

Publications of Lai-Sang Young

(Updated December 2025)

- [1] L.-S. Young, *Entropy of continuous flows on compact 2-manifolds*, Topology 16, **4**, 1977, 465-467.
- [2] L.-S. Young, *On the prevalence of horseshoes*, Trans. AMS, **263** (1981), 75-88.
- [3] L.-S. Young, *A closing lemma on the interval*, Invent. Math., **54** (1979), 179-187.
- [4] L. Block, J. Guckenheimer, M. Misiurewicz and L.-S. Young, *Periodic points and topological entropy of one-dimensional maps*, Springer Lecture Notes in Math., **819** (1980), 18-34.
- [5] C. Robinson and L.-S. Young, *Nonabsolutely continuous foliations for an Anosov diffeomorphism*, Invent. Math., **61** (1980), 159-176.
- [6] J. Franks and L.-S. Young, *A C^2 Kupka-Smale diffeomorphism of the disk with no sources or sinks*, Proc. Warwick Symp, Springer Lecture Notes in Math., **898** (1981), 90-98.
- [7] S. Newhouse and L.-S. Young, *Dynamics of certain skew products*, Proc. Conf. in Dyn. Sys., Rio de janeiro, Springer Lecture Notes in Math, **1007** (1983), 611-629.
- [8] D. Rand and L.-S. Young, *Dynamical Systems and Turbulence, Warwick 1980*, Springer Verlag Lecture Notes in Math, **898** (1981). (edited book)
- [9] L.-S. Young, *Capacity of attractors*, Ergod. Thy & Dynam. Sys., **1** (1981), 381-388.
- [10] L.-S. Young, *Dimension, entropy and Lyapunov exponents*, Ergod. Thy & Dynam. Sys., **2** (1982), 109-124.
- [11] L.-S. Young, *Entropy, Lyapunov exponents, and Hausdorff dimension in differentiable dynamical systems*, Special Issue, IEEE Trans. on Circuits & Systems, **30** (1983), 599-606. (expository article)
- [12] L.-S. Young, *Bowen-Ruelle measures for certain piecewise hyperbolic maps*, Trans. AMS, **287** (1985), 41-48.
- [13] L.-S. Young, *Dimension, entropy and Lyapunov exponents in differentiable dynamical systems*, Physica A, **124** (1984), 639-646. (text of lecture at International Congress of Math Phys., Boulder 1983)
- [14] F. Ledrappier and L.-S. Young, *The metric entropy of diffeomorphisms, Part I: Characterization of measures satisfying Pesin's entropy formula*, Annals Math., **122** (1985), 509-539.

- [15] Ledrappier and L.-S. Young, *The metric entropy of diffeomorphisms, Part II: Relations between entropy, exponents and dimension*, Annals Math., **122** (1985), 540-574.
- [16] L.-S. Young, *Stochastic stability of hyperbolic attractors*, Ergod. Th. & Dynam. Sys., **6** (1986), 311-319.
- [17] L.-S. Young, *Random perturbations of matrix cocycles*, Ergod. Th. & Dynam. Sys., **6** (1986), 627-637.
- [18] F. Ledrappier and L.-S. Young, *Entropy formula for random transformations*, Prob. Th. Rel. Fields, **80** (1988), 217-240.
- [19] F. Ledrappier and L.-S. Young, *Dimension formula for random transformations*, Commun. Math. Phys., **117** (1988), 529-548.
- [20] L.-S. Young, *Some large deviation results for dynamical systems*, Trans. AMS, **318** (1990), 525-543.
- [21] F. Ledrappier and L.-S. Young, *Stability of Lyapunov exponents*, Ergod. Th. & Dynam. Sys., **11** (1991), 469-484.
- [22] P. Thieullen, C. Tresser and L.-S. Young, *Exposant de Lyapunov positif dans des familles a un parametre d'applications unimodales*, C.R. Acad. Sci. Paris, **315.I**, 1992, 69-72 (research announcement); J d'Analyse, **64** (1994), 121-172.
- [23] M. Benedicks and L.-S. Young, *Absolutely continuous invariant measures and random perturbations of certain one-dimensional maps*, Ergod. Th. & Dynam. Sys, **12** (1992), 13-37.
- [24] L.-S. Young, *Decay of correlations for certain quadratic maps*, Commun. Math. Phys, **146** (1992), 123-138.
- [25] M. Benedicks and L.-S. Young, *Sinai-Bowen-Ruelle measures for certain Hénon maps*, Invent. Math, **112** (1993), 541-576.
- [26] L.-S. Young, *Ergodic theory of chaotic dynamical systems*, Proc. of Smalefest, Springer-Verlag, (1993), 201-226. (expository article)
- [27] L.-S. Young, *Some open sets of nonuniformly hyperbolic cocycles*, Ergod. Th. & Dynam. Sys., **13**, (1993), 409-415.
- [28] V. Baladi and L.-S. Young, *On the spectra of randomly perturbed expanding maps*, Commun. Math. Phys., **156** (1993), 355-385.
- [29] H. Hu and L.-S. Young, *Nonexistence of SBR measures for some diffeomorphisms that are "almost Anosov"*, Ergod. Th. & Dynam. Syst., **15** (1995), 67-76.

- [30] L.-S. Young, *Ergodic theory of differentiable dynamical systems*, "Real and Complex Dynamics", Ed. Branner and Hjorth, NATO ASI series, Kluwer Academic Publishers (1995), 293-336. (expanded notes based on lecture at Hillerod, Denmark)
- [31] I. Klapper and L.-S. Young, *Rigorous bounds on the fast dynamo growth rate involving topological entropy*, Commun. Math. Phys., **173** (1995), 623-646.
- [32] L.-S. Young, *Ergodic theory of attractors*, Proceedings of the International Congress of Mathematicians, Zürich, Switzerland 1994, Birkhäuser Verlag (1995), 1230-1237.
- [33] L.-S. Young, *Lyapunov exponents for some quasi-periodic cocycles*, Ergod. Th. & Dynam. Syst., **17** (1997), 483-504
- [34] L.-S. Young, *Statistical properties of dynamical systems with some hyperbolicity*, Annals of Math. (1998), 585-650
- [35] R. Murray, M. Keane and L.-S. Young, *Computing invariant measures for expanding circle maps*, Nonlinearity (1998)
- [36] L.-S. Young, *Ergodic theory of chaotic dynamical systems*, Proc. International Congress of Math. Phys., Brisbane 1997, International Press (1999), 132-143
- [37] L.-S. Young, *Developments in chaotic dynamics*, AMS Notices, Nov. 1998 (expository article)
- [38] M. Benedicks and L.-S. Young, *Markov extensions and decay of correlations for certain Hénon maps*, Asterisque **261** (2000), 13-56.
- [39] L.-S. Young, *Recurrence times and rates of mixing*, Israel J Math. **110** (1999), 153-188.
- [40] L.-S. Young, *Geometric and ergodic theory of hyperbolic dynamical systems*, Lecture series in Current Developments in Mathematics 1998, Harvard-MIT, International Press (1999) (expository article)
- [41] Q.D. Wang and L.-S. Young, *Strange attractors with one direction of instability*, Commun. Math. Phys. **218** (2001), 1-97.
- [42] N. Chernov and L.-S. Young, *Decay of correlations for Lorentz gases and hard balls*, Encycl. of Math. Sc., Math. Phys. II, Vol. 101, Ed. Szasz, (2001), 89-120. (expository article)
- [43] Q.D. Wang and L.-S. Young, *From invariant curves to strange attractors*, Commun. Math. Phys. **225** (2002), 275-304.
- [44] N. Masmoudi and L.-S. Young, *Ergodic theory of infinite dimensional systems with applications to dissipative parabolic PDEs*, Commun. Math. Phys., **227** (2002), 461-481.

- [45] L.-S. Young, *Entropy in dynamical systems*, in *Entropy*, Ed. Greven, Keller and Warnecke, Princeton Univ. Press (2003), 313-328.
- [46] L.-S. Young, *What are SRB measures, and which dynamical systems have them?*, J. Stat. Phys., **108** Issue 5 (in honor of the 65th birthday of Ruelle and Sinai) (2002), 733-754.
- [47] Q.D. Wang and L.-S. Young, *Strange attractors in periodically-kicked limit cycles and Hopf bifurcations*, Commun. Math. Phys. **240** (2003), 509-529.
- [48] L.-S. Young, Advisor and contributor to *Encyclopedia of Nonlinear Science*, Ed. A. Scott, Routledge (2004).
- [49] J.-P. Eckmann and L.-S. Young, *Temperature profiles in Hamiltonian heat conduction*, Europhys. Lett., **68** (2004), 790-796.
- [50] W. Cowieson and L.-S. Young, *SRB measures as zero-noise limits*, to appear in Ergod. Th. & Dynam. Sys. **25** (2005), 1115-1138.
- [51] J.-P. Eckmann and L.-S. Young, *Nonequilibrium Energy Profiles for a Class of 1-D Models*, Commun. Math. Phys., **262** (2006), 237-267.
- [52] Q.D. Wang and L.-S. Young, *Nonuniformly expanding 1D maps*, Commun. Math. Phys., **264**, (2006), 255-282.
- [53] M. Demers and L.-S. Young, *Escape rate and conditionally invariant measures*, Nonlinearity, **19** (2006), 377-397.
- [54] J. Guckenheimer, M. Weschelberger and L.-S. Young, *Chaotic Attractors of Relaxation Oscillators*, Nonlinearity, **19** (2006), 701-720.
- [55] Q.D. Wang and L.-S. Young, *Toward a theory of rank one attractors*, Ann. Math., **167**, No.2 (2008), 349-480.
- [56] K. Ravishankar and L.-S. Young, *Local thermodynamic equilibrium for some stochastic models of Hamiltonian origin*, J Stat. Phys., **128**, No. 3 (2007), 641-665.
- [57] E. Kobre and L.-S. Young, *Extended systems with deterministic local dynamics and random jumps*, Commun. Math. Phys., **275**, No.3 (2007), 709-720.
- [58] K. Lin and L.-S. Young, *Correlations in nonequilibrium steady states of Random Halves Models*, J. Stat. Phys., **128**, No. 3 (2007), 607-639.
- [59] L. Rey-Bellet and L.-S. Young, *Large Deviations in nonuniformly hyperbolic dynamical systems*, Ergod Th & Dynam Sys, **28**, Issue 02 (2008), 587-612.
- [60] K. Lin and L.-S. Young, *Shear-induced chaos*, Nonlinearity, **21** (2008), 899-922.
- [61] L.-S. Young, *Chaotic phenomena in three settings: large, noisy and out of equilibrium*, Nonlinearity, **21**, No. 11 (2008), T245-T252. (invited article on Open Problems)

- [62] K. Lin, E. Shea-Brown and L.-S. Young, *Reliability of coupled oscillators*, J. Nonlin. Sci., **19** (2009), 497-545.
- [63] W. Ott, M. Stenlund and L.-S. Young, *Memory loss for time-dependent dynamical systems*, Math. Res. Lett., **16**, no. 3 (2009), 463-475.
- [64] K. Lin, E. Shea-Brown and L.-S. Young, *Reliability of layered neural oscillator networks*, Comm. Math. Sci., **7** (2009), 239-247. (rapid communication)
- [65] K. Lin, E. Shea-Brown and L.-S. Young, *Spike-time reliability of layered neural oscillator networks*, J. Comp. Neurosci., **27** (2009), 135-160.
- [66] P. Balint, K. Lin and L.-S. Young, *Ergodicity and energy distributions for some boundary driven integrable Hamiltonian chains*, Commun. Math. Phys., Vol 294, 1 (2010), 199-228.
- [67] M. Demers, P. Wright and L.-S. Young, *Escape rates and physically relevant measures for billiards with small holes*, Commun. Math. Phys., Vol 294, no. 2 (2010), 353-338.
- [68] S. Mintchev and L.-S. Young, *Self-organization in predominantly feedforward oscillator chains*, Chaos (2009), no. 4, 043131.
- [69] J. Koiller and L.-S. Young, *Coupled map networks*, Nonlinearity, **23**, 5 (2010), 1121-1141.
- [70] K. Lin and L.-S. Young, *Nonequilibrium steady states for certain Hamiltonian models*, J. Stat. Phys. **139** no. 4 (2010), 630-657.
- [71] K. Lin and L.-S. Young, *Dynamics of periodically-kicked oscillators*, J. Fixed Point Theory Appl., 7 no. 2 (2010), 291-312.
- [72] J.-P. Eckmann and L.-S. Young, *Rattling and freezing in a 1-D transport model*, Nonlinearity 24 (2011), 207-226.
- [73] Z. Lian and L.-S. Young, *Lyapunov exponents, periodic orbits and horseshoes for mappings of Hilbert spaces*, Ann. Henri Poincaré 12 (2011), 1081-1108.
- [74] Q.D. Wang and L.-S. Young, *Dynamical profile of a class of rank-one attractors*, Ergod Th & Dynam Sys, Vol 33, Issue 04, (2013) p.1221-1264.
- [75] K. Lu, Q. D. Wang and L.-S. Young, *Strange attractors for periodically forced parabolic equations*, AMS Memoirs, (2013)
- [76] M. Demers, P. Wright and L.-S. Young, *Entropy, Lyapunov exponents and escape rates in open systems*, Ergod Th & Dynam Sys, **32**:4 (2012), 1270-1301.
- [77] Z. Lian and L.-S. Young, *Lyapunov exponents, periodic orbits and horseshoes for semiflows on Hilbert spaces*, J Amer. Math. Soc., **25** (2012), 637-665

- [78] K. Lin, K.C.A. Wedgewood, S. Coombes and L.-S. Young, *Limitations of perturbative techniques in the analysis of rhythms and oscillations*, J. Math. Biol. **66** (2013) 139–161
- [79] B. Ryals and L.-S. Young, *Nonequilibrium steady states of some simple 1-D mechanical chains*, J Stat. Phys., Vol. 146, No. 5, (2012) 1089–1103
- [80] Z. Lian, L.-S. Young, and C. Zeng, *Absolute continuity of stable foliations for systems on Banach spaces*, J Diff. Equations, Vol. 254, **1**, (2013) 283–308
- [81] A. Rangan and L.-S. Young, *Emergent dynamics in a model of visual cortex*, J Comp. Neurosci., Vol 35, Issue 2, 155–167 (2013)
- [82] A. Rangan and L.-S. Young, *Dynamics of spiking neurons: between homogeneity and synchrony*, J Comput. Neurosci., Volume 34, Issue 3 (2013), Page 433–460
- [83] B. Ryals and L.-S. Young, *Horseshoes of periodically-kicked van der Pol oscillators*, Chaos **22**, (2012) 043140
- [84] L.-S. Young, *Understanding chaotic dynamical systems*, (invited article), Commun. Pure & Appl. Math. Vol 66, Issue 9 (2013), 1439–1462
- [85] M. Stenlund, L.-S. Young and H. Zhang, *Dispersing billiards with moving scatterers*, Commun. Math. Phys. Vol. 322, Issue 3 (2013), 909–955
- [86] L.-S. Young, *Mathematical theory of Lyapunov exponents*, (invited review article), J. Phys. A: Math Theor. **46** (2013) 254001
- [87] A. Barrat, B. Fernandez, K. Lin and L.-S. Young, *Modeling temporal networks using random itineraries*, Phys. Rev. Lett. **110** (2013), article no 158702
- [88] Y. Li and L.-S. Young, *Existence of nonequilibrium steady state for a simple model of heat conduction*, J Stat Phys., **152** (2013) 1170–93
- [89] Y. Li and L.-S. Young, *Nonequilibrium steady states for a class of particle systems*, Nonlinearity **27** (2014) 607–636
- [90] L. Chariker and L.-S. Young, *Emergent spike patterns in neuronal populations*, J Comp. Neurosci. (2015) 38:203–220
- [91] Y. Li, P. Nandori and L.-S. Young, *Local thermal equilibrium for certain stochastic models of heat transport*, J Stat Phys. **163** (2016) 1: 61–91.
- [92] Y. Li and L.-S. Young, *Polynomial convergence to equilibrium for a system of interacting particles*, Annals of Applied Prob. **27**(1), (2017) 65–90
- [93] T. Pereira and L.-S. Young, *Control of epidemics on complex networks: effectiveness of delayed isolation*, Phys. Rev. E, **92**, 022822 (2015)
- [94] A. Blumenthal and L.-S. Young, *Entropy, volume growth and SRB measures for Banach space mappings*, Invent. Math. (2017) 207, No. 2, 833–893

- [95] G. Lajoie and L.-S. Young, *Dynamic signal tracking in a simple V1 spiking model*, Neural Comp. **28** (2016) 1985-2010.
- [96] A. Blumenthal, J. Xue and L.-S. Young, *Lyapunov exponents for random perturbations of some area-preserving maps including the standard map*, Annals of Math, 185 (2017) 1-26
- [97] L. Chariker, R. Shapley and L.-S. Young, *Orientation selectivity from very sparse LGN inputs in a comprehensive model of macaque V1 cortex*, J Neurosci., (2016) 36(49):12368 -12384
- [98] A. Blumenthal and L.-S. Young, *Absolute continuity of stable foliations for mappings of Banach spaces*, Commun. Math. Phys., (2017) 354:591-619
- [99] L.-S. Young, *Generalizations of SRB measures to nonautonomous, random, and infinite dimensional systems*, (review article), J Stat. Phys. (2017) 166:494-515
- [100] L.-S. Young, *Unraveling the dynamics of the brain through modeling and analysis*, *Patterns of Dynamics*, Springer Proc. Math. & Stat., Ed Gurevich et al (2017), p.393
- [101] A. Blumenthal, J. Xue and L.-S. Young, *Lyapunov exponents and correlation decay for random perturbations of some prototypical 2D maps*, Commun. Math. Phys. 359:347-373 (2018)
- [102] L.-S. Young, *Dynamical systems evolving*, Proc. International Congress of Math. 2018, Rio de Janeiro, World Scientific
- [103] Y. Li, L. Chariker and L.-S. Young, *How well do reduced models capture the dynamics of interacting neurons?*, J. Math. Biol., (2019) 78:83-115
- [104] A. Blumenthal and L.-S. Young, *Equivalence of physical and SRB measures in random dynamical systems*, Nonlinearity 32 (2019) 1494-1524
- [105] L. Chariker, R. Shapley and L.-S. Young, *Rhythm and synchrony in a realistic cortical network model*, J of Neurosci. (2018) 38(40):8621 - 8634
- [106] S. Ruschel, T. Pereira, S. Yanchuk and L.-S. Young, *An SIQ delay differential equations model for disease control via isolation*, J of Math Biol (2019) 79:249-279
- [107] L.-S. Young, S. Ruschel, S. Yanchuk, and T. Pereira, *Consequences of delays and imperfect implementation of isolation in epidemic control*, Scientific Reports (2019) 9:3505
- [108] L.-S. Young, *Comparing chaotic and random dynamical systems*, Proc. Int. Congr. on Math. Phys., J Math Phys 60, 052701 (2019)
- [109] M. Joglekar, L. Chariker, R. Shapley and L.-S. Young, *A case study in the functional consequences of scaling the sizes of realistic cortical models* PLoS Comput Biol 15(7): e1007198 (2019)

- [110] L.-S. Young, L. Tao, M. Shelley, R. Shapley, A. Rangan and D. McLaughlin, *The evolution of large-scale modeling of monkey primary visual cortex, V1: steps towards understanding cortical function*, Commun. in Math. Sc. 17(5): 1387-1406 (2019)
- [111] L.-S. Young, *Towards a mathematical model of the brain* J Stat Phys (2020) 180:612–629
- [112] L. Chariker, R. Shapley and L.-S. Young, *Contrast response in a comprehensive network model of macaque V1*, J of Vision Vol 20 (2020)
<https://doi.org/10.1167/jov.20.4.16>
- [113] M. Tanzi and L.-S. Young, *Nonuniformly hyperbolic systems arising from coupling of chaotic and gradient-like systems*, Disc. & Cont. Dyn. Sys. Vol 40, No. 10, (2020) 6015-6041
- [114] W.-H. Lin, E. Kussell, L.-S. Young and C. Jacobs-Wagner, *Origin of exponential growth in nonlinear reaction networks*, PNAS (2020) vol. 117, no. 45, 27795–27804
- [115] Y. Zhang and L.-S. Young, *DNN-assisted statistical analysis of a model of local cortical circuits*, Scientific Repoerts (2020) 10:20139
- [116] S. Saraf and L.-S. Young, *Malleability of gamma rhythms enhances population-level correlations*, J Compt Neurosci., 49, (2021) 189–205
- [117] Y. Li and L.-S. Young, *Unraveling the mechanisms of surround suppression in early visual processing*, PLOS Comp. Bio. (2021) 17(4): e1008916
- [118] Z. Danial and L.-S. Young, *Three pre-vaccine responses to Covid-like epidemics*, PLOS ONE, (2021) PLOS ONE 16(5): e0251349
- [119] L. Chariker, R. Shapley, M. Hawken and L.-S. Young, *A theory of direction selectivity for macaque primary visual cortex*, PNAS (2021) 118 (32) e2105062118
- [120] Z.-C. Xiao, K. Lin and L.-S. Young, *A data-informed mean-field approach to mapping of cortical parameter landscapes*, PLoS Comp. Bio. 17 (2021)
- [121] M. Tanzi and L.-S. Young, *Existence of physical measures in some excitation-inhibition networks*, Nonlinearity (2021) 35 889
- [122] L. Chariker, R. Shapley, M. Hawken and L.-S. Young, *A computational model of direction selectivity in macaque V1 cortex based on dynamic differences between On and Off pathways*, J Neurosci (2022) 42 (16) 3365-3380
- [123] B. Ambrosio and L.-S. Young, *The use of reduced models to generate irregular, broad-band signals that resemble brain rhythms*, Frontiers in Comp Neurosci (2022) 10.3389/fncom.2022.889235
- [124] L.-S. Young, *The brain is a dynamical system*, SIAM News invited article (2022)

- [125] P. Nandori and L.-S. Young, *Growth and depletion in linear stochastic reaction networks*, PNAS (2022) vol 119 No. 51 e2214282119
- [126] M. Morrison and L.-S. Young, *Chaotic heteroclinic networks as models of switching behavior in biological systems*, Chaos: An Interdisciplinary Journal of Nonlinear Science, (2022) vol. 32, p. 123102.
- [127] L.-S. Young, *Observable events and typical trajectories in finite and infinite dimensional systems*, Ennio De Giorgi Colloquio series (2024)
- [128] Z.-C. Xiao, K. Lin and L.-S. Young, *Efficient models of cortical activity via local dynamic equilibria and coarse-grained interactions*, PNAS (2024) 121 (27) e2320454121
- [129] A. Blumenthal and L.-S. Young, *Ergodic Theory: a probabilistic approach to dynamical systems*, Texts in Applied Math 84, Springer (2026) **[book]**
- [130] M. Morrison and L.-S. Young, *A data-driven biology-based network model reproduces C. elegans premotor neural dynamics*, to appear in PLoS Comp Biol
- [131] Y. Bakhtin, R. Raquépas and L.-S. Young, *Random attractors and nonergodic attractors for diffusions with degeneracies*, under review