrence, A., Shenker, S.
  2002; 66 (12)
- **Initial conditions for inflation** *JOURNAL OF HIGH ENERGY PHYSICS*
  Kaloper, N., Kleban, M., Lawrence, A., Shenker, S., Susskind, L.
  2002
- **Closed strings from nothing** *PHYSICAL REVIEW D*
  Kleban, M., Lawrence, A., Shenker, S.
  2001; 64 (6)
- **Tachyon condensation in noncommutative** *NUCLEAR PHYSICS B*
  Kraus, P., Rajaraman, A., Shenker, S.
  2001; 598 (1-2): 169-188
- **Non-commutative gauge dynamics from the string worldsheet** *JOURNAL OF HIGH ENERGY PHYSICS*
  Gomis, J., Mehen, T., Rangamani, M., Kleban, M., Shenker, S.
  2000
- **M theory as a matrix model: A conjecture** *PHYSICAL REVIEW D*
  Banks, T., Fischler, W., SHENKER, S. H., Susskind, L.
  1997; 55 (8): 5112-5128
- **SCALES OF CHIRAL SYMMETRY-BREAKING IN QUANTUM CHROMODYNAMICS** *PHYSICAL REVIEW LETTERS*
  Kogut, J., Stone, M., Wyld, H. W., Shigemitsu, J., SHENKER, S. H., Sinclair, D. K.
  1982; 48 (17): 1140-1143
- **PHASE-DIAGRAMS OF LATTICE GAUGE-THEORIES WITH HIGGS FIELDS** *PHYSICAL REVIEW D*
  Fradkin, E., SHENKER, S. H.
  1979; 19 (12): 3682-3697
- **GAUGE SYMMETRIES IN RANDOM MAGNETIC SYSTEMS** *PHYSICAL REVIEW B*
  Fradkin, E., Huberman, B. A., SHENKER, S. H.
  1978; 18 (9): 4789-4814