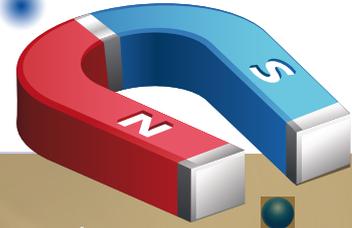


# Physics

Newsletter

October | 2019



## New Members of the Department

### Dr. Jane Lixin Dai

Assistant Professor  
B.Sc. HKUST; M.Sc., Ph.D. Stanford

I am a theoretical astrophysicist. Originally from Benxi, Liaoning, I came to Hong Kong for undergraduate studies in Physics and Mathematics at HKUST. Then I moved to the US and completed my PhD studies in Physics at Stanford. After working for a few years as a postdoc in the US and an Assistant Professor at the Niels Bohr Institute, Denmark, now I happily return to Hong Kong and join the family of the Department of Physics at HKU. My research mainly focuses on various astrophysical phenomena around black holes, such as accretion disks, jets, outflows, tidal disruption events, binaries, etc. I use both analytical calculations and large-scale numerical simulations for my research. Come and have a chat with me if you want to learn more about my research or about black holes!



### Dr. Tran Trung Luu

Assistant Professor  
B.Sc. VNU; M.Sc. KAIST; Ph.D. LMU

Direct visualization of electron motion: Our naked eyes allow us to observe natural phenomena happening over a few tens of milliseconds, i.e. human time scale. In order to see or to sense much faster phenomena, we would need equivalently fast, if not faster, tools. In our newly established group in the Department of Physics, HKU, we would like to construct ultrashort laser pulses (the tools) whose duration is at the order of attoseconds ( $1\text{as} = 10^{-18}\text{s}$ ). These tools will allow us to not only trigger ultrafast electron dynamics but also “see” them in action. We are hopeful that these new tools will enable us to initiate and learn novel phenomena over such extremely fast time scale.



### Dr. Zi Yang Meng

Associate Professor  
B.Sc. USTC; Ph.D. Uni. Stuttgart

Associate Professor Zi Yang Meng is a theoretical condensed matter physicist, his research focuses on strongly correlated quantum many-body systems. He develops computational approaches such as quantum Monte Carlo, density matrix and tensor network renormalization groups and artificial intelligence and neural networks, to investigate quantum many-body systems such as correlated 2D materials, non-Fermi-liquid, interacting Dirac fermion systems, frustrated magnets, topological order and quantum phase transitions beyond Landau-Ginzburg-Wilson paradigms, etc. Besides physics, he enjoys literature and essay writing. His group page is at: <https://www.physics.hku.hk/~mengziyang>

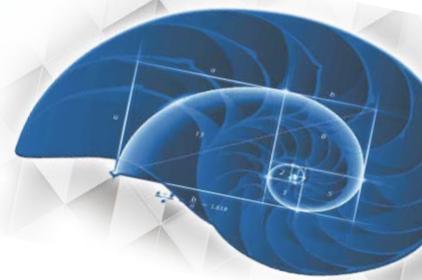


### Editors:

Dr. Kai-Ming Lee  
Prof. Quentin A. Parker  
Dr. Jenny Hiu Ching Lee



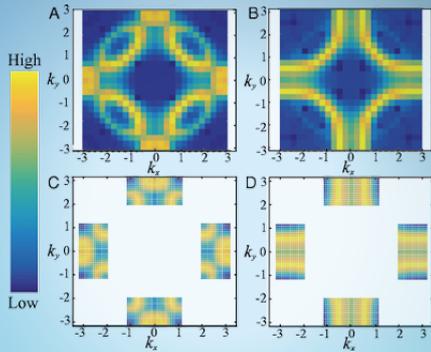
<https://www.physics.hku.hk/>



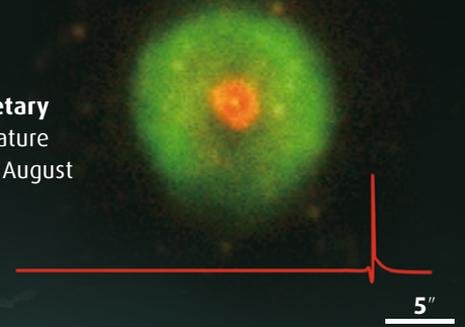
# Research and Grants Highlights

- Dr. Ki and Dr. Dai are awarded RGC **Early Career Scheme grant**.

- Liu, et al., **"Itinerant quantum critical point with fermion pockets and hotspots"**, PNAS August 1, 2019  
<https://doi.org/10.1073/pnas.1901751116>



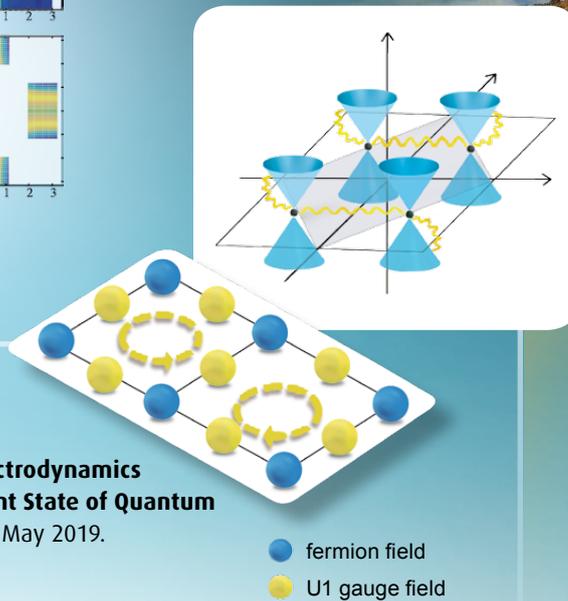
- Guerrero, et al., **"The inside-out planetary nebula around a born-again star"**, Nature Astronomy 2, 784-789 (2018) (cover of August 2018 issue).



- Fragkou, Parker, Zijlstra, Crause & Barker, **"A high-mass planetary nebula in a Galactic open cluster"**, Nature Astronomy 3, 841-857 (2019).



- Xu, et al., **"Monte Carlo Study of Lattice Compact Quantum Electrodynamics with Fermionic Matter: The Parent State of Quantum Phases"**, Phys. Rev. X 9, 021022, 2 May 2019.



• fermion field  
 • U1 gauge field

## Nishina Summer School

Our department has co-organized Nishina Summer School since 2016 under the MEMORANDUM OF UNDERSTANDING between HKU Science Faculty and RIKEN Nishina Center. This 2-week school for Nuclear Physics is held annually in summer at RIKEN research institute in Tokyo (Japan) which has the world's most powerful radioactive beam facility. Participants include students from HKU, Peking University, Seoul National University and universities in Japan and United States. The curriculum of the School is designed to introduce the pleasure of nuclear physics to undergraduate students. The first-week program consists of lectures, basic experimental and accelerator trainings; while the second-week program is dedicated to a real-beam experiment using RIKEN accelerators and detectors, starting from design of setup, data-taking followed by data analysis, discussion as well as student presentation.

Not only knowledge of nuclear physics and its frontier research, students gain fantastic research experimental experience at the large-scale international facility which does not exist in Hong Kong. In addition, students have interactions with

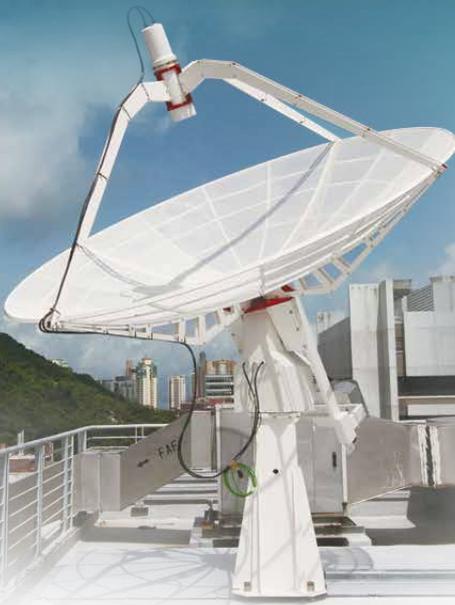
well-known scientists there as well as enjoy the culture exchange and collaborations via group project with students from Mainland, Korea, Japan and United States. More photos and students' sharing can be found here: <https://www.physics.hku.hk/~nuclear/index%20-%20SummerSchool.html>



# Observational Astronomy Experiential Learning 2019

On May 30, our group of 13 students, led by Dr. Jeremy Lim and Ms. Emily Wong, arrived in the Spanish town of Teruel where we would spend the next 19 days planning and conducting astronomical observations and research projects at Observatorio Astrofisico de Javalambre. Our primary meeting point was at CEFCa (Centro de Estudios de Física del Cosmos de Aragón), set in the beautiful old town of Teruel.

During our trip we worked on an individual project in which we observed two star clusters (NGC 6791 and NGC 6811), and a group project in which we plan and execute our own observing programs, and combine our observations to create a composite color image, such as the image of the Dumbbell Planetary Nebula seen above.



## HKU Radio Telescope

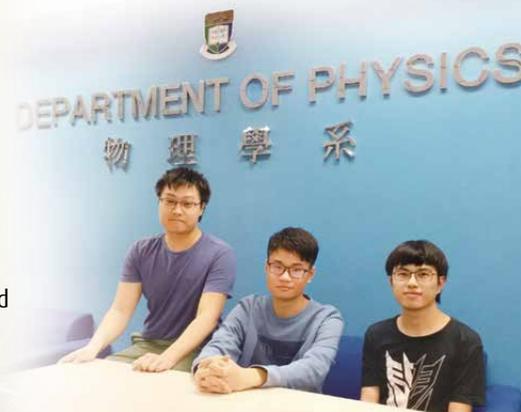
We have recently upgraded the radio telescopes at the roof of the physics building, from the 2.3m-diameter Small Radio Telescope (SRT) to the 3m SPIDER 300A radio telescope, together with a more sensitive receiver. The new telescope will be able to observe the strongest radio sources in the sky, including the Sun, supernova remnants, radio galaxies, and the hydrogen 21cm line. The HI line is particularly interesting, as it can map the rotation curve of the Milky Way galaxy to infer the existence of dark matter. You can search "HKU radio telescope" on YouTube to find videos online.

## Student News

- Mr. Amruth Alfred is awarded a Kurt Godel gold medal for being the best poster presenter at the conference **"Kurt Gödel's Legacy: Does Future lie in the Past?"**.
- Three HKU physics undergraduate students, Deng Jian Qiao (middle), Wong Hong Tsun (left) and Yeung Ryan Wai-Yen (right), teamed with two other students from the University of Oxford and Peking University, joined the online International Theoretical Physics Olympiad 2019 and ranked the top 10 out of 88 teams worldwide.



<http://thworldcup.com/contest2019>



## A flurry of interns at the Laboratory for Space Research

While most places slow down during the summer, that's not the case for the Laboratory for Space Research (LSR), which is buzzing with activity. Three student interns from the University of Chicago, two from Singapore International School, one from HKUST, and one from IIT, Bombay are working on a range of projects, including soft gamma-ray pulsars, planetary nebulae, machine learning techniques, etc. During their internship, several of the interns had the opportunity to travel with their supervisor, Dr. Saz Parkinson, to attend a week-long workshop in high-energy astrophysics, in nearby Zhuhai. The recent inauguration of the University of Chicago HK Campus, near Cyberport, should lead to closer ties and hopefully more interns from Chicago in the future.



Left to right: A. Vyas (HKUST), S. Chandra (IIT, Bombay), N. Levine (U. of Chicago), A. Panfichi (U. of Chicago), and Dr. Saz Parkinson (LSR). Not pictured: G. Liu (U. of Chicago).



X+Y

### New Courses and Major

- **PHYS2650 Modern Astronomy**
- **PHYS2261 Introductory Heat and Thermodynamics**
- **PHYS2160 Introductory Computational Physics**
- **PHYS3151 Machine Learning in Physics**

The Department is going to launch the Major In Physics (Intensive) that recognizes students who take at least 50% more physics courses than the required minimum in the Major In Physics. By the time you read this Newsletter, the Major In Physics (Intensive) should have been approved by the University.



## Hong Kong Secondary School Physics Quiz Contest 2019

In June, the Physics Society held Hong Kong Secondary School Physics Quiz Contest 2019 which aims to promote interest of students in pursuing further study in physics. Prof. H. F. Chau was invited to be the judge and guest speaker. With the difficulty of the questions, students were engaged in the contest by pulling out all the stops. After a keen competition, S.K.H. Tsang Shiu Tim Secondary School won the contest among 16 schools. Last but not least, we would like to express our greatest gratitude to all judges, participants and helpers for their invaluable contributions.

PHYSICS SOCIETY  
DEPARTMENT OF PHYSICS, THE UNIVERSITY OF HONG KONG

### Hong Kong Secondary School Physics Quiz Contest 2019

DATE : 30TH JUNE 2019 (SUNDAY)  
TIME : 09:00 - 17:15  
VENUE : LIBRARY EXTENSION THEATRE 1, MAIN CAMPUS, HKU

PARTICIPATION FEE: 90 HKD PER TEAM  
APPLICATION DEADLINE: 2ND JUNE 2019

Includes Talks on Neutrino held by Prof. Mei Fang CHAU

Society homepage: <http://www.physoc.org>  
Should you have any enquiries, please contact us through email: [hsphysoc@gmail.com](mailto:hsphysoc@gmail.com)

Sponsored by Department of Physics, The University of Hong Kong

