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Tomoki Nosaka

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Education

- Ph.D. in Science, Kyoto University, March 2016.
  Thesis title: M2-branes in M-theory and exact large N expansion
  Ph.D. supervisor: Naoki Sasakura
- M.A. in Science, Kyoto University, March 2013.
- B.S. in Science, Kyoto University, March 2011.

Employment

- Assistant Professor in Shanghai Institute for Mathematics and Interdisciplinary Sciences, May 2024–Present.
- Postdoctoral Fellow in Kavli Institute for Theoretical Sciences, University of Chinese Academy of Sciences, May 2022–May 2024,
- Visiting Researcher in Kavli Institute for Theoretical Sciences, University of Chinese Academy of Sciences, February 2022–April 2022,
- Research Part-time Worker in RIKEN iTHEMS, November 2021–January 2022.
- Postdoctoral Visiting Researcher in Scuola Internazionale Superiore di Studi Avanzati (Research Fellow of Istituto Nazionale Di Fisica Nucleare), November 2019–October 2021.
- Research Fellow in Korea Institute for Advanced Study, Korea, April 2016–October 2019.
- Research Fellow in Japan Society for the Promotion of Science (JSPS), April 2013–March 2016.

Grants and Fellowships

[A1] JSPS Research Fellowship (DC1), April 2013–March 2016.

Awards

[B1] "Distinguish" level (Yōuxiùgèrén; top 20 percent) in the 2023 annual performance review in University of Chinese Academy of Sciences

Experience of Teaching

[C1] Teaching assistant in "Exercises in Electrodynamics 4" (Japanese), Kyoto University, October 2013-January 2014.

Invited Talks

[D1] "New recursion relation for M2-brane matrix model", in "Frontier Forum on "Supersymmetry in Physics and Mathematics", Qiandaohu, China, May 2024,

[D2] "New recursion relation for M2-brane matrix model", in "ITHEMS-YITP Workshop: Bootstrap, Localization and Holography", Yukawa Institute for Theoretical Physics, Japan, May 2024,

[D3] "M2-branes and q-Painleve equations" in "6TH INTERNATIONAL CONFERENCE ON HOLOGRAPHY, STRING THEORY AND SPACETIME IN DA NANG", Da Nang, Vietnam, February 2023,

[D4] "M2-branes and discrete Painleve systems", in "5th International Conference on Holography, String Theory and Discrete Approach", Hanoi, Vietnam (Zoom), August 2021,

[D5] "Quantum chaos/integrable transition from level statistics, and its gravity dual", in "Universality and ergodicity in quantum many-body systems", SCGP, Stony Brook University, US, October 2019,

[D6] "chaos/integrable transition and eternal traversable wormhole", in "INTERNATIONAL CONFERENCE ON HOLOGRAPHY, STRING THEORY AND DISCRETE APPROACHES IN DANANG", Vietnam, August 2019,

[D7] "Traversable wormhole and chaotic/integrable transition", "KMI Interdisciplinary Seminar" at Kobayashi-Maskawa Institute for the Origin of Particles and the Universe, Nagoya, Japan, July 2019,

[D8] "M2-branes on orbifold and exact large N expansion", in "Mini Workshop on Gauge theory and Supergravity", Pohang, Korea, July 2016,

[D9] "Instanton effects of M2-branes in various orbifolds", in "Japan-Hungary bilateral program workshop", Tokyo, Japan, November 2015.

Seminar Presentations

[E1] "Large N expansion of mass deformed ABJM matrix model: M2-instanton condensation and beyond", Yau Mathematical Sciences Center at Tsinghua University, Beijing, China, 29 Feb 2024,

[E2] "Weyl covariance of M2-brane matrix models and Painleve equations", Shing-Tung Yau Center of Southeast University, Nanjing, China, 27 Jun 2023,

[E3] "Quantum chaos and revival dynamics in coupled Sachdev-Ye-Kitaev models", Jilin University, Changchun, China, 17 May 2023,

[E4] "Quantum chaos and revival dynamics in coupled Sachdev-Ye-Kitaev models", Shanghai Jiaotong University, Shanghai, China, 9 May 2023,

[E5] "Quantum chaos and traversable wormholes in coupled Sachdev-Ye-Kitaev models", Vietnam Academy of Science and Technology, Hanoi, Vietnam, 28 February 2023,

[E6] "Towards Black Hole Interior by Magic of Chaos", Entanglement Meetingg, Yukawa Institute for Theoretical Physics, 28 July 2022,

[E7] "Black Hole Interior by Magic of Chaos", University of Warshaw, 12 May 2022,

[E8] "Quantum chaos, Entanglement and Black holes", RIKEN iTHEMS Coffee Meeting, 24 December 2021,

[E9] "M2-branes and discrete Painleve systems", Yukawa Institute for Theoretical Physics, Kyoto, Japan, 10 December 2021,

[E10] "M2-branes and discrete Painleve systems", Osaka City University, 21 September 2021,

[E11] "Quantum chaos transition in a two-site SYK model dual to an eternal traversable wormhole", Fudan University, Shanghai, China, 18 March 2019,

[E12] "Instanton Effects in Rank Deformed Superconformal Chern-Simons Theories from Topological Strings", Korea Institute for Advanced Study, Seoul, Korea, 12 June 2017,

[E13] "Instantons in rank-deformed Chern-Simons matter theory from topological string", National Taiwan University, Taipei, Taiwan, 26 May 2017,

[E14] "Orientifold in ABJ(M) Fermi Gas", Korea Institute for Advanced Study, Seoul, Korea, 13 June 2016,

[E15] "Partition function of 3d superconformal Chern-Simons theory and instanton effects in M-theory", Kyoto University, 18 November 2015,

[E16] "Exact large N expansion of the partition function of 3d superconformal Chern-Simons theories", King's College London Department of Mathematics, London, UK, February 2015,

[E17] "Supersymmetric Yang-Mills theory on a squashed four sphere", Tokyo Institute of Technology Particle Physics Group, Tokyo, Japan, January 2014,

[E18] "Multiple M5 solutions in ABJM theory", Graduate School of Mathematics, Nagoya University, Nagoya, Japan, November 2012.

Presentations in International Conferences

(Oral)

[F1] "Large N expansion of mass deformed ABJM matrix model: M2-instanton condensation and beyond" in KEK Theory workshop 2023, Ibaraki, Japan, December 2023,

[F2] "M2-branes and discrete integrable systems" in 14th Taiwan String Workshop, Taipei/Kaohsiung, Taiwan, October 2023,

[F3] "M2-branes and q-Painleve equations", in "KEK Theory Workshop 2022", Ibaraki, Japan (Zoom), December 2022,

[F4] "chaos and thermodynamics of SYK traversable wormholes", in "Strings and Fields 2020", Kyoto, Japan (Zoom), November 2020,

[F5] "A sharp transition in quantum chaos and thermodynamics of mass deformed SYK models", in "4th international conference on holography, string theory and discrete approach", Hanoi, Vietnam (Zoom), August 2020,

[F6] "Quantum chaos transition in a two-site SYK model dual to an eternal traversable wormhole", in "Strings and Fields 2019", Kyoto, Japan, August 2019,

[F7] "The Thouless time for mass-deformed SYK", in "Strings and Fields 2018", Kyoto, Japan, July 2018,

[F8] "Thouless time for mass-deformed SYK", in "Workshop on Fields, Strings and Gravity", Seoul, Korea, May 2018,

[F9] "Phases in mass deformed ABJM theory from Monte Carlo Simulation", in "10th Taiwan String Workshop", Hsinchu, Taiwan, October 2017,

[F10] "M2-branes on orbifold and exact large N expansion", in "Strings and Fields 2017", Kyoto, Japan, August 2017,

[F11] "Massive ABJM theory on three sphere and phase transition in large N limit", in "Current Topics in String Theory: Conformal Field Theories", Seoul, Korea, December 2016,

[F12] "Orientifold ABJM Matrix Model: Chiral Projections and Worldsheet Instantons", in "Strings and Fields 2016", Kyoto, Japan, August 2016,

[F13] "Exact large N partition function of non-conformally deformed ABJM theory", in "Developments in String Theory and Quantum Field Theory", Kyoto, Japan, November 2015,

[F14] "Exact large N expansion of the partition function of 3d superconformal quiver Chern-Simons theories", in "2nd String Theory in Greater Tokyo", Tokyo, Japan, June 2015,

[F15] "ABJM Membrane Instanton from Pole Cancellation Mechanism", in "7th Taiwan String Workshop", Taipei, Taiwan, November 2014,

(Poster)

[F16] "Quantum chaos transition in a model dual to eternal traversable wormhole", in "Quantum Information and String Theory 2019", Kyoto, Japan, June 2019,

[F17] "Symmetry Breaking in Quantum Curves and Super Chern-Simons Matrix Models", in "Kavli Asian Winter School 2019", Seoul, Korea, January 2019,

[F18] "Spontaneous SUSY breaking in a Large N gauge theory", in "EuroStrings2018", London, UK, April 2018,

[F19] "Complete factorization in minimal $\mathcal{N} = 4$ Chern-Simons matter theory", in "KIAS-YITP joint workshop 2017: Strings, Gravity and Cosmology", Kyoto, Japan, September 2017,

[F20] "Exact partition function of quiver superconformal Chern-Simons theories", in "KIAS-YITP Joint Workshop 2015, Geometry in Gauge Theories and String Theory", Seoul, Korea, September 2015,

[F21] "M-theoretical expansion for Superconformal quiver Chern-Simons theories", in "Integrability in Gauge and String Theory 2015", London, UK, July 2015,

[F22] "Exact partition function of quiver superconformal Chern-Simons theories", in "Strings 2015", Bangalore, India, June 2015,

[F23] "Exact Instanton Expansion of Superconformal Chern-Simons Theories from Topological Strings", in "KEK Theory Workshop 2015", Ibaraki, Japan, January 2015,

[F24] "The Partition Function of Super Chern-Simons theories from Fermi Gas Approach", in "Strings and Fields", Kyoto, Japan, July 2014,

[F25] "Supersymmetric Gauge Theories on a Squashed Four-Sphere", in "KEK Theory Workshop 2014", Ibaraki, Japan, February 2014,

[F26] "Supersymmetric gauge theory on a squashed four sphere", in "Cern Winter School on Supergravity, Strings, and Gauge Theory 2014", Geneva, Switzerland, February 2014.

List of Publications/Preprints

The five representative publications are marked with " $*$ ".

Total number of citations: 635 (counted in INSPIRE: `https://inspirehep.net/literature?sort=mostrecent&size=25&page=1&q=f%20ea%20%22tomoki%20nosaka%22`)

(Publications on Journal)

[G1] Sanefumi Moriyama and Tomoki Nosaka, "Affine Symmetries for ABJM Partition Function and its Generalization", JHEP 05 (2024) 153 [arXiv:2312.04206 [hep-th]]. (2 citations)
`https://link.springer.com/article/10.1007/JHEP05(2024)153`
`https://arxiv.org/abs/2312.04206`

*[G2] Tomoki Nosaka, "Large N expansion of mass deformed ABJM matrix model: M2-instanton condensation and beyond", JHEP 03 (2024) 087 [arXiv: 2401.11484 [hep-th]]. (3 citations)
`https://link.springer.com/article/10.1007/JHEP03(2024)087`
`https://arxiv.org/abs/2401.11484`

[G3] Kanato Goto, Taozhi Guo, Tomoki Nosaka, Masahiro Nozaki, Shinsei Ryu and Kotaro Tamaoka, "Spatial deformation of many-body quantum chaotic systems and quantum information scrambling", Phys. Rev. B 109 (2024) 5, 054301 [arXiv: 2305.01019 [quant-ph]]. (3 citations)
`https://journals.aps.org/prb/abstract/10.1103/PhysRevB.109.054301` `https://arxiv.org/abs/2305.01019`

[G4] Sanefumi Moriyama and Tomoki Nosaka, "40 Bilinear Relations of q-Painleve VI from N=4 Super Chern-Simons Theory", JHEP 08 (2023) 191 [arXiv:2305.03978 [hep-th]]. (5 citations)
`https://link.springer.com/article/10.1007/JHEP08(2023)191`
`https://arxiv.org/abs/2305.03978`

[G5] Tomoki Nosaka and Tokiro Numasawa, "On SYK traversable wormhole with imperfectly correlated disorders", JHEP **04** (2023) 145 [arXiv:2210.13123 [hep-th]]. (2 citations)
https://link.springer.com/article/10.1007/JHEP04(2023)145
https://arxiv.org/abs/2210.13123

[G6] Kanato Goto, Tomoki Nosaka and Masahiro Nozaki, "Probing chaos by magic monotones," Phys. Rev. D **106** (2022), 126009 [arXiv:2112.14593 [hep-th]]. (18 citations)
https://journals.aps.org/prd/abstract/10.1103/PhysRevD.106.126009
https://arxiv.org/abs/2112.14593

*[G7] Giulio Bonelli, Fran Globlek, Naotaka Kubo, Tomoki Nosaka and Alessandro Tanzini, "M2-branes and q-Painleve equations," Lett. Math. Phys. **112** (2022) 109 [arXiv:2202.10654 [hep-th]]. (12 citations)
https://link.springer.com/article/10.1007/s11005-022-01597-0
https://arxiv.org/abs/2202.10654

[G8] Hirotaka Hayashi, Tomoki Nosaka and Tadashi Okazaki, "Dualities and flavored indices of M2-brane SCFTs," JHEP **10** (2022) 023 [arXiv:2206.05362 [hep-th]]. (8 citations)
https://link.springer.com/article/10.1007/JHEP10(2022)023
https://arxiv.org/abs/2206.05362

*[G9] Tomoki Nosaka, "SU(N) q-Toda equations from mass deformed ABJM theory," JHEP **06** (2021) 060 [arXiv:2012.07211 [hep-th]]. (10 citations)
https://link.springer.com/article/10.1007/JHEP06(2021)060
https://arxiv.org/abs/2012.07211

[G10] Tomoki Nosaka and Tokiro Numasawa, "Chaos exponents of SYK traversable wormholes," JHEP **02** (2021) 150 [arXiv:2009.10759 [hep-th]]. (13 citations)
https://link.springer.com/article/10.1007/JHEP02(2021)150
https://arxiv.org/abs/2009.10759

[G11] Tomoki Nosaka and Tokiro Numasawa, "Quantum Chaos, Thermodynamics and Black Hole Microstates in the mass deformed SYK model," JHEP **08** (2020) 081 [arXiv:1912.12302[hep-th]]. (14 citations)
https://link.springer.com/article/10.1007/JHEP08(2020)081
https://arxiv.org/abs/1912.12302

[G12] Antonio M. García-García, Tomoki Nosaka, Dario Rosa, Jacobus J. M. Verbaarschot, "Quantum chaos transition in a two-site SYK model dual to an eternal traversable wormhole", 10.1103/PhysRevD.100.026002 [arXiv:1901.06031[hep-th]]. (83 citations)
https://journals.aps.org/prd/abstract/10.1103/PhysRevD.100.026002
https://arxiv.org/abs/1901.06031

[G13] Naotaka Kubo, Sanefumi Moriyama, Tomoki Nosaka, "Symmetry Breaking in Quantum Curves and Super Chern-Simons Matrix Models", JHEP **1901** (2019) 210 [arXiv:1811.06048 [hep-th]]. (20 citations)
https://link.springer.com/article/10.1007%2FJHEP01%282019%29210
https://arxiv.org/abs/1811.06048

*[G14] Masazumi Honda, Tomoki Nosaka, Kazuma Shimizu and Seiji Terashima, "Supersymmetry Breaking in a Large N Gauge Theory with Gravity Dual", JHEP **1903** (2019) 159 [arXiv:1807.08874 [hep-th]]. (12 citations)
https://dx.doi.org/10.1007/JHEP03(2019)159
https://arxiv.org/abs/1807.08874

[G15] Tomoki Nosaka, Dario Rosa and Junggi Yoon, "The Thouless time for mass-deformed SYK", JHEP **1809** (2018) 041 [arXiv:1804.09934 [hep-th]]. (44 citations)
https://link.springer.com/article/10.1007%2FJHEP09%282018%29041
https://arxiv.org/abs/1804.09934

[G16] Tomoki Nosaka and Shuichi Yokoyama, "Index and duality of minimal $\mathcal{N} = 4$ Chern-Simons-matter theories", JHEP **1806** (2018) 028 [arXiv:1804.04639 [hep-th]]. (8 citations)
https://dx.doi.org/10.1007/JHEP06%282018%29028
https://arxiv.org/abs/1804.04639

[G17] Sanefumi Moriyama, Tomoki Nosaka and Katsuya Yano, "Superconformal Chern-Simons Theories from del Pezzo Geometries", JHEP **1711** (2017) 089 [arXiv:1707.02420 [hep-th]]. (22 citations)
https://link.springer.com/article/10.1007%2FJHEP11%282017%29089
https://arxiv.org/abs/1707.02420

[G18] Tomoki Nosaka and Shuichi Yokoyama, "Complete factorization in minimal $\mathcal{N} = 4$ Chern-Simons-matter theory", JHEP **1801** (2018) 001 [arXiv:1706.07234 [hep-th]]. (27 citations)
https://link.springer.com/article/10.1007%2FJHEP01%282018%29001
https://arxiv.org/abs/1706.07234

[G19] Sanefumi Moriyama, Shota Nakayama and Tomoki Nosaka, "Instanton Effects in Rank Deformed Superconformal Chern-Simons Theories from Topological Strings", JHEP **1708** (2017) 003 [arXiv:1704.04358[hep-th]]. (26 citations)
https://link.springer.com/article/10.1007%2FJHEP08%282017%29003
https://arxiv.org/abs/1704.04358

[G20] Tomoki Nosaka, Kazuma Shimizu and Seiji Terashima, "Mass Deformed ABJM Theory on Three Sphere in Large limit", JHEP **1703** (2017) 121 [arXiv:1608.02654[hep-th]]. (21 citations)
https://link.springer.com/article/10.1007%2FJHEP03%282017%29121
https://arxiv.org/abs/1608.02654

[G21] Sanefumi Moriyama and Tomoki Nosaka, "Orientifold ABJM Matrix Model: Chiral Projections and Worldsheet Instantons", JHEP **1606** (2016) 068 [arXiv:1603.00615[hep-th]]. (29 citations)
https://dx.doi.org/10.1007/JHEP06%282016%29068
https://arxiv.org/abs/1603.00615

[G22] Tomoki Nosaka, Kazuma Shimizu and Seiji Terashima, "Large N behavior of mass deformed ABJM theory", JHEP **1603** (2016) 063 [arXiv:1512.00249[hep-th]]. (27 citations)
https://dx.doi.org/10.1007/JHEP03%282016%29063
https://arxiv.org/abs/1512.00249

*[G23] Tomoki Nosaka, "Instanton effects in ABJM theory with general R-charge assignments", JHEP **1603** (2016) 059 [arXiv:1512.02862[hep-th]]. (48 citations)
https://dx.doi.org/10.1007/JHEP03%282016%29059
https://arxiv.org/abs/1512.02862

[G24] Sanefumi Moriyama and Tomoki Nosaka, "Superconformal Chern-Simons Partition Functions of Affine D-type Quiver from Fermi Gas," JHEP **1509** (2015) 054 [arXiv:1504.07710[hep-th]]. (35 citations)
https://link.springer.com/article/10.1007%2FJHEP09%282015%29054
https://arxiv.org/abs/1504.07710

[G25] Sanefumi Moriyama and Tomoki Nosaka, "Exact Instanton Expansion of Superconformal Chern-Simons Theories from Topological Strings," JHEP **1505** (2015) 022 [arXiv:1412.6243[hep-th]]. (45 citations)
https://link.springer.com/article/10.1007%2FJHEP05%282015%29022
https://arxiv.org/abs/1412.6243

[G26] Sanefumi Moriyama and Tomoki Nosaka, "ABJM membrane instanton from a pole cancellation mechanism," Phys. Rev. D **92** (2015) 2, 026003 [arXiv:1410.4918[hep-th]]. (26 citations)
https://dx.doi.org/10.1103/PhysRevD.92.026003
https://arxiv.org/abs/1410.4918

[G27] Sanefumi Moriyama and Tomoki Nosaka, "Partition Functions of Superconformal Chern-Simons Theories from Fermi Gas Approach," JHEP **1411** (2014) 164 [arXiv:1407.4268[hep-th]]. (50 citations)
https://link.springer.com/article/10.1007%2FJHEP11%282014%29164
https://arxiv.org/abs/1407.4268

[G28] Tomoki Nosaka and Seiji Terashima, "Supersymmetric Gauge Theories on a Squashed Four-Sphere," JHEP **1312** (2013) 001 [arXiv:1310.5939[hep-th]]. (26 citations)
https://link.springer.com/article/10.1007%2FJHEP12%282013%29001
https://arxiv.org/abs/1310.5939

[G29] Tomoki Nosaka and Seiji Terashima, "M5-branes in ABJM theory and Nahm equation," Phys. Rev. D **86** (2012) 125027 [arXiv:1208.1108[hep-th]]. (6 citations)
https://dx.doi.org/10.1103/PhysRevD.86.125027
https://arxiv.org/abs/1208.1108

(Preprints)

[G30] Hirotaka Hayashi, Tomoki Nosaka and Tadashi Okazaki, "ADHM Wilson line defect indices", [arXiv:2406.00413 [hep-th]]. (2 citations)
https://arxiv.org/abs/2312.04206

[G31] Naotaka Kubo and Tomoki Nosaka, "Fermi gas formalism for D-type quiver Chern-Simons theory with non-uniform ranks", [arXiv:2403.12808 [hep-th]]. (1 citations)
https://arxiv.org/abs/2403.12808

[G32] Hirotaka Hayashi, Tomoki Nosaka and Tadashi Okazaki, "Asymptotic degeneracies of M2-brane SCFTs", [arXiv:2307.02901 [hep-th]]. (1 citations)
https://arxiv.org/abs/2307.02901

(Proceedings)

[G33] Tomoki Nosaka, "q-discrete Painleve VI equations from M2-branes," J. of Hol. App. Volume 3, Issue 4 (2023) 57-80. (0 citations)
https://jhap.du.ac.ir/article_369.html

[G34] Tomoki Nosaka, "A sharp transition in quantum chaos and thermodynamics of mass deformed SYK model," SciPost Phys. Proc. 4, 006 (2021) [arXiv:2012.10628 [hep-th]]. (0 citations)
https://scipost.org/SciPostPhysProc.4.006
https://arxiv.org/abs/2012.10628