

Astrophysical Big Bang Laboratory

長瀧天体ビッグバン研究室

PI: Shigehiro Nagataki (Ph.D of Science), Associate Chief Scientist

1. Abstract

Our laboratory, Astrophysical Big Bang Laboratory (ABBL), was established on 1st Apr. 2013. Our group focuses on unveiling lots of mysteries surrounding astrophysical explosive phenomena such as supernovae (SNe) and gamma-ray bursts (GRBs). SNe and GRBs are the most powerful explosions in the universe, and yet very little are known about their explosion mechanisms. These astrophysical big bangs continue to fascinate us with their unknown physics and puzzling astronomical phenomena such as gravitational waves, r-process nucleosynthesis, particle acceleration, high-energy gamma-rays/neutrinos, ultra-high energy cosmic rays. Through our theoretical and computational approaches, we strive to reveal the complete pictures of these violent explosions and provide the-state-of-the-art physical interpretations for current, cutting-edge observations as well as useful predictions for future observations by the next-generation astronomical observatories. We are more than passionate to co-operate with researchers in RIKEN as well as all other interested groups in Japan and the world, and together we would like to establish a Utopia in RIKEN for scientists.

Deep understanding on mathematical and computational physics is very important to solve fundamental, unsolved problems in astrophysics. Our group has joined one of the Pioneering Projects, “Interdisciplinary Theoretical Science Research Group (iTHES)” (Group Director is Dr. Tetsuo Hatsuda) from FY2014, to solve such problems by enhancing communications with researchers of nuclear physics, condensed matter, chemistry, and biology in RIKEN. These activities should be also helpful to increase our group’s activities in astrophysics. Shigehiro Nagataki, the PI of ABBL, has been a team leader of Interdisciplinary Mathematical and Computational Collaboration Team of iTHES. Due to the great success of iTHES, a new program, “Interdisciplinary Theoretical and Mathematical Science Program (iTHEMS)” has been approved by MEXT in FY2016 (Program Director is Tetsuo Hatsuda). iTHEMS has a same concept with iTHES, but iTHEMS includes Mathematics. Shigehiro Nagataki has been a Deputy Program Director of iTHEMS. We will achieve our scientific goal through good communications & collaborations among ABBL & iTHEMS members (iTHES is terminated at

the end of March, 2017 since it is 5-year project from April 2013).

To enhance activities in nuclear-astrophysics in RIKEN, which is one of our dreams, further communications & collaborations with Nishina Center, CNS (U. Tokyo), and WNSC (KEK) are crucial. The state-of-the-art equation of state for dense matter and nuclear reaction data for various channels can be provided by Nishina Center groups, which are essential to unveil the phenomena of SNe and GRBs. Our group had joint meetings with Dr. Nakatsukasa's group continuously since FY2013. Even after Dr. Nakatsukasa's moving to Tsukuba University, we have been organizing the joint meetings occasionally by inviting nuclear physicists as speakers. Our group has joined one of the Pioneering Projects, "Extreme precisions to explore fundamental physics with exotic particles (Triple-E)" (Group Director: Dr. Yasunori Yamazaki). This project definitely helps our group to enhance communications and collaborations with Nishina Center, especially Dr. Uesaka's group as well as CNS & WNSC. We also believe that our group can contribute especially to new science of RIBF through this project. Further, we are highly motivated to study more about nuclear-astrophysics by the discovery of the neutron star merger event in August 2017.

Super-computing is indispensable for unveiling the explosion mechanisms of SNe and GRBs. Full-understanding of them is still not achieved even by using K-computer. We would like to achieve the complete understanding of the explosion mechanisms using super-computers in RIKEN, National Astronomical Observatory of Japan (NAOJ), Yukawa Institute for Theoretical Physics (YITP), and Max Planck Institute for Astrophysics (MPA). Dr. Tomoya Takiwaki, who did numerical simulations of SNe by K-computer supported by HPCI Strategic Program Field 5 "The origin of matter and the universe" joined our group from 1st Aug. 2014, obtained lots of fruitful results on SNe and GRBs in our group, and got a permanent position of Assistant Professor at NAOJ successfully in 2016 (he is also keeping affiliation of ABBL as a visiting researcher). We will continue to encourage excellent researchers of this field to join our group from all over the world, so that our group in RIKEN keeps leading the world in this field.

As mentioned above, our group has already decided to lead the world in the field of astrophysical big bangs. For the purpose, we are seeking for top-ranked researchers in the world, encouraging them to join our group, and doing the-state-of-the-art researches in this field. We are succeeding to have an international laboratory composed of 9 Japanese including PI and 10 non-Japanese (2 from Russia & China, and 1 from Italy, Hong-Kong, Thailand, USA, France, Germany), including Alumni who succeeded to get their next positions, such as a

faculty position (full professor, tenured) at Yunnan Observatory in China, a lecturer position at Kyoto University (tenured), a lecturer position at National Institute of Technology Asahikawa College (tenured), an assistant professor position at NAOJ (tenured), an assistant professor position at Jagellonian University (tenure-track), Kavli IPMU at the University of Tokyo, Purdue University, and assistant professor position at Tohoku University (for outreach). Among the 10 alumni, 5 got tenure or tenure-track positions successfully. Among the total 19 members, 3 joined ABBL from Stanford Univ., 3 from Max Planck Institute, and 1 from UCLA. We are sure that we can establish a top-ranked lab. in the world and achieve our goals & dreams in the near future leading the world.

2. Key Words

Supernova Explosions, Gamma-Ray Bursts, Neutron Stars, Black Holes, Supernova Remnants, gravitational waves, neutrinos, r-process/Explosive Nucleosynthesis, Radiation Transfer, Relativistic MHD Flow, Particle Acceleration, High-Energy Cosmic Rays, General Relativity, Equation of State for Dense Matter, High Performance Super-Computing.

3. Members

Principal Investigator

Shigehiro Nagataki

Chief Scientist

Postdoctoral Researcher

Masaomi Ono

Research Scientist

Core Members

Hiroataka Ito

Research Scientist

Masanori Arakawa

Junior Research Associate/Rikkyo U.

Donald Warren

Foreign Postdoctoral Researcher

Susumu Inoue

Research Scientist

Past Core Members

Alexey Tolstov

Postdoctoral Researcher, Kavli IPMU,
Univ. of Tokyo

Gilles Ferrand

Research Scientist

Jirong Mao

Faculty at Yunnan Observatory

Haoning He

Shiu-Hang Lee

Lecturer at Kyoto University

Visiting Scientist of RIKEN

Maria Giovanna Dainotti

Assistant professor at Jagellonian U.

Marie Curie Fellow at Stanford Univ.

Yuto Teraki

National Institute of Technology

Asahikawa College

Tomoya Takiwaki

Assistant Professor at NAOJ

Visiting Scientist of RIKEN

Tomohide Wada

Assistant Professor at Tohoku U.

(Outreach)

Maxim Barkov

Postdoc at Purdue University

Visiting Scientist of RIKEN

Annop Wongwathanarat

Researcher at Max Planck Institute for

Astrophysics

Jin Matsumoto

Researcher at Leeds University

Assistant

Tamaki Shibasaki

Kumiko Sakai

Long Term Visitors

Sarira Sahu (UNAM, Mexico : 2017/04/01

– 2018/01/31) Supported by JSPS

Tyler Parsotan (Oregon State U., USA:

(2017/06/20 – 2017/08/18). Supported by

NSF-JSPS.

Short Term Visitors

Akira Harada (U. Tokyo)

Kazumi Kashiyama (U. Tokyo)

Takeru Suzuki (U. Tokyo)

Toshitaka Kajino (NAOJ)

Hiroya Yamaguchi (NASA)

Geoffrey Ryan (NYU)

Masahiro Hoshino (U. Tokyo)

Aya Bamba (U. Tokyo)

Fumitaka Nakamura (NAOJ)

Evgeny Derishev (IAP, RAS)

Leung Shing Chi (IPMU)

Kai Wang (MPIK)

Friedrich Roepke (HITS)

Takahiro Nishimichi (IPMU)

Takashi Yoshia (U. Tokyo)

Denis Allard (APC)

Takaya Nozawa (NAOJ)

Hideyuki Umeda (U. Tokyo)

Thomas Janka (MPA)

Dmitry Khangulyan (Rikkyo U.)

Patrick Slane (CfA)

Daniel Patnaude (CfA)

Salvatore Orlando (Palermo Obs)

Samar Safi-Harb (U. Manitoba)

Keiichi Maeda (Kyoto U.)

Miguel Aloy (Valencia U.)

Amir Levinson (Tel Aviv U.)

Pawan Kumar (U. Texas)

Kipp Cannon (U. Tokyo)

Davide Lazzati (Oregon U.)

Alexander Kusenko (UCLA)

Toshikazu Shigeyama (U. Tokyo)
Yasunobu Uchiyama (Rikkyo U.)
Jirong Mao (Yunnan Obs)
Maria Dainotti (Stanford U.)
Annop Wongwathanarat (MPA)
Alexey Tolstov (IPMU)
Shiu-Hang Lee (Kyoto U.)

4. Achievements

(1) Press Release etc.

Annop Wongwathanarat “超新星残骸カシオペア座Aの放射性同位体分布を再現” 理研プレスリリース 2017/07/07.

http://www.riken.jp/pr/press/2017/20170707_1/

Maria Dainotti, “A 3D step towards sorting out the Gamma-Ray Bursts zoo” INAF Press release, 13th October 2017, <http://www.inaf.it/en/inaf-news/gold-grb> <https://kipac.stanford.edu/highlights/three-dimensional-step-towards-sorting-out-grb-zoo>

Oliver Just “The limit on the radii of neutron stars tightened” RIKEN Research Highlights, 2018/03/16. http://www.riken.jp/en/research/rikenresearch/highlights/20180316_0046/

(2) Lectures

Jin Matsumoto, Part-time Lecturer on Mathematical Analysis III at Aoyama Gakuin U. April-July 2017.

(3) Papers in Journals (Refereed)

Maria Dainotti, Shigehiro Nagataki, K. Maeda, S. Postnikov, Pian, E. “A study of gamma ray bursts with afterglow plateau phases associated with supernovae” *Astronomy & Astrophysics*, Volume 600, id.A98, 11 pp. 1st April, 2017.

Aharonian, F.A., Barkov, Maxim, Khangulyan, D. “Scenarios for Ultrafast Gamma-Ray Variability in AGN” *The Astrophysical Journal*, Volume 841, Issue 1, article id. 61, 14 pp. 20 May, 2017.

The CTA Consortium (including Shigehiro Nagataki, Susumu Inoue, Gilles Ferrand, Donald Warren, Haoning He, Maxim Barkov) “Prospects for Cherenkov Telescope Array observations of the young supernova remnant RX J1713.7-3946” *The Astrophysical Journal*, Volume 840, Issue 2, article id. 74, 14 pp. 2017/05. Volume 841, Issue 1, article id. 61, 14 pp., 20 May, 2017.

M. Kino, H. Ito, S. Wajima, N. Kawakatsu, R. Ito “Fossil Shell in 3C 84 as TeV γ -Ray Emitter and Cosmic-Ray Accelerator” *The Astrophysical Journal*, Volume 843, Issue 2, article id. 82, 12 pp. 2017/07.

Bosch-Ramon, V., Barkov, Maxim, Mignone, A., Bordas, P. “HESS J0632+057: hydrodynamics and

non-thermal emission” Monthly Notices of the Royal Astronomical Society, Letters Volume 471, Issue 1, p.L150-L154, 02 August, 2017.

R. U. Abbasi et al. (including Masaomi Ono, Hirotaka Ito, Shigehiro Nagataki) “The bursts of high energy events observed by the telescope array surface detector” Physics Letters A, Vol. 381, Issue 32, pp. 2565-2572, 28 August 2017.

Utrobin Victor, Wongwathanarat Annap, Hans-Thomas Janka, Müller Ewald “Light-curve Analysis of Ordinary Type IIP Supernovae Based on Neutrino-driven Explosion Simulations in Three Dimensions” The Astrophysical Journal, Volume 846, 37, 2017/08/30.

R. U. Abbasi et al. (including Masaomi Ono, Hirotaka Ito, Shigehiro Nagataki) “Search for EeV protons of galactic origin” Astroparticle Physics, Vol. 86, pp. 21-26, 28 August 2017.

Maria Dainotti, Hernandez,X., Postnikov, S., Shigehiro Nagataki, O'brien, P., Willingale, R., Striegel, S. “A Study of the Gamma-Ray Burst Fundamental Plane” The Astrophysical Journal, Volume 848, Issue 2, article id. 88, 12 pp. 20th October, 2017.

Perucho, M., Bosch-Ramon, V., Barkov, Maxim “Impact of red giant/AGB winds

on active galactic nucleus jet propagation” Astronomy & Astrophysics, Volume 606, id.A40, 14 pp. 10 October, 2017.

K. Yoshida, D. Yonetoku, H. Ito, J. Matsumoto, S. Nagataki “Search for a Signature of Interaction between Relativistic Jet and Progenitor in Gamma-Ray Bursts” The Astrophysical Journal, Volume 849, Issue 1, article id. 64, 7 pp, 2017/11.

Ishii, A., N. Ohnishi, H. Nagakura, H. Ito, S. Yamada “Validation of radiative transfer computation with Monte Carlo method for ultra-relativistic background flow” Journal of Computational Physics, Volume 348, p. 612-633., 2017/11.

S. Inoue, Y. Uchiyama, M. Arakawa, M. Renaud, K. Wada “Cosmic Rays and Non-thermal Emission Induced by Accretion of Cool Gas Onto the Galactic Disk” Astrophysical Journal 849, 22, 2017 November 1.

Daniel Patnaude, Shiu-Hang Lee, Patrick Slane, Carles Badenes, Shigehiro Nagataki, Donald Ellison, Dan Milisavljevic “The Impact of Progenitor Mass Loss on the Dynamical and Spectral Evolution of Supernova Remnants” The Astrophysical Journal, Volume 849, Issue 2, article id. 109, 13 pp., 10th November, 2017.

Bauswein Andreas, Just Oliver, Janka Hans-Thomas, Stergioulas Nikolaos “Neutron-star Radius Constraints from GW170817 and Future Detections” *Astrophysical Journal Letters*, 850, L34, 29th November, 2017.

WEST Jennifer L., JAFFE Tess, FERRAND Gilles, SAFI-HARB Samar, GAENSLER Bryan M. “When Disorder Looks Like Order: A New Model to Explain Radial Magnetic Fields in Young Supernova Remnants” *The Astrophysical Journal Letters*, Volume 849, Issue 2, article id. L22, 7 pp., 2017/11.

Wu Meng-Ru, Tamborra Irene, Just Oliver, Janka Hans-Thomas “Imprints of neutrino-pair flavor conversions on nucleosynthesis in ejecta from neutron-star merger remnants” *Physical Review D* Vol. 96, Issue 12, id. 123015, 29th December, 2017.

Matsumoto, J., Aloy, M., Perucho, M. “Linear theory of the Rayleigh-Taylor instability at a discontinuous surface of a relativistic flow” *Monthly Notices of the Royal Astronomical Society*, Volume 472, Issue 2, p.1421-1431, 2017/12.

Goriely Stephane, Bauswein Andreas, Janka Hans-Thomas, Just Oliver, Pllumbi Else “The r-process nucleosynthesis and related challenges”

EPJ Web of Conferences, Vol 165, 01025, 30th December, 2017.

Shigehiro Nagataki “Theories of central engine for long gamma-ray bursts” *Reports on Progress in Physics*, Volume 81, Issue 2, article id. 026901, 9th January, 2018.

Pozanenko, A.S., Maxim Barkov, et al. (10 authors) “GRB 170817A Associated with GW170817: Multi-frequency Observations and Modeling of Prompt Gamma-Ray Emission” *The Astrophysical Journal Letters*, Volume 852, Issue 2, article id. L30, 18 pp. 10th January, 2018.

R. U. Abbasi et al. (including Masaomi Ono, Hirotaka Ito, Shigehiro Nagataki) “First upper limits on the radar cross section of cosmic-ray induced extensive air showers” *Astroparticle Physics*, Vol. 87, pp. 1-17, January 2018.

Hirotaka Ito, Amir Levinson; Boris Stern, Shigehiro Nagataki “Monte Carlo simulations of relativistic radiation-mediated shocks - I. Photon-rich regime”, *Monthly Notices of the Royal Astronomical Society*, Volume 474, Issue 2, p.2828-2851, 2018年2月.

Tsuneyoshi Kamae, Lee, Shiu-Hang, K. Makishima, S. Shibata, T. Shigeyama “Evidence for GeV cosmic rays from

white dwarfs in the local cosmic ray spectra and in the gamma-ray emissivity of the inner Galaxy” Publications of the Astronomical Society of Japan, 28 February 2018.

Baushev, A.N., Maxim Barkov “Why does Einasto profile index $n \sim 6$ occur so frequently?” Journal of Cosmology and Astroparticle Physics, 20th March, 2018.

(4) Oral Presentations at International Meetings (Invited Talks)

Shigehiro Nagataki “My Thoughts on Cas A” CSI: Princeton -- A Definitive Investigation of the Core-Collapse Supernova Cassiopeia A, Princeton, USA, 18 Apr. 2018.

Susumu Inoue “Gravitational wave follow-up at VHE: What do we expect? What do we learn?” MAGIC Physics Meeting, CERN, Switzerland, 2017/04/27.

Shigehiro Nagataki “Opening Address” International Workshop "Theories of Astrophysical Big Bangs", Wako, RIKEN, Japan, 06 Nov. 2017.

Just Oliver “Neutron-star merger outflows and neutron-star radius constraints from gravitational wave observations” Theories of Astrophysical Big Bangs, RIKEN, Wako, Japan November 7, 2017.

M. Ono “Three dimensional numerical modeling of supernova explosions toward linking to supernova remnants: SN1987A” Theories of Astrophysical Big Bangs, RIKEN, Wako, Japan November 7, 2017.

FERRAND Gilles “3D simulations of young supernova remnants” Theories of Astrophysical Big Bangs, RIKEN, Wako, Japan November 7, 2017.

Donald Warren “Thermal electron production and consequences for GRB afterglows” Theories of Astrophysical Big Bangs, Wako, Japan, 8 Nov 2017.

H. Ito “Numerical Simulations of Photospheric Emission from Collapsar Jets” Theories of Astrophysical Big Bangs, Wako, RIKEN, Japan, 2017/11/9.

Haoning He “Neutrinos from Choked Jets accompanied by Type II Supernovae” Theories of Astrophysical Big Bangs, Wako, RIKEN, Japan, 2017/11/9.

S. Inoue “Cosmic Rays and Non-thermal Emission Induced by Accretion of Cool Gas onto the Outer Galactic Disk” Theories of Astrophysical Big Bangs, Wako, RIKEN, Japan, 2017/11/10.

M. Arakawa “Gamma-ray observation of

SNR Puppis A” Theories of Astrophysical Big Bangs, Wako, RIKEN, Japan, 2017/11/10.

S. Inoue “Short Gamma-Ray Bursts and Neutron Star Mergers at Very High Energy” 8th International LHAASO Meeting, Shanghai, China, 2017/12/11.

Shigehiro Nagataki “Massive Star Explosions & Nucleosynthesis” International Workshop on Hadron and Nuclear Physics 2017, Wako, RIKEN, Japan, 18 Dec. 2017.

Haoning He “Neutrinos from Choked Jets accompanied by Type II Supernovae” PACIFIC 2018, Akaigawa, Japan, 2018/02/16.

Donald Warren “Thermal electrons in gamma-ray burst afterglows” PACIFIC 2018, Akaigawa, Japan, 2018/02/16.

Shigehiro Nagataki “Why are Gamma-Ray Bursts Bright in Gamma-Rays?” PACIFIC 2018, Akaigawa, Japan, 2018/02/19.

(5) Oral Presentations at International Meetings (Contributed Talks):

Donald Warren “Thermal Electrons in GRB afterglows” Fifty-One Ergs, Corvallis, OR, USA 6 Jun 2017.

H. Ito “Photospheric Emission from

Collapsar Jets in 3D Relativistic Hydrodynamics ” Fifty-One Ergs, Corvallis, OR, USA 6 Jun 2017.

S. Inoue “Transient Physics Working Group Report” MAGIC Collaboration Meeting U. Rijeka, Croatia, 2017/06/15.

S. Inoue “Rapid follow-up observations of gamma-ray bursts with the MAGIC telescopes” 35th International Cosmic Ray Conference, Busan, Korea, 2017/07/18.

Haoning He “High Energy Gamma Rays and Neutrinos from a Past Hypernova in the Galactic Center” 35th International Cosmic Ray Conference, Busan, Korea, 2017/07/19.

Just Oliver “Core-collapse supernova simulations with the ALCAR code” The Progenitor-Supernova-Remnant Connection, Ringberg, Germany, July 26, 2017.

FERRAND Gilles, “3D simulations of young supernova remnants” Ringberg workshop on the Progenitor-Supernova-Remnant Connection, Keuth, Germany, 2017/07/26.

Wongwathanarat Annop “Long-time three-dimensional core-collapse supernova simulations” Workshop on the

progenitor-supernova-remnant connection, Kreuth, Germany, 2017/07/27.

Oliver Just “Impact of neutrinos in neutron-star mergers” Electromagnetic Signatures of R-process Nucleosynthesis in Neutron Star Binary Mergers, Seattle, USA, August 2, 2017.

Haoning He, “Neutrinos from Choked Jets Followed by Type II Supernovae” Workshop on Astroparticle Physics II, KIAA, Beijing, China, 2017/08/17.

H. Ito “Numerical Simulations of Photospheric Emission from Collapsar Jets” THESEUS Workshop 2017, Naples, Italy, 2017/10/6.

Donald Warren “Thermal particles and nonlinear acceleration in gamma-ray burst afterglows” Texas Symposium on Relativistic Astrophysics, Cape Town, South Africa, 4 Dec 2017.

S. Inoue “IC-170922A + TXS 0506+056: Interpretation” MAGIC Collaboration Meeting, DESY, Germany, 2018/02/21.

(6) Oral Presentations at Domestic Meetings (Invited/Keynote Talks)

Just Oliver “Modeling remnants of neutron-star mergers and core-collapse supernovae” Nuclear Astrophysics Workshop, Kobe, Japan, June 11th,

2017.

長瀧重博 “天体ビッグバンと iTHEMS” 2017 年度名古屋大学物理学教室憲章記念日講演会「階層を貫く物理」名古屋大学, 名古屋市、日本, 2017年6月13日.

井上進 “ガンマ線バーストと遠方宇宙・元素の起源” ガンマ線バースト研究の新機軸, 東京大学 宇宙線研究所, 柏市、日本, 2017/11/21.

井上進 “Multimessenger Transient Observations with MAGIC and Prospects for CTA” 高エネルギーガンマ線でみる極限宇宙 2017, 東京大学 宇宙線研究所, 柏市、日本, 2017/12/18.

長瀧重博 “連星中性子星に於けるガンマ線バーストおよび元素合成” 日本物理学会合同シンポジウム（一般）特異的天体環境における量子現象と元素合成, 野田市、日本, 2018/03/22.

井上進 “MAGIC で探るマルチメッセンジャー突発天体” マルチメッセンジャー天文学研究会 2018, 千葉大学, 千葉、日本 2018/03/27.

(7) Oral Presentations at Domestic Meetings (Contributed Talks)

伊藤裕貴 “光球面放射の数値シミュレーションから明らかにする米徳関係の起源” 高エネルギー宇宙物理学研究会 2017, 京都大学, 京都市、日本, 2017/9/5.

井上進 “銀河系ディスク外縁部への低温ガスの降着に伴う宇宙線加速と非熱的放射” 高エネルギー宇宙物理学研究会 2017, 京都大学, 京都市、日本, 2017/9/7.

伊藤裕貴 “三次元相対論的流体シミュレーションから明らかにする米徳関係の起源” 日本天文学会 秋季年会 札幌市、日本, 2017/9/11.

荒川真範 “フェルミ・ガンマ線宇宙望遠鏡による超新星残骸 Puppis A の観測” 日本天文学会 秋季年会 札幌市、日本, 2017/9/12.

井上進 “大質量星およびクエーサーによる宇宙再電離と高速電波バーストの分散測度” 日本天文学会 秋季年会 札幌市、日本, 2017/9/13.

Just Oliver “Neutron-star merger outflows and neutron-star radius constraints” NAOJ Meeting, Tokyo, Japan, October 21, 2017.

伊藤裕貴 “光球面放射の数値シミュレーションから明らかにする米徳関係の起源” ガンマ線バースト研究の新機軸, 東京大学宇宙線研究所, 柏市、日本, 2017/11/22.

伊藤裕貴 “光球面放射の数値シミュレーションから明らかにする米徳関係の起源” 平成 29 年度 cfca ユーザーズミーティング 国立天文台, 三鷹市、日本 2017/11/29.

井上進 “X-raying r-process nucleosynthesis in neutron star mergers” 重力波物理学・天文学：創世記シンポジウム, IPMU, 柏、日本、2018/03/06.

井上進 “中性子星合体における r-process 元素合成の X 線診断” 日本天文学会春季年会, 千葉大学、千葉、日本、2018/03/15.

井上進 “中性子星合体における r 過程元素合成の X 線診断” 日本物理学会春季年会, 東京理科大、野田、日本、2018/03/23.

(8) Outreach

Shigehiro Nagataki “Introduction to ABBL” Visit from Manchester U. RIKEN, Wako, 2017/05/15.

FERRAND Gilles “Virtual Reality for research and outreach” Meeting on the Outreach of RIKEN, Tambara, Japan, 2017-06-11.

長瀧重博 “コンピュータの中の天体ビッグバン” 数理サマー京大・理研合同市民講演会, 京都大学, 京都市、日本, 2017 年 7 月 30 日.

長瀧重博 “コンピュータの中の天体ビッグバン” 新潟県立長岡高等学校理研訪問会、理研、和光、2017/08/09.

長瀧重博 “2017 年ノーベル物理学賞の解説” 2017 年ノーベル賞解説会, 理研、和光、2017/10/31.

Shigehiro Nagataki “Astrophysical Big Bangs and Gravitational Waves” 異分野交流の夕べ、理研、和光、2017/11/01.

長瀧重博 “大質量星の爆発・中性子星の合体と重力波” 信大—理研アウトリーチトークセッション、信州大学工学部、長野、2017/12/09.

(9) Seminar Talks (International)

Donald Warren, “Astrophysical Big Bangs and the People Who Love Them” Mercer University Physics Department Colloquium, Macon, USA, 12 Apr 2017

Donald Warren “Nonlinear diffusive shock acceleration beyond the non-relativistic regime, with application to GRB afterglows” Georgia State University astrophysics seminar series, Atlanta, GA, USA 13 Apr 2017

Shigehiro Nagataki “Theories of Astrophysical Big Bangs” Seminar at University of Manitoba, Manitoba, Canada, 21 Apr. 2017.

Shigehiro Nagataki “Project from a SN to a SNR” Astro-Tea Talk at University of Manitoba, Manitoba, Canada, 24 Apr. 2017.

FERRAND Gilles “From the supernova to the supernova remnant” U. of Manitoba, Winnipeg, Canada,

2017/07/20.

FERRAND Gilles “From the supernova to the supernova remnant” Dunlap Institute of the University of Toronto, and the Canadian Institute for Theoretical Astrophysics (CITA), Toronto, Canada, 2017/07/28.

Haoning He “The summaries on the IceCube Observations and Neutrinos from Choked Jets Followed by Type II Supernovae” Nanjing Univ., Nanjing, China, 2017/08/15.

Just Oliver “Modeling core-collapse supernovae and remnants of neutron-star mergers” Berkeley Lab seminar, Berkeley, USA, September 15, 2017.

(10) Poster Presentations at International Meetings

Shigehiro Nagataki, Haoning He, Alexander Kusenko “How can we hunt the sources of VHE neutrinos?” International Workshop of Neutrinos, Kyoto U., Kyoto, Japan, 2018/03/06.

(11) Poster Presentations at Domestic Meetings

Donald Warren, “An extended numerical investigation of gamma-ray bursts and their afterglows. Also, virtual reality.”, RIKEN SPDR Evening, Wako, Japan, 31 Jan 2018.

(12) Meetings organized or
co-organized by our group

International Workshop “Theories of
Astrophysical Big Bangs”, RIKEN, Wako,
Japan, 6-17, November, 2017.

<https://indico2.riken.jp/event/2450/>

International Workshop “PACIFIC-2018”
Kiroro, Hokkaido, Japan, 13-19 February,
2018. <https://conferences.pa.ucla.edu/pacific-2018/>