

CURRICULUM VITAE

Date: February 5, 2020

HIROSHI KORI

1 PERSONAL INFORMATION

Sex: Male
Date of Birth: March 20th, 1976
Nationality: Japan
E-mail: kori@k.u-tokyo.ac.jp

2 CURRENT JOB

Professor,
Department of Complexity Science and Engineering,
Graduate School of Frontier Sciences,
The University of Tokyo

Address: 5-1-5 Kashiwanoha, Kashiwa-shi, Chiba-ken 277-8561, Japan
Phone number : +81-4-7136-3936

3 EDUCATION

March 1998 Bachelor, Department of Physics, Tohoku University
March 2000 Master, Department of Physics, Kyoto University
March 2003 Doctor of Science, Department of Physics, Kyoto University

4 DOCTORAL THESIS

Doctor of Science, Kyoto University (March 24, 2003)
Title “Slow Switching in Globally Coupled Oscillators”

5 AWARD

Young Scientist Award of the Physical Society of Japan (2009)

6 WORK EXPERIENCE

Apr '02–Mar '03 JSPS Fellow

Apr '03–Mar '04 JSPS Postdoctoral Fellow

Apr '04–Feb '05 Research Fellow of Max-Planck Society (Fritz-Haber Institute)

Mar '05–Mar '06 Alexander von Humboldt Research Fellow (Fritz Haber Institute)

Apr '06–Feb '08 Research Fellow, Department of Mathematics, Hokkaido University

Mar '08–Mar '12 Assistant Professor, Ochanomizu Academic Production, Ochanomizu University

Apr '12–Aug '18 Associate Professor, Department of Computer Sciences, Ochanomizu University

Sep '18– Professor, Graduate School of Frontier Sciences, The University of Tokyo

7 MEMBERSHIP OF ACADEMIC SOCIETY

Physical Society of Japan (JPS), Japanese Society for Mathematical Biology (JSMB)

8 ACTIVITIES IN ACADEMIC SOCIETY

Apr '12–Mar '13 Organizing Committee of JPS, Field #11

Apr '14–Mar '16 Committee of New Book Introduction of JPS

9 EDITOR IN ACADEMIC JOURNALS

Sep '17–Apr '18 Chaos, Guest Editor

10 RESEARCH INTERESTS

- Synchronization
- Complex networks
- Biological rhythms, circadian rhythms, jet lag
- Pattern formation
- Non-linear, non-equilibrium systems

11 PUBLICATIONS IN PEER-REVIEWED JOURNALS

*: corresponding author(s)

1. Y. Katoh, *H. Kori: “Noise stability of synchronization and optimal network structures”, **Chaos** **30**, 013148 (2020) [10 pages]
2. K. Yoshioka-Kobayashi, M. Matsumiya, Y. Niino, A. Isomura, H. Kori, A. Miyawaki, *R. Kageyama, “Coupling delay controls synchronized oscillation in the segmentation clock”, **Nature** (2020) [5 pages] <https://doi.org/10.1038/s41586-019-1882-z>
3. T. Kobayashi, W. Piao, T. Takamura, H. Kori, H. Miyachi, S. Kitano, Y. Iwamoto, M. Yamada, I. Imayoshi, S. Shioda, A. Ballabio, *R. Kageyama, “Enhanced lysosomal degradation maintains the quiescent state of neural stem cells”, **Nature Communications** **10**, 5446 (2019) [14 pages]
4. *H. Kori, I.Z. Kiss, S. Jain, J.L. Hudson, “Partial synchronization of relaxation oscillators with repulsive coupling in autocatalytic integrate-and-fire model and electrochemical experiments”, **Chaos** **28**, 045111 (2018) [7 pages]
5. K. Sugimura, *H. Kori, “A reduced cell-based phase model for tissue polarity alignment through global anisotropic cues”, **Scientific Reports** **7**, 17466 (2017) [13 pages]
6. A. Isomura, H. Kori, *R. Kageyama, “Segmentation Genes Enter an Excited State”, **Developmental Cell** **43**, pp. 121–123, (2017)
7. *S. Koinuma, H. Kori, I.T. Tokuda, K. Yagita, *Y. Shigeyoshi, “Transition of phase response properties and singularity in the circadian limit cycle of cultured cells”, **PLoS ONE** **12**(7), e0181223 (2017) [16 pages]
8. Y. Murayama, *H. Kori, C. Oshima, T. Kondo, H. Iwasaki, *H. Ito, “Low temperature nullifies the circadian clock in cyanobacteria through Hopf bifurcation”, **PNAS** **114**, pp. 5641–5646 (2017)
9. *H. Kori, Y. Yamaguchi, H. Okamura, “Accelerating recovery from jet lag: prediction from a multi-oscillator model and its experimental confirmation in model animals”, **Scientific Reports** **7**, 46702 (2017) [10 pages]
10. *A. Isomura, F. Ogushi, H. Kori, *R. Kageyama, “Optogenetic perturbation and bioluminescence imaging to analyze cell-to-cell transfer of oscillatory information”, **Genes & Development** **31**, pp. 524–535 (2017)
11. *M. Iima, H. Kori, T. Nakagaki, “Studies of the phase gradient at the boundary of the phase diffusion equation, motivated by peculiar wave patterns of rhythmic contraction in the amoeboid movement of *Physarum polycephalum*”, **Physica D** **50**, 154004 (2017) [10 pages]
12. *Y. Izumida, H. Kori, U. Seifert, “Energetics of synchronization in coupled oscillators rotating on circular trajectories”, **Physical Review E** **94**, 052221 (2016)

13. *Y. Kobayashi, H. Kori, “Synchronization failure caused by interplay between noise and network heterogeneity”,
Chaos **26**, 094805 (2016) [8 pages]
14. H. Shimojo, A. Isomura, Toshiyuki Ohtsuka, H. Kori, Hitoshi Miyachi, Ryoichiro Kageyama, “Oscillatory control of Delta-like1 in cell interactions regulates dynamic gene expression and tissue morphogenesis”,
Genes & Development **30**, pp. 102–116 (2016)
15. K. Sugimura, H. Kori, “Exponential system-size dependence of the lifetime of transient spiral chaos in excitable and oscillatory media”,
Physical Review E **92**, 062915 (2015) [6 pages]
16. T. Nagy, E. Verner, V. Gáspár, H. Kori, I. Z. Kiss, “Delayed feedback induced multirhythmicity in the oscillatory electrodisolution of copper”,
Chaos **25**, 064608 (2015) [8 pages]
17. *Y. Kobayashi, H. Kori, “Reentrant transition in coupled noisy oscillators”,
Physical Review E **91**, 012901 (2015) [6 pages]
18. *H. Kori, Y. Kuramoto, S. Jain, I.Z. Kiss, J.L. Hudson, “Clustering in Globally Coupled Oscillators Near a Hopf Bifurcation: Theory and Experiments”,
Physical Review E **89**, 062906 (2014, June) [11 pages]
19. *I. Imayoshi, A. Isomura, Y. Harima, K. Kawaguchi, H. Kori, H. Miyachi, T. Fujiwara, F. Ishidate, *R. Kageyama, “Oscillatory Control of Factors Determining Multipotency and Fate in Mouse Neural Progenitors”,
Science **342**, pp. 1203–1208 (2013)
20. Y. Yamaguchi, T. Suzuki, Y. Mizoro, H. Kori, K. Okada, Y. Chen, J.M. Fustin, F. Yamazaki, N. Mizuguchi, J. Zhang, X. Dong, G. Tsujimoto, Y. Okuno, M. Doi, *H. Okamura, “Mice Genetically Deficient in Vasopressin V1a and V1b Receptors Are Resistant to Jet Lag”,
Science **342**, pp. 85–90 (2013)
21. *F. Mori, H. Kori, “Period variability of coupled noisy oscillators”,
Physical Review E **87**, 030901 (2012) [5 pages]
22. *N.E. Kouvaris, H. Kori, A.S. Mikhailov, “Traveling and Pinned Fronts in Bistable Reaction-Diffusion Systems on Networks”,
PloS ONE **7(9)**, e45029 (2012) [12 pages]
23. *H. Kori, Y. Kawamura, *N. Masuda, “Structure of Cell Networks Critically Determines Oscillation Regularity”,
J. Theoretical Biology **297**, pp. 61–72, (2012)
24. *R. Tönjes, H. Kori, “Synchronization of weakly perturbed Markov chain oscillators”,
Physical Review E **84**, 056206 (2011) [14 pages]
25. Doi, A. Ishida, A. Miyake, M. Sato, R. Komatsu, F. Yamazaki, I. Kimura, S. Tsuchiya, H. Kori, K. Seo, Y. Yamaguchi, M. Matsuo, J.M. Fustin, R. Tanaka, Y. Santo, H. Yamada, Y. Takahashi, M. Araki, K. Nakao, S. Aizawa, M. Kobayashi, K. Obrietan, G. Tsujimoto, *H. Okamura, “Circadian regulation of intracellular G-protein signalling mediates intercellular synchrony and rhythmicity in the suprachiasmatic nucleus”,
Nature Communications **2**, 327 (2011) [9 pages]

26. *Y. Kawamura, H. Nakao, K. Arai, H. Kori, Y. Kuramoto, "Phase synchronization between collective rhythms of globally coupled oscillator groups: Noisy identical case", **Chaos** **20**, 043109 (2010) [10 pages]
27. *Y. Kawamura, H. Nakao, K. Arai, H. Kori, Y. Kuramoto, "Phase synchronization between collective rhythms of globally coupled oscillator groups: Noiseless nonidentical case", **Chaos** **20**, 043110 (2010) [8 pages]
28. *N. Masuda, H. Kori, "Dynamics-based centrality for directed networks", **Physical Review E** **82**, 056107 (2010) [11 pages]
29. N. Masuda, Y. Kawamura, *H. Kori, "Collective fluctuations in networks of noisy components", **New Journal of Physics** **12**, (2010) [15 pages]
30. *R. Tönjes, N. Masuda, H. Kori, "Synchronization transition of identical phase oscillators in a directed small-world network", **Chaos** **20**, 033108 (2010) [12 pages]
31. *K.H. Nagai, H. Kori, "Noise-induced synchronization of a large population of globally coupled nonidentical oscillators", **Physical Review E** **81**, 065202(R) (2010) [4 pages]
32. Y. Zhai, I.Z. Kiss, H. Kori, *J.L. Hudson, "Desynchronization and clustering with pulse stimulations of coupled electrochemical relaxation oscillators", **Physica D** **239**, pp. 848–856 (2010)
33. *N. Masuda, Y. Kawamura, H. Kori, "Impact of hierarchical modular structure on ranking of individual nodes in directed networks", **New Journal of Physics** **11**, 113002 (2009) [21 pages]
34. *N. Masuda, Y. Kawamura, H. Kori, "Analysis of relative influence of nodes in directed networks", **Physical Review E** **80**, 046114 (2009) [10 pages]
35. *H. Kori, Y. Kawamura, H. Nakao, K. Arai, Y. Kuramoto, "Collective-phase description of coupled oscillators with general network structure", **Physical Review E** **80**, 036207 (2009) [9 pages]
36. Y.K. Takahashi, H. Kori, *N. Masuda, "Self-organization of feed-forward structure and entrainment in excitatory neural networks with spike-timing-dependent plasticity", **Physical Review E** **79**, 051904 (2009)
37. C.G. Rusin, I.Z. Kiss, H. Kori, J.L. Hudson, "A framework for engineering the collective behavior of complex rhythmic systems", **Industrial & Engineering Chemistry Research** **48**, 9416 (2009) [16 pages]
38. *Y. Kobayashi, H. Kori, "Design principle of multi-cluster and desynchronized states in oscillatory media via nonlinear global feedback", **New Journal of Physics** **11**, 033018 (2009) [17 pages]
39. Y. Kawamura, *H. Nakao, K. Arai, H. Kori, Y. Kuramoto, "Collective phase sensitivity", **Physical Review Letters** **101**, 024101 (2008) [4 pages]
40. *H. Kori, C.G. Rusin, I.Z. Kiss, J.L. Hudson, "Synchronization Engineering: Theoretical Framework and Application to Dynamical Clustering", **Chaos** **18**, 026111 (2008) [13 pages]

41. *I.Z. Kiss, M. Quigg, S.C. Chun, H. Kori, J.L. Hudson, “Characterization of Synchronization in Interacting Groups of Oscillators: Application to Seizures”, **Biophysical Journal** **94**, pp. 1121–1130 (2008)
42. I.Z. Kiss, C.G. Rusin, H. Kori, *J.L. Hudson, “Engineering Complex Dynamical Structures: Sequential Patterns and Desynchronization”, **Science** **316**, pp. 1886–1889 (2007)
43. *N. Masuda, H. Kori, “Formation of feedforward networks and frequency synchrony by spike-timing-dependent plasticity”, **J. Computational Neuroscience** **22**, 327–345 (2007)
44. *H. Kori, A.S. Mikhailov, “Strong effects of network architecture in the entrainment of coupled oscillator systems”, **Physical Review E** **74**, 066115 (2006) [14 pages]
45. S. Lämmer, H. Kori, K. Peters, D. Helbing, “Decentralised control of material or traffic flows in networks using phase-synchronisation”, **Physica A** **363**, pp. 39–47 (2006)
46. *H. Kori, A.S. Mikhailov, “Entainment of randomly coupled oscillator networks by a pacemaker”, **Physical Review Letters** **93**, 254101 (2004) [4 pages]
47. *H. Kori, “Slow switching in a population of delayed pulse-coupled oscillators”, **Physical Review E** **68**, 021919 (2003) [8 pages]
48. *H. Kori, “Slow switching in globally coupled oscillators: robustness and occurrence through delayed coupling”, **Physical Review E** **63**, 046214 (2001) [10 pages]

12 BOOK

1. “Biological rhythm and dynamical systems”, H. Kori, Y. Morita, Kyoritsu Publishing (2011) [171 pages] (in Japanese)

13 ORAL PRESENTATIONS IN INTERNATIONAL CONFERENCES

○: invited talk

1. ○“Circadian Rhythm Stops via Hopf Bifurcation: In Vitro Experiments and Molecular-Level Theoretical Interpretation”, **Gordon Research Conference: Oscillations and Dynamic Instabilities in Chemical Systems**, Les Diablerets Conference Center Les Diablerets, Switzerland, July 8-13 (2018)
2. ○“Collective Dynamics of Oscillator Networks”, **APS March Meeting 2016**, Baltimore Convention Center, Baltimore, USA, Mar. 14-18 (2016)
3. ○“Multi-oscillator model of the circadian clock system and experiments: Why is eastbound long-distance trip so heavy?”, **Pacificchem 2015**, Sheraton Waikiki Hotel, Honolulu, Hawaii, Dec. 15-20 (2015)

4. ○“Mathematical approach to jet lag”, **The 3rd East Asia Joint Seminar on Statistical Physics**, KIAS, Seoul, Korea, Oct. 14-17 (2015)
5. ○“A mathematical and experimental study on jet lag: why is eastbound trip so hard?”, **ICIAM 2015**, China National Convention Center, Beijing, China, Aug. 10-14 (2015)
6. ○“Clustering near hopf bifurcation and reentrant transition with strong coupling”, **Dynamics of Coupled Oscillators: 40 years of the Kuramoto Model International workshop**, Max Planck Institute, Dresden, Germany, Jul. 27-31 (2015)
7. ○“Theoretical Study on Clustering near Hopf Bifurcation, Reentrant Transition with Strong Coupling, and Jet lag”, **8th International Conference Engineering of Chemical Complexity**, Technische Universität München, Munich, Germany, Jun. 22-26 (2015)
8. “A mathematical study on jet lag: Why is traveling east so heavy?”, **Winter Q-Bio Meeting**, Oahu-Sheraton Waikiki, Maui, Hawaii, Feb. 17-20 (2015)
9. ○“Mathematical Model of Suprachiasmatic Nucleus: Mechanism of Jet Lag”, **Neuroscience 2014**, Pacifico Yokohama, Yokohama, Japan, Sep. 11-13 (2014)
10. ○“Jet lag can be avoided? : an oscillator network model for the circadian clock”, **AIMS 2014**, Instituto de Ciencias Matemáticas, Madrid, Spain, July. 7-11 (2014)
11. ○“Novel synchronization phenomena in coupled noisy oscillators: Common- noise-induced synchronization and reentrant transition”, **Engineering of Chemical Complexity 2013**, Rostock-Warnemuende, Germany, June 10-13 (2013)
12. “Network structure dependence of oscillation regularity in coupled noisy oscillators” **Engineering of Chemical Complexity**, Berlin, Germany, July 4-8 (2011)
13. ○“Collective Enhancement of Temporal Precision in Networks of Noisy Oscillators”, **2011 SIAM Conference on Dynamical Systems**, Snowbird, USA, May 21-26 (2011)
14. “Collective phase diffusion and temporal precision in networks of noisy oscillators”, **XXX Dynamics Days Europe 2010**, Bristol, United of Kingdom, September 6-10 (2010)
15. ○“Collective phase diffusion and temporal precision in networks of noisy oscillators”, **International Workshop: Nonlinear Dynamics on Networks**, Kiev, Ukraine, July 5-9 (2010)
16. “Response of Oscillator Networks: A Centrality Measure Quantifying the Relative Importance of a Node”, **Dynamics Days 2010: International Conference on Chaos and Nonlinear Dynamics**, Evanston, USA, January 4-7 (2010),
17. ○“Effects of intercellular communication on the entrainment to time cues”, XI. Congress of the European Biological Rhythms Society, Strasbourg, France, August 22-28 (2009)
18. ○“Linking cell-level and system-level responses in oscillator networks with any network structure”, **International Conference on Nonlinear Sciences**, Hokkaido university, Sapporo, Japan, February 10-14 (2009)
19. ○“Collective Response of Coupled Dynamical Units with Arbitrary Network Structure: Micro-macro Linking”, **International Conference on Complex Networks: The Past 10 Years and Future**, Seoul National University, Seoul, Korea, December 19-22 (2008)
20. “Synchronization Engineering”, **Dynamics Days Asia Pacific 5 (DDAP5)**, Nara Prefectural New Public Hall, Nara, Japan, September 9-12 (2008)

21. ○“Synchronization Engineering via Global Delayed Nonlinear Feedback”, **The 5th European Congress of Mathematics**, Amsterdam RAI Center, Amsterdam, Holland, July 14-18 (2008)
22. “Collective dynamical response to external forcing in complex oscillator networks”, **The 3rd International IEEE Scientific Conference on Physics and Control**, University of Potsdam, Potsdam, Germany, September 3-7 (2007)
23. ○“Entrainment of Complex Oscillator Networks and Implications for Biological Clocks”, **International Workshop on Synchronization: Phenomena and Analyses 2006**, University of Tokyo, Tokyo, Japan, October 3 - 6 (2006)
24. “Entrainment of random oscillator networks and design of biological clocks”, **Dynamics on Complex Networks and Applications**, Max Planck Institute for the Physics of Complex Systems, Dresden, Germany, February 06-March 3 (2006)
25. “Entrainment of randomly coupled oscillator networks”, **An Isaac Newton Institute Workshop: Theory and Applications of Coupled Cell Networks**, Cambridge University, Cambridge, England, September 26-30 (2005)
26. “Entrainment of Complex Oscillator Networks and Design of Biological Clocks”, **Dynamics Days 2005**, Technical University, Berlin, Germany, July 25-28, 2005
27. ○“Entrainment of complex oscillator networks and design of biological clocks”, **Complex Dynamics of Networks of Oscillators: From Basic Research to Novel Therapy**, Hokkaido University, Sapporo, Japan, November 4-6 (2005)
28. “Slow switching and broken one-cluster state in a population of neuronal oscillators”, **Dynamics Days Asia-Pacific 2002**, Zhejiang University, Hangzhou, China, August 8-12 (2002)

14 PATENT

1. J.L. Hudson, I.Z. Kiss, C.G. Rusin, H. Kori, “Method, system and computer program product for controlling complex rhythmic systems”, U.S. Patent No. 8463374. Washington, DC: U.S. Patent and Trademark Office (2013).

15 GRANTS

1. Grant-in-Aid for Scientific Research on Innovative Areas, MEXT (2015–2020)
 Subject: Modeling of dynamical hierarchical networks
 JPY 17,200,000 (to my group)
 Role: CoI (PI: Kenji Morita, University of Tokyo)
2. Grant-in-Aid for Young Scientists (B), JPSP (2015–2018)
 Subject: Oscillator networks: modeling and theory construction to understand and predict biological phenomena
 JPY 4,590,000 (to my group)
 Role: PI

3. CREST, Japan Science and Technology Agency (2012–2018)
Subject: Elucidation and control of dynamics of oscillatory gene expression in cell proliferation and differentiation
JPY 43,000,000 (to my group)
Role: CoI (PI: Ryoichiro Kageyama, Kyoto University)
 4. Grant-in-Aid for Scientific Research on Innovative Areas, MEXT (2012–2014)
Subject: Construction of a fundamental theory describing the hierarchy and instability of decision-making dynamics
JPY 10,000,000 (to my group)
Role: PI
 5. Grant-in-Aid for Young Scientists (B), JPSP (2012–2015)
Subject: Network structure and dynamics: theory to clarify optimal network structures JPY 3,200,000 (to my group)
Role: PI
 6. Basic Research Programs PRESTO, Japan Science and Technology Agency (2008–2011)
Subject: Application of oscillator theories to the fields of biology, chemistry, engineering, and medicine.
JPY 44,000,000 (to my group)
Role: PI
 7. Grant for Basic Science Research Projects, The Sumitomo Foundation (2007-2008)
Subject: Theoretical study on bio-feedback control for biological oscillators
JPY 1,200,000 (to my group)
Role: PI
 8. Grant-in-Aid for Research Activity start-up, JSPS (2007-2009)
Subject: Response and control of oscillator networks: Basic theory and application to biological systems
JPY 2,710,000 (to my group)
Role: PI
 9. Grant-in-Aid for JSPS Fellows, JSPS (2002-2004)
Subject: Phase dynamics of a population of limit-cycle oscillators
JPY 1,800,000 (to my group)
Role: PI
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16 TEACHING

The University of Tokyo (undergraduate course)

1. Bio Information Processing (2 credit, in Japanese)
Summer 2019
Role: sole unit organizer

Ochanomizu University (undergraduate course)

2. Calculus III (2 credit, in Japanese)
Spring 2012, Spring 2013, Spring 2014, Spring 2015, Spring 2016
Role: sole unit organizer
3. Calculus 5,6 (2 credit, in Japanese)
Spring 2017, Spring 2018
Role: sole unit organizer
4. Exercises in Calculus III (2 credit, in Japanese)
Spring 2012, Spring 2013
Role: sole unit organizer
5. Computer Science for Environmental Science (2 credit, in Japanese)
Fall 2012, Fall 2013, Fall 2014, Fall 2015, Fall 2016, Fall 2017, Spring 2018
Role: sole unit organizer
6. Fourier Analysis and Laplace Transformation (2 credit, in Japanese)
Spring 2013, Spring 2014, Spring 2015, Spring 2016, Spring 2017, Role: sole unit organizer

Ochanomizu University (graduate course)

7. Seminar on Functional Analysis (2 credit, master course, in Japanese)
Fall 2012, Fall 2014, Fall 2016
Role: sole unit organizer
8. Advanced Topics in Applied Functional Analysis (2 credit, master course, in Japanese) Fall
2012, Fall 2014, Fall 2016
Role: sole unit organizer
9. Seminar on Information Analysis (2 credit, master course, in Japanese)
Fall 2013, Fall 2015, Fall 2017
Role: sole unit organizer
10. Advanced Information Analysis (2 credit, master course, in Japanese)
Fall 2013, Fall 2015, Fall 2017
Role: sole unit organizer
11. Mathematical Biology (2 credit, doctoral course, in Japanese)
Spring and Fall 2015
Role: sole unit organizer
12. Practice on Mathematical Biology (2 credit, doctoral course, in Japanese)
Spring and Fall 2015
Role: sole unit organizer
13. Complex Systems (2 credit, doctoral course, in Japanese)
Spring and Fall 2017
Role: sole unit organizer

Part-time lecturer (intensive courses in graduate or undergraduate courses)

14. Advanced Topics in Nonequilibrium Dynamics (2 credit, master course, in Japanese)
2015 Fall, Department of Physics, Nara Women University
Role: sole unit organizer

15. Nonequilibrium Statistical Physics (2 credit, undergraduate course, in Japanese)
2010 Fall, Department of Physics, Chiba University
Role: sole unit organizer
16. Science of Rhythmic Phenomena (1 credit, master course, in Japanese)
2009 Spring, Department of Mathematical and Biological Sciences, Hiroshi University
Role: sole unit organizer