

Curriculum Vitae for Edmund Bertschinger

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Birth and citizenship

1958, Oakland, California; US citizen

Education

PhD in Astrophysical Sciences, Princeton University, 1984
BS in Physics, California Institute of Technology, 1979

Positions Held

Professor of Physics, MIT, 1996 – present
Associate Professor of Physics, MIT, 1991 – 1996
Assistant Professor of Physics, MIT, 1986 – 1991
Miller Research Fellow, UC Berkeley, 1985 – 1986
Research Associate, University of Virginia, 1983 – 1985

Administrative Positions

Physics Department Head, MIT, 2008 – present
Astrophysics Division Head, MIT, 2002 – 2007

Honors

Luis Walter Alvarez Award for the Advancement of Latinos in Science,
SACNAS-SHPE-MAES STEM Consortium, 2012
Honorary Member, MIT Alumni Association, 2012
Dr. Martin Luther King, Jr. Leadership Award, MIT, 2012
Mentoring Award, MIT Committee on Race and Diversity, 2010
Guggenheim Fellowship, 2007
Buechner Teaching Prize, MIT Physics Department, 2002
Fellow, American Physical Society, 1998
Helen B. Warner Prize, American Astronomical Society, 1992
Alfred P. Sloan Research Fellowship, 1988 – 1990

Visiting Positions

Visiting Professor, Harvard University, 2000 – 2001
Visiting Professor, Canadian Institute for Theoretical Astrophysics, 2000
Visiting Member, Institute for Advanced Study, 1993
Visiting Scholar, Institute for Theoretical Physics, 1988

Professional Service

Co-Chair, Organizing Committee, Institute Diversity Summit, MIT, 2012
Conseil scientifique extérieur, Institut de Physique Théorique de Saclay, 2011
Member-at-Large, AAAS Section on Physics, 2011 – 2015
Dannie Heineman Prize Committee, American Astronomical Society, 2011 – 2013
Chair, Organizing Committee, MIT150 Symposium Leaders in Science and Engineering:
The Women of MIT, 2011
Faculty chair, Northeast Conference for Undergraduate Women in Physics, 2011
BU Graduate Women in Science and Engineering Advisory Board, 2010 – present
NSERC Physics Evaluation Group, 2010 – 2013; Section Chair, 2012 – 2013
Princeton University Physics Department Advisory Council, 2010 – 2013
Committee on the Status of Women in Astronomy, AAS, 2010 – 2013
Chair, Faculty Advisory Committee, MIT Office of Minority Education, 2010 – 2012
NRC Report Review Committee, Decadal Survey of Astronomy and Astrophysics, 2010
Committee on Race and Diversity, MIT, 2009 – 2011
Technion Physics International Review Committee, 2009
Gender Equity Visits Program, APS Committee on the Status of Women in Physics, 2009
Magellan Council, 2008 – present
Scientific Advisory Board, New Astronomy, 1999 – present
Receiving Editor, New Astronomy, 1997 – 1999
Member-at-Large, APS Division of Computational Physics, 1996 – 1999
Committee on Undergraduate Admissions and Financial Aid, MIT, 1995 – 1998
URA Visiting Committee, Fermilab, 1995
Convener, Dahlem Conference on the Evolution of the Universe, 1995
Convener, Cosmology group, Snowmass '94
Peer Review Board, Pittsburgh Supercomputing Center/NCSA, 1992 – 1995
Chair or panelist for many NSF and NASA proposal review committees

PhD Theses Supervised

James M. Gelb 1992, *Large simulations of gravitational clustering in the universe*
John C. H. Tsai 1992, *Theoretical studies of X-ray emission from clusters of galaxies*
Chung-Pei Ma 1993, *Baryon asymmetry and structure formation in our universe* (co-supervised with Alan Guth)
Bhuvnesh Jain 1994, *The evolution of cosmological density fluctuations* (co-supervised with Alan Guth)
Uros Seljak 1995, *Light propagation in a weakly perturbed expanding universe*
Lam Hui 1996, *The evolution of density fluctuations through reheating in the inflationary universe and gravitational instability in the nonlinear regime* (co-supervised with Alan Guth)
James J. Frederic 1997, *Cosmological signatures in galaxy cluster structures*
Rennan Barkana 1997, *Gravitational lensing as a probe of dark matter, the distance scale, and gravitational waves in the universe*
Anand V. Mehta 1998, *The role of vortices in the formation of the solar system* (co-supervised with Glenn Flierl)
Matias Zaldarriaga 1998, *Fluctuations in the cosmic microwave background*

Sergei V. Bashinsky 2001, *Inhomogeneities in the early universe from the configuration space perspective*
 Jamie Portsmouth 2003, *Polarization in the Sunyaev-Zel'dovich effect* (co-supervised with Alan Guth)
 Jeremy D. Schnittman 2005, *Radiation transport around Kerr black holes*
 Alexander V. Shirokov 2005, *Scalable parallel simulations of small-scale structures in cold dark matter*
 Will M. Farr 2009, *Numerical relativity from a gauge theory perspective*
 Robyn E. Sanderson 2011, *Understanding dark matter halos with tidal caustics*
 Phillip Zukin 2012, *Dark matter dynamics*

B.S. Theses Supervised

John M. Miller 1986 University of Virginia, *Numerical simulations of secondary infall: Self-similar galaxy formation* (co-supervised with Roger Chevalier)
 Paul N. Watts 1987, *Galaxy formation with cosmic strings and massive neutrinos*
 Samuel T. Osofosky 1988, *Low mass star formation in dense molecular clouds: formation rate and infrared lifetime*
 Phillip B. Yecko 1988, *Gravitational lensing by a cosmic string*
 Sima Setayeshgar 1990, *Growth of isocurvature fluctuations in baryon seeded hot dark matter*
 Mark A. Siegel 1990, *Large scale structures and flows in universes dominated by cold dark matter*
 Tomislav Kundić 1991, *Physics of gravitational clustering in the expanding universe*
 Jody A. White 1991, *Was Newton right? : cosmological scale test of Newton's Law*
 Jeffrey B. Jewell 1992, *Observational constraints on cosmological models*
 Višnja Katalinić 1992, *Biasing models for galaxy formation*
 Eric A. Woods 1992, *A cosmological exploration of Milgrom's modified gravity*
 Judith Castelino 1995, *Tidal effects of an external mass on the formation of the Local Group*
 Mehul A. Shah 1996, *An investigation into the single-particle distribution function for dark matter and galaxies*
 Darius J. Sadri 1999, *Cosmological recombination*
 Adam C. Reynolds 2001, *Gravitomagnetism and extra dimensions*
 Yukyan Lam 2004, *Dark energy and CMB anisotropy*
 Svetlin V. Tassev 2005, *Quantum field theory of scalar cosmological perturbations*
 Daniel M. Scolnic 2007, *Solving the system of atomic rate equations during recombination*
 Fei Sun 2012, *The scattering and shrinking of a Gaussian wave packet by delta function potentials*

Refereed Publications

1. M. A. Amin, P. Zukin, and E. Bertschinger, "Scale-Dependent Growth from a Transition in Dark Energy Dynamics," *Phys Rev D* 85, 103510 (2012)
2. E. Bertschinger, "One gravitational potential or two? Forecasts and tests," *Phil. Trans. R. Soc. A* 369 (1957), 4947 (2011)

3. R. Sanderson and E. Bertschinger, "Seen and unseen tidal caustics in the Andromeda galaxy," *ApJ* 725, 1652 (2010)
4. P. Zukin and E. Bertschinger, "Velocity Structure of Self-Similar Spherically Collapsed Halos," *Phys Rev D* 82, 104045 (2010)
5. P. Zukin and E. Bertschinger, "Self-Similar Spherical Collapse with Tidal Torque," *Phys Rev D* 82, 104044 (2010)
6. N. Ashfordi, R. Mohayaee, and E. Bertschinger, "Hierarchy in the phase space and dark matter astronomy," *Phys Rev D* 81, 101301 (2010)
7. N. Ashfordi, R. Mohayaee, and E. Bertschinger, "Hierarchical phase space structure of dark matter haloes: Tidal debris, caustics, and dark matter annihilation," *Phys Rev D* 79, 083526 (2009)
8. E. Bertschinger and P. Zukin, "Distinguishing modified gravity from dark energy," *Phys Rev D* 78, 024015 (2008)
9. S. Tassev and E. Bertschinger, "Kinematic Density Waves in Accretion Disks," *ApJ* 686, 423 (2008)
10. W. M. Farr and E. Bertschinger, "Variational Integrators for the Gravitational N-Body Problem," *ApJ* 663, 1420 (2007)
11. E. Bertschinger, "Effects of cold dark matter decoupling and pair annihilation on cosmological perturbations," *Phys Rev D* 74, 063509 (2006)
12. E. Bertschinger, "On the Growth of Perturbations as a Test of Dark Energy and Gravity," *ApJ* 648, 797 (2006)
13. C.-P. Ma and E. Bertschinger, "A Cosmological Kinetic Theory for the Evolution of Cold Dark Matter Halos with Substructure: Quasi-Linear Theory," *ApJ* 612, 28 (2004)
14. J. D. Schnittman and E. Bertschinger, "The Harmonic Structure of High-Frequency Quasi-periodic Oscillations in Accreting Black Holes," *ApJ* 606, 1098 (2004)
15. S. Bashinsky and E. Bertschinger, "Dynamics of cosmological perturbations in position space," *Phys Rev D* 65, 123008 (2002)
16. E. Bertschinger, "Multiscale Gaussian Random Fields and Their Application to Cosmological Simulations," *ApJS* 137, 1 (2001)
17. S. Bashinsky and E. Bertschinger, "Position-Space Description of the Cosmic Microwave Background and Its Temperature Correlation Function," *Phys Rev Lett* 87, 081301 (2001)
18. B. Jain and E. Bertschinger, "Self-Similar Evolution of Gravitational Clustering. II. N-Body Simulations of the $n = -2$ Spectrum," *ApJ* 509, 517 (1998)
19. E. Bertschinger, "Simulations of Structure Formation in the Universe," *Ann Rev Astr* Ap 36, 599 (1998)
20. M. Zaldarriaga, U. Seljak and E. Bertschinger, "Integral Solution for the Microwave Background Anisotropies in Nonflat Universes" *ApJ* 494, 491 (1998)
21. R. P. Saglia, D. Burstein, G. Baggley, E. Bertschinger, M. M. Colless, R. L. Davies, R. K. McMahan, and G. Wegner, "The peculiar motions of early-type galaxies in two distant regions. III. The photometric data," *MNRAS* 292, 499 (1997)
22. C.-P. Ma, E. Bertschinger, L. Hernquist, D. H. Weinberg, and N. Katz, "Cosmological Constraints from High-Redshift Damped Lyman alpha Systems," *ApJ* 484, L1 (1997)

23. R. P. Saglia, E. Bertschinger, G. Baggley, D. Burstein, M. Colless, R. L. Davies, R. K. McMahan, and G. Wegner, "The Peculiar Motions of Early-Type Galaxies in Two Distant Regions. IV. The Photometric Fitting Procedure," *ApJS* 109, 79 (1997)
24. G. Wegner, M. Colless, G. Baggley, R. L. Davies, E. Bertschinger, D. Burstein, R. K. McMahan, and R. P. Saglia, "The Peculiar Motions of Early-Type Galaxies in Two Distant Regions. I. Cluster and Galaxy Selection," *ApJS* 106, 1 (1996)
25. G. Tormen and E. Bertschinger, "Adding Long Wavelength Modes to an N-Body Simulation," *ApJ* 472, 14 (1996)
26. L. Hui and E. Bertschinger, "Local Approximations to the Gravitational Collapse of Cold Matter," *ApJ* 471, 1 (1996)
27. N. Y. Gnedin and E. Bertschinger, "Building a Cosmological Hydrodynamic Code: Consistency Condition, Moving Mesh Gravity and SLH-P3M," *ApJ* 470, 115 (1996)
28. R. Van de Weygaert and E. Bertschinger, "Peak and gravity constraints in Gaussian primordial density fields: an application of the Hoffman-Ribak method," *MNRAS* 281, 84 (1996)
29. B. Jain and E. Bertschinger, "Self-Similar Evolution of Gravitational Clustering: Is $n=-1$ Special?" *ApJ* 456, 43 (1996)
30. C.-P. Ma and E. Bertschinger, "Cosmological Perturbation Theory in the Synchronous and Conformal Newtonian Gauges," *ApJ* 455, 7 (1995)
31. R. Ferrell and E. Bertschinger, "Particle-Mesh Methods on the Connection Machine," *Int J Mod Phys C* 5, 933 (1994)
32. J. M. Gelb and E. Bertschinger, "Cold dark matter II: Spatial and velocity statistics," *ApJ* 436, 491 (1994)
33. J. M. Gelb and E. Bertschinger, "Cold dark matter I: The formation of dark halos," *ApJ* 436, 467 (1994)
34. N. Katz, T. Quinn, E. Bertschinger, and J. M. Gelb, "Formation of Quasars at High Redshift," *MNRAS* 270, L71 (1994)
35. E. Bertschinger and A. J. S. Hamilton, "Lagrangian evolution of the Weyl tensor," *ApJ* 435, 1 (1994)
36. E. Bertschinger, "Cosmic structure formation," *Physica D*, 77, 354 (1994)
37. C.-P. Ma and E. Bertschinger, "Do galactic systems form too late in cold+hot dark matter models?" *ApJ* 434, L5 (1994)
38. B. Jain and E. Bertschinger, "Second-order power spectrum and nonlinear evolution at high redshift," *ApJ* 431, 495 (1994)
39. E. Bertschinger and B. Jain, "Gravitational instability of cold matter," *ApJ* 431, 486 (1994)
40. C.-P. Ma and E. Bertschinger, "A calculation of the full neutrino phase space in cold+hot dark matter models," *ApJ* 429, 22 (1994)
41. U. Seljak and E. Bertschinger, "Amplitude of primeval fluctuations from cosmological density reconstructions," *ApJ* 427, 523 (1994)
42. J. C. Tsai, N. Katz, and E. Bertschinger, "X-Ray Emission from a Simulated Cluster of Galaxies," *ApJ* 423, 553 (1994)
43. L. Kofman, E. Bertschinger, J. M. Gelb, A. Nusser, and A. Dekel, "Evolution of one-point distributions from Gaussian initial fluctuations," *ApJ* 420, 44 (1994)
44. U. Seljak and E. Bertschinger, "Maximum-Likelihood Analysis of the COBE Angular Correlation Function," *ApJ* 417, L9 (1993)

45. R. P. Saglia, E. Bertschinger, G. Baggley, D. Burstein, M. Colless, R. L. Davies, R. K. McMahan, and G. Wegner, "The Effects of Seeing on the Photometric Properties of Elliptical Galaxies," *MNRAS* 264, 961 (1993)
46. A. Dekel, E. Bertschinger, A. Yahil, M. Strauss, M. Davis, and J. Huchra, "IRAS galaxies versus POTENT mass: Density field, biasing, and Omega," *ApJ* 412, 1 (1993)
47. M. Colless, D. Burstein, G. Wegner, R. P. Saglia, R. McMahan, R. L. Davies, E. Bertschinger, and G. Baggley, "Photoelectric and CCD photometry of E and S0 galaxies," *MNRAS* 262, 475 (1993)
48. R. J. Scherrer and E. Bertschinger, "Statistics of primordial density perturbations from discrete seed masses," *ApJ* 381, 349 (1991)
49. A. Nusser, A. Dekel, E. Bertschinger, and G. R. Blumenthal, "Cosmological velocity-density relation in the quasi-linear regime," *ApJ* 379, 6 (1991)
50. D. J. Batuski, A. L. Melott, R. J. Scherrer, and E. Bertschinger, "Comparison of likely candidate models for Abell cluster structures against the observed distribution," *ApJ* 367, 393 (1991)
51. J. V. Villumsen, R. J. Scherrer, and E. Bertschinger, "Seeded hot dark matter models for large-scale structure," *ApJ* 367, 37 (1991)
52. E. Bertschinger, A. Dekel, S. M. Faber, A. Dressler, and D. Burstein, "Potential, velocity, and density fields from redshift-distance samples. Application: Cosmography within 6000 km/s," *ApJ* 364, 370 (1990)
53. A. Dekel, E. Bertschinger, and S. M. Faber, "Potential, velocity, and density fields from redshift-distance samples: Method," *ApJ* 364, 349 (1990)
54. E. Bertschinger, K. M. Gorski, and A. Dekel, "Effect of the Great Attractor on the cosmic microwave background radiation," *Nature* 345, 507 (1990)
55. B. Gradwohl, G. Kalbermann, T. Piran, and E. Bertschinger, "Global Strings and Superfluid Vortices: Analogies and Differences," *Nucl Phys B* 338, 371 (1990)
56. D. La, P. Steinhardt, and E. Bertschinger, "Prescription for successful extended inflation," *Phys. Lett. B* 231, 231 (1989)
57. E. Bertschinger, "The evolution of cooling flows: Self-similar cooling waves," *ApJ* 340, 666 (1989)
58. R. J. Scherrer, A. L. Melott, and E. Bertschinger, "Formation of Large-Scale Structure from Cosmic Strings and Massive Neutrinos," *Phys Rev Lett* 62, 379 (1989)
59. E. Bertschinger and A. Dekel, "Recovering the full velocity and density fields from large-scale redshift-distance samples," *ApJ* 336, L5 (1989)
60. D. F. Cioffi, C. F. McKee, and E. Bertschinger, "Dynamics of radiative supernova remnants," *ApJ* 334, 252 (1988)
61. E. Bertschinger and R. Juszkiewicz, "Searching for the great attractor," *ApJ* 334, L59 (1988)
62. E. Bertschinger and P. N. Watts, "Galaxy formation with cosmic strings and massive neutrinos," *ApJ* 328, 32 (1988)
63. E. Bertschinger, "Can cosmic strings generate large-scale streaming velocities?" *ApJ* 324, 5 (1988)
64. E. Bertschinger, "Path integral methods for primordial density perturbations: Sampling of constrained Gaussian random fields," *ApJ* 323, L103 (1987)
65. E. Bertschinger, "Cosmological accretion wakes," *ApJ* 316, 489 (1987)

66. E. Bertschinger and A. Meiksin, "The role of heat conduction in the cooling flows of galaxy clusters," *ApJ* 306, L1 (1986)
67. E. Bertschinger, "On the structure and stability of radiative shock waves," *ApJ* 304, 154 (1986)
68. E. Bertschinger and R. A. Chevalier, "A periodic shock wave model for Mira variable atmospheres," *ApJ* 299, 167 (1985)
69. E. Bertschinger, "Cosmological detonation waves," *ApJ* 295, 1 (1985)
70. E. Bertschinger, "Self-similar secondary infall and accretion in an Einstein-de Sitter universe," *ApJS* 58, 39 (1985)
71. E. Bertschinger, "The self-similar evolution of holes in an Einstein-de Sitter universe," *ApJS* 58, 1 (1985)
72. E. T. Vishniac, J. P. Ostriker, and E. Bertschinger, "Explosions in the early universe," *ApJ* 291, 399 (1985)
73. E. Bertschinger, "Cosmological self-similar shock waves and galaxy formation," *ApJ* 268, 17 (1983)

Non-Refereed Publications

1. E. Bertschinger, "Leaders in Science and Engineering: The Women of MIT," STATUS, American Astronomical Society, June/July 2011, 11 (2011)
2. E. Bertschinger, "Departmental Discussions of Diversity and Inclusion," MIT Faculty Newsletter, vol. 23, no. 4 (March/April 2011)
3. D. J. Nelson, E. Bertschinger, D. Burgess, and E. A. Nalley, "Bullying Can Happen in College, Too," *Chronicle of Higher Education*, vol. 57, issue 24 (February 13, 2011)
4. E. Bertschinger and E. F. Taylor, "General relativity for sophomores," *Am J Phys*, 76, 103 (2008)
5. E. Bertschinger, "Brownian Motion of Stars, Dust, and Invisible Matter," in *Proceedings of the Albert Einstein Century*, ed. J.-M. Alimi and A. Fuzfa (New York: AIP), 97 (2006)
6. J. D. Schnittman and E. Bertschinger, "A Hot Spot Model for Black Hole QPOs," in *X-Ray Timing 2003: Rossi and Beyond*, ed. P. Kaaret, F. K. Lamb, and J. H. Swank (Melville, NY: American Institute of Physics), 40 (2004)
7. E. Keyes and E. Bertschinger, "Inversion Analysis of Analytic versus Numerically-Simulated Gravitational Lens Models," in *Gravitational Lensing: Recent Progress and Future Goals*, ed. T. G. Brainerd and C. S. Kochanek (San Francisco: ASP), 319 (2001)
8. E. Bertschinger, "Cosmological Perturbation Theory and Structure Formation," in *Proceedings of Cosmology 2000*, ed. M. C. Bento, O. Bertolami, and L. Teodoro (2000)
9. E. Bertschinger, R.G. Bower, A.G. Doroshkevich, N. Kaiser, P. Petitjean, M. Steinmetz, A.S. Szalay, J. Wambsganss, and S.D.M. White, "Group Report: How did galaxies form?" in *The Evolution of the Universe*, ed. G. Borner and S. Gottlober (Chichester: Wiley), 275 (1997)
10. R. P. Saglia, M. Colless, G. Baggley, E. Bertschinger, D. Burstein, R. L. Davies, R. K. McMahan, and G. Wegner, "The EFAR Fundamental Plane," in *The Nature of Elliptical Galaxies*, proc. 2nd Stromlo Symposium, ed. M. Arnaboldi, G. S. Da Costa, and P. Saha (New York: AIP), 180 (1997)

11. E. Bertschinger, "Cosmological Dynamics," in *Cosmology and Large Scale Structure*, proc. Les Houches Summer School, Session LX, ed. R. Schaeffer, J. Silk, M. Spiro, and J. Zinn-Justin (Amsterdam: Elsevier Science), 273 (1996)
12. P. Bode and E. Bertschinger, "Parallel Linear General Relativity and CMB Anisotropies," in *Proceedings of Supercomputing '95*
13. R. C. Ferrell and E. Bertschinger, "A Parallel Processing Algorithm for Computing Short-Range Particle Forces with Inhomogeneous Particle Distributions," in *Proceedings of the Society for Computer Simulation Multiconference*, April 1995
14. U. Seljak and E. Bertschinger, "Constraints on Models from POTENT and CMB Anisotropies," in *Present and Future of the Cosmic Microwave Background*, ed. J. L. Sanz, E. Martinez-Gonzalez, and L. Cayon (Berlin: Springer-Verlag), 165 (1994)
15. E. Bertschinger, "The Revolution in Cosmology," in *1994 Yearbook of Science and the Future*, Encyclopaedia Britannica (Chicago: Encyclopaedia Britannica), 46 (1994)
16. G. Tormen and E. Bertschinger, "Adding long wavelength modes to an N-body simulation," in *Cosmic Velocity Fields*, ed. F. Bouchet and M. Lachieze-Rey (Gif-sur-Yvette: Editions Frontieres), 589 (1993)
17. U. Seljak and E. Bertschinger, "Testing the theoretical models using POTENT reconstructed density fields," in *Cosmic Velocity Fields*, ed. F. Bouchet and M. Lachieze-Rey (Gif-sur-Yvette: Editions Frontieres), 579 (1993)
18. E. Bertschinger, "Kinematical and dynamical approaches to gravitational instability," in *Cosmic Velocity Fields*, ed. F. Bouchet and M. Lachieze-Rey (Gif-sur-Yvette: Editions Frontieres), 137 (1993)
19. E. Bertschinger, "Gravitational Clustering in Cosmology," in *Statistical Description of Transport in Plasma, Astro-, and Nuclear Physics*, ed. J. Misguich, G. Pelletier, and P. Schuck, (Commack, NY: Nova Science), 193 (1993)
20. E. Bertschinger, "Galaxy Formation and Large-Scale Structure," *Ann NY Acad Sci* 688, 297 (1993)
21. R. L. Davies, G. Bagley, E. Bertschinger, D. Burstein, M. Colless, R. McMahan, R. Saglia, and G. Wegner, "The Distances to Elliptical Galaxies," in *Structure, Dynamics and Chemical Evolution of Early-Type Galaxies*, ed. I. J. Danziger, W. W. Zeilinger, and K. Kjar, 159 (1993)
22. E. Bertschinger, "Large-Scale Structures and Motions: Linear Theory and Statistics," in *New Insights into the Universe*, ed. V. J. Martinez, M. Portilla and D. Saez (New York: Springer-Verlag), 64 (1992); also in *Current Topics in Astrofundamental Physics*, ed. N. Sanchez and A. Zichici (Singapore: World Scientific), 237 (1992)
23. E. Bertschinger, "Dark Matter in the Universe," in *The Astronomy and Astrophysics Encyclopedia*, ed. S. P. Maran (New York: Van Nostrand Reinhold), 170 (1991)
24. E. Bertschinger and J. M. Gelb, "Cosmological N-body simulations," *Computers in Physics* 5, 164 (1991)
25. E. Bertschinger, "N-Body simulations: From galaxies to cosmology," in *After the First Three Minutes*, ed. S. Holt, V. Trimble and C. Bennett (New York: AIP), 297 (1991)
26. G. Wegner, R. L. Davies, M. Colless, D. Burstein, E. Bertschinger, and R. K. McMahan, "On Determining the Dn-log(σ) Relation for Elliptical Galaxies using Red CCD Images," in *Large-Scale Structures and Peculiar Motions in the Universe*, ed. D. W. Latham and L. N. da Costa (San Francisco: ASP), 129 (1991)

27. A. Dekel and E. Bertschinger, "Mapping Large-Scale Flows in Three Dimensions: Application," in *Large-Scale Structures and Peculiar Motions in the Universe*, ed. D. W. Latham and L. N. da Costa (San Francisco: ASP), 83 (1991)
28. E. Bertschinger and A. Dekel, "Mapping Large-Scale Flows in Three Dimensions: Method," in *Large-Scale Structures and Peculiar Motions in the Universe*, ed. D. W. Latham and L. N. da Costa (San Francisco: ASP), 67 (1991)
29. E. Bertschinger, "Large-Scale Motions in the Universe: A Review," in *Particle Astrophysics: The early universe and cosmic structures*, ed. J. M. Alimi, A. Blanchard, A. Bouquet, F. Martin de Volnay, and J. Tran Thanh Van (Gif sur Yvette: Editions Frontieres), 411 (1990)
30. E. Bertschinger, "Einstein's Blunder Resurrected," *Nature*, 348, 675 (1990)
31. E. Bertschinger, "String-seeded galaxy formation: Linear theory and N-body simulations," in *Proc. Cambridge Symposium on the Formation and Evolution of Cosmic Strings* (Cambridge: Cambridge University Press), 481 (1990)
32. E. Bertschinger, "Cosmic strings and galaxy formation," *Ann N.Y. Acad Sci*, 571, 151 (1989)
33. E. Bertschinger, "Neutrinos, cosmic strings, and galaxy formation," in *Neutrino '88*, ed. J. Schneps, T. Kafka, W. A. Mann, and P. Nath (Singapore: World Scientific), 674 (1989)
34. E. Bertschinger, "Resurrecting Hot Dark Matter with Cosmic Strings," in *Cosmic Strings: The Current Status*, ed. F. S. Accetta and L. M. Krauss (Singapore: World Scientific), 185 (1988)
35. E. Bertschinger, "Monte Carlo simulations of large-scale streaming velocities," in *The Post-Recombination Universe*, ed. N. Kaiser and A. N. Lasenby (Dordrecht: Kluwer), 249 (1988)
36. E. Bertschinger, "A semi-analytic approach to cooling flow evolution," in *Cooling Flows in Galaxies and Clusters*, ed. A. C. Fabian (Dordrecht: Kluwer), 337 (1988)
37. E. Bertschinger and J. M. Gelb, "Path Integral Methods for Primordial Density Perturbations," in *Large Scale Structures of the Universe*, proc. IAU Symp. 130, ed. J. Audouze, M.-C. Pelletan, and A. Szalay (Dordrecht: Reidel), 593 (1988)
38. E. Bertschinger, "Stringing Along the Galaxies," *Nature* 333, 13 (1988)
39. E. Bertschinger, "Galaxy Formation in a Universe Dominated by Cold Dark Matter," in *Dark Matter in the Universe*, proc. IAU Symp. 117, ed. J. Kormendy and G. R. Knapp (Dordrecht: Reidel), 360 (1987)