

Proceedings of
the 2016 International Symposium on
Nonlinear Theory and its Applications (NOLTA2016)

November 27–30, 2016.

New Welcity Yugawara,
Yugawara, Japan

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**2016 International Symposium on
Nonlinear Theory and its Applications**

New Welcity Yugawara,
Yugawara, Japan
November 27–30, 2016

Organizer:

NOLTA Society, IEICE

In Cooperation with:

Technical Group on Nonlinear Problems, IEICE
Technical Group on Complex Communication Sciences, IEICE

Welcome Message from the General Chair

Welcome to Yugawara, Japan!!

On behalf of the organizing committee, we sincerely welcome all of you to Yugawara, Japan and to the 2016 International Symposium on Nonlinear Theory and Its Applications (NOLTA2016). This is the 26th NOLTA Symposium organized by the NOLTA Society, IEICE. Since the 1st NOLTA in 1991, NOLTA has been held not only in Japan, but also in various places: Canada, China, Germany, Hungary, Italy, Poland, Spain, Switzerland, and USA. Then, it is our great honor to organize the NOLTA2016 in Yugawara, Japan.

A long long time ago, a badly injured mountain animal was walking along the riverside, and by chance discovered a hot spring near the cold mountain stream. The serious injury of the animal healed rapidly by the hot spring. The riverside (“kawara” in Japanese) which flows from that magical hot spring (“yu” in Japanese) came to be called Yugawara. Today, Yugawara is one of the oldest hot spring villages in Japan, the place where the mountain animals told us of the secret power of the hot spring.

Please have fun while in Yugawara, nestled by the mountains and the sea, and enjoy the brilliant blue sea and the green mountains. You can enjoy an open-air bath, a quiet room for relaxation, and other services.

The word Yugawara can also be found in the oldest Japanese anthology of poems, “Manyoshu,” published about 1,200 years ago. Many famous Japanese poets and writers love Yugawara and have created wonderful stories there throughout the hot spring’s very long history. We support your creative activities by providing the hot spring and various types of conference rooms. Yugawara also benefits from both the mountains and sea, which enable us to provide fresh seasonal food.

The most essential aspect of NOLTA2016 is its technical program. In particular, we have a large number of special session papers at NOLTA2016. We also have a large number of regular session papers, and we are also proud to present the best student paper awards at NOLTA2016.

I would like to thank the Technical Program Chairs, Prof. Hiroo Sekiya (Chiba University) and the Technical Program Secretary, Prof. Shintaro Arai (Okayama University of Science), who have organized a high-quality technical program spanning three days of lecture sessions that cover all subjects of interest in the field of nonlinear science and engineering. We also would like to thank to the efforts of our Special Session Chair, Prof. Mikio Hasegawa (Tokyo University of Science), and the Special Session Secretary, Dr. Kaori Kuroda (Tokyo University of Science), for organizing such a huge number of special sessions.

Special thanks also go to the Technical Program Committee Members and reviewers for their dedicated service. We would also like to thank the keynote speakers and session co-chairs for their great contributions to the technical program.

Finally, we would like to express our sincere thanks to General Co-Secretaries, Prof. Takayuki Kimura (Nippon Institute of Technology) and Dr. Yutaka Shimada (Tokyo University of Science) and all the symposium committee members of NOLTA 2016.

We hope you will enjoy NOLTA2016 and Yugawara!



Tohru Ikeguchi
Tokyo University of Science
General Chair, NOLTA2016

池口 徹

Technical Program Chair's Message

On behalf of the Technical Program Committee (TPC), welcome to 2016 International Symposium on Nonlinear Theory and Its Applications (NOLTA2016) at Yugawara, where is one of the most famous hot-spring resort in Japan!

A total of 212 papers have been received from 15 countries and 208 papers are included for presentations in the technical program. We have 38 oral sessions including 30 special sessions. Additionally, it is my pleasure to have two exciting Plenary Talks: "Math Spectacle Show" by Prof. Jin Akiyama, Tokyo University of Science on Monday, and "Almighty Google knows everything! – Big-data and Network Science" by Prof. Hawoong Jeong, Korea Advanced Institute of Science and Technology (KAIST) on Tuesday.

Our program can cover hot topics in variety of research areas, which gather under the term of 'Nonlinear'. I would like to express my appreciation for all authors who submitted papers to NOLTA 2016. It is one of the traditional features of the technical programs in NOLTA that many special sessions are organized by leading researchers. The special sessions from wide research areas may raise new collaborations among symposium participants, which is quite important for succeeding NOLTA2016. I would like to express my thanks to the special session organizers and presenters. In addition, organizing and coordinating of NOLTA2016 are impossible without contributions and services of review committee members, reviewers, and session co-chairs. I am also equally thankful for Tom Wehner's support of web-based services.

The poster area appears for finding NOLTA2016 student paper award winners, which is the first trial in NOLTA history. All the participants including students have a right to recommend the award-winner candidates. Please visit the poster area, discuss with students, and vote the award-winner candidates.

Finally, I would like to announce the Special Section related with NOLTA2016, which will be published in NOLTA. IEICE at January 2018. The paper submission dead line is April 10, 2017. I hope that all authors, especially students, consider to submit the extended version of papers in this program to the Special Section.

I really hope participants to attend as many activities as possible, exchange and discuss ideas, enjoy the technical program and NOLTA2016!



Hiroo Sekiya
Chiba University
Technical Program Chair, NOLTA2016

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Special Session Organizers

A2L-C Time series and complex networks (1)

A3L-C Time series and complex networks (2)

Organizers Michael Small (University of Western Australia) and Yoshito Hirata (University of Tokyo)

A2L-E Electromechanical systems

Organizers Hiroyuki Asahara (Okayama University of Science)

A2L-F Power packet: Energy-and-Information integrated technology (1)

A3L-F Power packet: Energy-and-Information integrated technology (2)

Organizers Hiroyasu Ando (University of Tsukuba) and Ryo Takahashi (Kyoto University)

A2L-G Radio Frequency Technology

Organizers Takeshi Kamio (Hiroshima City University) and Hisato Fujisaka (Hiroshima City University)

A3L-B Nonlinear Methods with Interaction

Organizers Tomoya Suzuki (Ibaraki University)

A3L-D Hybrid dynamical systems: Modeling, Analysis, and Applications

Organizers Daisuke Ito (University of Shiga Prefecture)

A3L-G Implementation technology and theory for neuronal and neuronal network models

Organizers Takashi Kohno (University of Tokyo)

A4L-C Random Number Generation and Chaos

Organizers Hiroshi Fujisaki (Kanazawa University)

A4L-D Collective behaviors of chemically/electrically coupled neurons

Organizers Ryosuke Hosaka (Fukuoka University) Kantaro Fujiwara (Tokyo University of Science) and Hideyuki Kato (Tokyo University of Technology)

A4L-E Complex Communication Sciences

Organizers Mikio Hasegawa (Tokyo University of Science)

A4L-F Simulations in Cardiovascular Systems

Organizers Hiroyuki Kitajima (Kagawa University) and Kunichika Tsumoto (Osaka University)

B2L-B Koopman operator techniques in nonlinear dynamical systems

Organizers Yoshihiko Susuki (Kyoto University) and Igor Mezic (University of California)

B2L-C Coupled Nonlinear Circuits and Networks (1)

B3L-C Coupled Nonlinear Circuits and Networks (2)

C1L-C Coupled Nonlinear Circuits and Networks (3)

Organizers Yoko Uwate (Tokushima University) and Yoshifumi Nishio (Tokushima University)

B2L-D Noise-Driven and Stochastic Information Processing Systems

Organizers Tetsuya Asai (Hokkaido University) and Shintaro Arai (Okayama University of Science)

B2L-F Recent Progress in Nonlinear Optimization Algorithms and its Applications (1)

B3L-F Recent Progress in Nonlinear Optimization Algorithms and its Applications (2)

Organizers Hidehiro Nakano (Tokyo City University) and Takuya Shindo (Nippon Institute of Technology)

B3L-B Complex Photonics and Applications (1)

C1L-B Complex Photonics and Applications (2)

C2L-B Complex Photonics and Applications (3)

Organizers Kazutaka Kanno (Fukuoka University) and Atsushi Uchida (Saitama University)

B3L-D Synchronization in real worlds and its mathematical modeling

Organizers Tohru Ikeguchi (Tokyo University of Science) and Yutaka Shimada (Tokyo University of Science)

B3L-E AD Converters and Dynamical Systems

Organizers Yutaka Jitsumatsu (Kyushu University) and Katsutoshi Shinohara (Hitotsubashi University)

C1L-D Localization phenomena in nonlinear lattices (1)

C2L-D Localization phenomena in nonlinear lattices (2)

Organizers Masayuki Sato (Kanazawa University) and Masayuki Kimura (Kyoto University)

C1L-F Cellular Dynamical Systems

Organizers Hiroyuki Torikai (Kyoto Sangyo University)

C2L-E Applications to Temporal Nonlinear Systems

Organizers Tomoya Suzuki (Ibaraki University)

C2L-F Information Networks as Collective Statistical Systems

Organizers Hiroyoshi Miwa (Kwansei Gakuin University)

Symposium Information

Symposium Venue

New Welcity Yugawara
107 Izumi, Atami-city, Shizuoka, Japan

[Opening Ceremony & Plenary Talks]
Hall TAIKAN on Floor 2

[Parallel Sessions]
Six rooms on Floors 1, 2 & 3

[Poster Session, presented by Award candidates]
Lobby on Floor 2

Symposium Registration

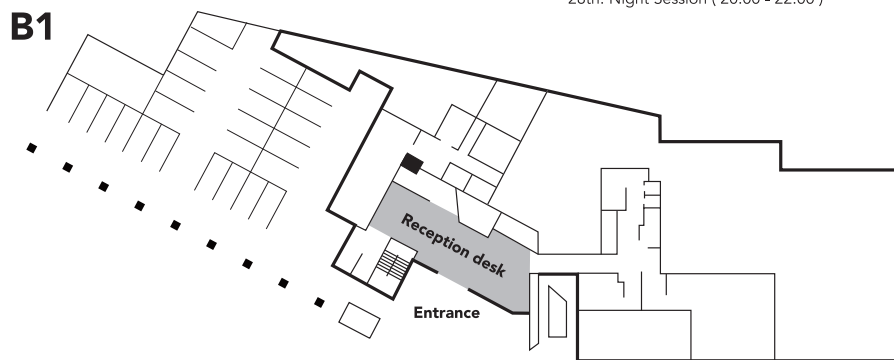
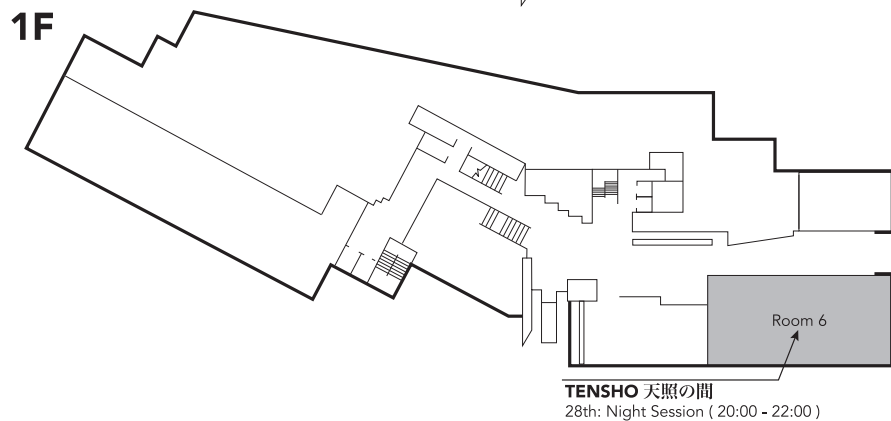
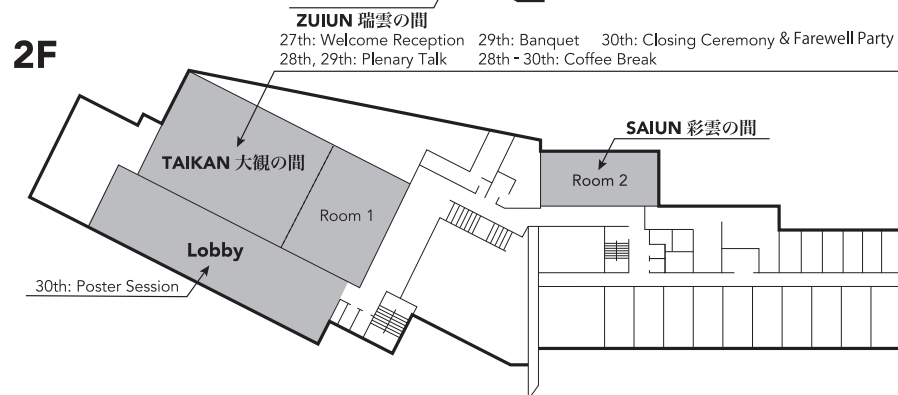
Nov. 27, 16:30 – 19:30 on the Floor B1, New Welcity Yugawara
Nov. 28, 8:15 – 18:30 on the Floor B1, New Welcity Yugawara
Nov. 29, 8:30 – 17:00 on the Floor B1, New Welcity Yugawara
Nov. 30, 8:30 – 14:30 on the Floor B1, New Welcity Yugawara

Social Events

- Nov. 27, 18:00 – 19:30, Welcome reception: Hall TAIKAN
- Nov. 29, 19:00 – 21:00, Banquet: Hall TAIKAN
- Nov. 30, 15:30 – 17:00, Farewell party and Student paper award ceremony: Hall TAIKAN

Session Room Information

Hall	TAIKAN on Floor 2	Room 2	SAIUN on Floor 2
Room 1	TAIKAN on Floor 2	Room 4	BAIKA on Floor 3
Room 3	ZUIUN on Floor 3	Room 6	TENSHO on Floor 1
Room 5	TATIBANA on Floor 3		



Session room

Session at a Glance

November 28, 2016 (Monday)

New Welcity Yugawara						
9:00–9:10	Opening ceremony Place: Hall TAIKAN					
9:10–10:10	Plenary Talk 1, Prof. Jin Akiyama (Tokyo University of Science, Japan) Chair: Tohru Ikeguchi (Tokyo University of Science) Place: Hall TAIKAN					
10:10–10:30	Coffee break					
	Room 1	Room 2	Room 3	Room 4	Room 5	Room 6
10:30–12:30	A2L-B Chaos and Bifurcation 1 Chairs: Kyohei Kamiyama and Marco Reit Page xviii	A2L-C Special Session: Time Series and Complex Networks 1 Chair: Michael Small Page xix	A2L-D Neural Networks and Optimization Chair: Hiroyuki Yasuda Page xix	A2L-E Special Session: Electromechanical Systems Chair: Hiroyuki Asahara Page xx	A2L-F Special Session: Power Packet: Energy-and-Information Integrated Technology 1 Chair: Hiroyasu Ando Page xxi	A2L-G Special Session: Radio Frequency Technology Chairs: Takeshi Kamio and Hisato Fujisaka Page xxi
12:30–13:50	Lunch break					
13:50–15:30	A3L-B Special Session: Nonlinear Methods with Interaction Chair: Tomoya Suzuki Page xxii	A3L-C Special Session: Time Series and Complex Networks 2 Chair: Yoshito Hirata Page xxii	A3L-D Special Session: Hybrid Dynamical Systems: Modeling, Analysis, and Applications Chair: Daisuke Ito Page xxiii	A3L-E Control and Robotics Chairs: Keiji Konishi and Yoshiaki Sugitani Page xxiv	A3L-F Special Session: Power Packet: Energy-and-Information Integrated Technology 2 Chair: Ryo Takahashi Page xxiv	A3L-G Special Session: Implementation Technology and Theory for Neuronal and Neuronal Network Models Chairs: Kazuyuki Aihara and Takashi Kohno Page xxv
15:30–15:50	Coffee break					
15:50–18:30	A4L-B Chaos and Bifurcation 2 Chairs: Yusuke Matsuoka and Martin Schüle Page xxv	A4L-C Special Session: Random Number Generation and Chaos Chair: Hiroshi Fujisaki Page xxvi	A4L-D Special Session: Collective Behaviors of Chemically/Electrically Coupled Neurons Chair: Ryosuke Hosaka Page xxvii	A4L-E Special Session: Complex Communication Sciences Chairs: Mikio Hasegawa and Hidehiro Nakano Page xxvii	A4L-F Special Session: Simulations in Cardiovascular Systems Chairs: Hiroyuki Kitajima and Kunichika Tsumoto Page xxviii	A4L-G Synchronization Chair: Kuniyasu Shimizu Page xxix

November 29, 2016 (Tuesday)

New Welcity Yugawara						
9:00–10:00	Plenary Talk 2, Prof. Hawoong Jeong (Korea Advanced Institute of Science and Technology, Korea) Chair: Hiroo Sekiya (Chiba University) Place: Hall TAIKAN					
10:00–10:20	Coffee break					
	Room 1	Room 2	Room 3	Room 4	Room 5	Room 6
10:20–12:40	B2L-B Special Session: Koopman Operator Techniques in Nonlinear Dynamical Systems Chair: Yoshihiko Susuki Page xxx	B2L-C Special Session: Coupled Nonlinear Circuits and Networks 1 Chair: Yoko Uwate Page xxxi	B2L-D Special Session: Noise-Driven and Stochastic Information Processing Systems Chairs: Tetsuya Asai and Shintaro Arai Page xxxii	B2L-E Communication Systems and Signal Processing Chairs: Francis C.M. Lau and Yuko Osana Page xxxiii	B2L-F Special Session: Recent Progress in Nonlinear Optimization Algorithms and its Applications 1 Chair: Hidehiro Nakano Page xxxiiii	
12:40–14:00	Lunch break					
14:00–16:00	B3L-B Special Session: Complex Photonics and Applications 1 -Random Number Generation- Chair: Atsushi Uchida Page xxxiv	B3L-C Special Session: Coupled Nonlinear Circuits and Networks 2 Chair: Thomas Ott Page xxxv	B3L-D Special Session: Synchronization in Real Worlds and its Mathematical Modeling Chairs: Tohru Ikeguchi and Yutaka Shimada Page xxxvi	B3L-E Special Session: AD Converters and Dynamical Systems Chair: Yutaka Jitsumatsu Page xxxvii	B3L-F Special Session: Recent Progress in Nonlinear Optimization Algorithms and its Applications 2 Chair: Takuya Shindo Page xxxviii	
19:00–21:00	Banquet Place: Hall TAIKAN					

November 30, 2016 (Wednesday)

New Welcity Yugawara						
9:00–10:15	Poster Session, presented by Award candidates Place: Lobby on Floor 2					
10:15–10:30	Coffee break					
	Room 1	Room 2	Room 3	Room 4	Room 5	Room 6
10:30–12:30	C1L-B Special Session: Complex Photonics and Applications 2 -Photonic integrated circuits- Chair: Kazutaka Kanno Page xxxvii	C1L-C Special Session: Coupled Nonlinear Circuits and Networks 3 Chair: Kyohei Kamiyama Page xxxviii	C1L-D Special Session: Localization Phenomena in Nonlinear Lattices 1 Chair: Masayuki Kimura Page xxxviii	C1L-E Complex Networks and Systems Chair: Michael Small Page xxxix	C1L-F Special Session: Cellular Dynamical Systems Chair: Hiroyuki Torikai Page xxxix	
12:30–13:50	Lunch break					
13:50–15:30	C2L-B Special Session: Complex Photonics and Applications 3 -Reservoir Computing and Laser Dynamics- Chair: Andreas Karsaklian Dal Bosco Page xl	C2L-C Stability of Power Systems and Oscillators Chair: Yoko Uwate Page xli	C2L-D Special Session: Localization Phenomena in Nonlinear Lattices 2 Chair: Masayuki Sato Page xli	C2L-E Special Session: Applications to Temporal Nonlinear Systems Chair: Tomoya Suzuki Page xlii	C2L-F Special Session: Information Networks as Collective Statistical Systems Chair: Hiroyoshi Miwa Page xlii	
15:30–17:00	Farewell party and Student paper award ceremony Place: Hall TAIKAN					

Technical Program

A1L-A Plenary Talk 1

DATE: 2016/11/28 09:10–10:10

ROOM: Hall

Chair: Tohru Ikeguchi (Tokyo University of Science)

- A1L-A1 Math Spectacle Show** 1
Jin Akiyama (Tokyo University of Science)

A2L-B Chaos and Bifurcation 1

DATE: 2016/11/28 10:30–12:30

ROOM: Room 1

Chairs: Kyohei Kamiyama (University of Tokyo) and Marco Reit (Leibniz Universität Hannover)

- A2L-B1 Detecting Bifurcations from Time Series Data** 3
Kazuto Ogoshi (Kagawa University), Hiroyuki Kitajima (Kagawa University), Toru Yazawa (Kagawa University)
- A2L-B2 Bifurcation Analysis for Early Afterdepolarization in Shannon Model** 7
Ai Takahashi (Kagawa University), Hiroyuki Kitajima (Kagawa University), Toru Yazawa (Kagawa University)
- A2L-B3 Analysis of a 3-Dimensional Piecewise-Constant Chaos Generator Without Constraint** 11
Shuntaro Hamatani (Nagaoka University of Technology), Tadashi Tsubone (Nagaoka University of Technology)
- A2L-B4 Shishi-Odoshi and Large Deviations** 15
Syuji Miyazaki (Kyoto University), Kenta Yamada (Kyoto University)
- A2L-B5 Properties of Discrete-Time Bifurcation-Based Amplifiers** 18
Marco Reit (Leibniz Universität Hannover), Sven Feldkord (Leibniz Universität Hannover), Wolfgang Mathis (Leibniz Universität Hannover)

A2L-C Special Session: Time Series and Complex Networks 1

DATE: 2016/11/28 10:30–12:30

ROOM: Room 2

Chair: Michael Small (University of Western Australia)

- A2L-C1** **Detecting Directional Couplings from Time Series: Joint Distribution of Distances** 22
Yoshito Hirata (University of Tokyo), José Amigó (Universidad Miguel Hernández), Kazuyuki Aihara (University of Tokyo)
- A2L-C2** **On Ranking and Mining Universities with the Encyclopedia Wikipedia** 26
Zongjian Li (Fudan University), Cong Li (Fudan University), Xiang Li (Fudan University)
- A2L-C3** **Characterization and Control of Chimera State Collapses** 30
Ralph Andrzejak (Universitat Pompeu Fabra), Christian Rummel (University Bern), Florian Mormann (University Bonn), Kaspar Schindler (University Bern)
- A2L-C4** **Extremal Optimisation Approaches for Building Complex Geometric Structures in 3D Integrated Circuits** 31
Maciej Ogorzalek (Jagiellonian University), Katarzyna Grzesiak-Kopec (Jagiellonian University), Piotr Oramus (Jagiellonian University)
- A2L-C5** **The Anatomy of the Global Football Player Transfer Network: Club Functionalities Versus Network Properties** 32
Xiao Fan Liu (Southeast University)

A2L-D Neural Networks and Optimization

DATE: 2016/11/28 10:30–12:30

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