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2024 LSR Annual Report

From 1st September 2023 to 31st August 2024

Foreword by the LSR director, Prof. Quentin Parker



I am delighted to present the fifth and perhaps final annual report for the Laboratory for Space Research in its current form and the second under the new arrangements as an independent cost-centre of the faculty of science since December 2022. This is because of our developing plans for re-birth as INSPIRE – the “International Space and Planetary Institute for Research Excellence”. More about that in the body of the report. This has been yet another successful year for the LSR with much to report and hence another bumper edition!

This includes our becoming an equal partnership in the Chang'E 7 international wide field telescope camera on board the lunar lander awarded to the International Lunar Observatory Association based in Hawaii (see special focus), our first major philanthropic donation of \$3million HKD to help with our participation in this lunar mission and the award to HKU-LSR as host of the highly prestigious IAU Asia Pacific Regional meeting to be held in March/April 2026. This meeting is second in importance only to the IAU General Assembly itself. More than 500 astronomers are expected.

Once more I stress that the content summarized here has only been achieved due to the on-going support and contributions from LSR members. I believe it is self-evident that our research excellence, capacity and collaborations are leveraged off our brand and structure. The whole of the LSR is so much more than just the sum of its parts. The LSR remains a free and open association of like-minded scientists, technologists and engineers whose opinions are respected, where every voice is heard and whose members remain because they want to.

I would also like to express my sincere thanks to our Laboratory manager Ms. Scorpio Rokumon Wong for her continued professional support, including with helping gathering content for this annual report.

I also want to give special thanks and appreciation to deputy director Dr. Joe Michalski who is stepping down after 7 years of service. His wise counsel, personal leadership through amazing achievements and support for the ideals and vision of the LSR have been vital to our story and are greatly appreciated. I wish you well Joe and look forward to your continued support from the shopfloor as it were.

I also want to express deep gratitude to Dr. Meng Su, long-term LSR deputy director, who has again been extremely steadfast and active in bringing significant opportunities for the LSR to fruition.

Finally, I want to thank our Deputy director for Mainland Affairs Ms. Wu Xian (Infinity) who has worked tirelessly both in the Mainland and in HKSAR to foster collaborations and, in particular, bring NewSpace companies into partnership with us. This is for key projects like our RAISE+ and ITSP proposals. If successful, these will be a real gamechanger for LSR-INSPIRE.

In closing I hope you appreciate this report and the value the LSR has brought to HKU through our activities and achievements as a simple trawl of the www attests. No one knows what the future will bring but we are trying to make a positive difference. I remain grateful and privileged to have had the opportunity to serve the LSR and Faculty of Science at the University of Hong Kong.



10th September 2024

1. Executive Summary of LSR activity 2023-2024 by the numbers

- ▶ 72 LSR members for the second year running across 5 departments and 2 faculties (c.f. 15 in 2017 and 64 in 2021 - a stable but changing membership over the reporting period as several join and others have left)
- ▶ \$9.82HKD Million in grants and donations: including ~\$6.67 million from 7 GRFs (2 up from last year) – c.f. \$8.6million in 2022-2023
- ▶ 9 MoUs, Strategic cooperation agreements and letters of intent signed
- ▶ 6 LSR colloquia including 4 by distinguished visiting professors
- ▶ 32 Interns with 9 from the UK, USA and Canada and 4 from the Mainland
- ▶ 9 Professional University, Government or professional group delegation visits to the LSR in Cyberport and 12 LSR delegation visit to the Mainland
- ▶ 14 publications in top journals: 4 in Nature Astronomy, 1 in Nature Communications and 9 in ApJ letters, a new record
- ▶ 110 papers and articles including 87 refereed publications
- ▶ 7 press releases (a new record) and the significant associated news stories
- ▶ 88 TV interviews, newspaper articles, radio/TV show contributions and local/international media links (up from 52 last year)
- ▶ 264 news/media LSR related stories in the academic year including 74/190 clippings from local/international (or mainland). This represents 22% of all 1243 media outputs from the Faculty of Science (340 local and 903 international/mainland)
- ▶ 4 major initiatives in-train:
 - o Participation in Chang'E 7 lunar lander camera (special focus)
 - o Space Debris and Sustainability conference for Dec 2-4th 2024
 - o 6U MeV CubeSat program still in train
 - o RAISE+, ITPS and other major funding proposals submitted
- ▶ 5 Key LSR achievements over the reporting period:
 - o Excellent GRF/CRF grant results again obtained
 - o Shortlisted for AoE -resubmission with DES in train
 - o Robust research publication record
 - o Award to HKU-LSR of the prestigious IAU Regional Pacific Meeting to be held in April 2026
 - o \$3 million HKD donation for help with Chang'E 7 mission

2. LSR Mission, Vision, Structure and Value

Our LSR Mission, Vision & Brand remains unchanged and undimmed:

- ▶ i) To emerge as a leading interdisciplinary research centre in Space and Planetary sciences across the Asian region with a strong identity
- ▶ ii) To maintain and grow the LSR to be an internationally recognised brand for research excellence in mainstream space science and related programs
- ▶ iii) To strengthen and develop our ties to the Mainland Space program and globally

2.1 Curated LSR website with Chinese traditional and simplified Versions

One of our Lab manager's key activities is a weekly update to the LSR website to both English and Chinese parallel versions. This is necessary to keep on top of reporting all our activities, initiatives, key developments and news stories which occur on a regular basis. Our web site is hence proactively curated and has a popular following (see web stats in Appendix II). An example page of the simplified Chinese version of our LSR website is shown below.



2.2. Formal LSR Governance Structure

The LSR Governance structure was established in 2019 due to the expansion and emergence of the LSR as a strong, interdisciplinary HKU entity, with a burgeoning brand and profile as our regular press releases, research outputs and impacts show (see elsewhere in this report). The LSR adopts the Good Governance principles based on the United Nations “Progressive Good Governance principles and guidelines” as below:



We currently adhere to good governance guidelines (creative commons graphics).

// Formal LSR Governance Structure

The LSR is an interdisciplinary independent cost centre formally under the Faculty of Science since December 2022. The following base-level operational parameters have been set.

- a. The LSR director reports directly to the Dean
- b. The LSR director is responsible for its management and for setting its strategic direction in consultation with FoS and members
- c. The LSR director has the authority to negotiate agreements and MoUs
- d. The Faculty is responsible for approving research proposals and other LSR specific grant spending which concern the LSR as a cost centre
- e. The Faculty of Science is responsible for approving/endorsing higher level agreements, contracts,

MoUs etc. following established procedures

- ▶ i. This includes, where relevant, approval by the Faculty Board and/or involvement and checking by TTO and/or Research Services
- ▶ ii. Copies of the approved agreements, contracts, etc. will be provided to the relevant RDDs for their information and reference after the approval process has been completed

// LSR Advisory Board

A formal LSR advisory board was established in October 2020 as an official committee of the FoS. It has the following terms of reference. To:

1. Advise the Faculty of Science Board on all academic matters relating to the Laboratory for Space Research (LSR hereafter).
2. Report annually to the Faculty of Science Board on the activities of the LSR.
3. Advise on the program of activities and strategic development of the LSR.
4. Advise on suitable candidates for visiting research appointments in the LSR.
5. Recommend appointment of the Director of the LSR.

// Membership of the LSR Advisory Board

The Membership of the LSR Advisory Board is as follows:

1. Dean or Associate Dean (Research and Graduate Studies) of Faculty of Science (Chairperson).
2. The Director of the LSR or his/her delegate (to be one of the Deputy LSR Directors).
3. Three teachers of the Faculty of Science who work wholly or partly at the LSR, at least one each from the Divisions of Physics and Astronomy, and Earth and Planetary Science as appointed by the Board of the Faculty of Science (appointments 2 years, renewable).
4. At least one, and not more than three, reputable and relevant international scientists who are not members of the University staff, as nominated by the Dean of Science, and appointed by the Board of the Faculty of Science (appointments 2 years, renewable).
5. Not more than three other members, co-opted by the Advisory Board (appointments 2 years, renewable). To include at least one industry or government representative to represent views of non-academic stakeholders.

2.3. Who we are and what we offer our members

Advances in Astrophysics, Space and Planetary Science and our other foci depend on research that is highly international and collaborative and inherently interdisciplinary. The HKU departments of Physics and Earth Sciences, where most LSR members come from, are engaged in space and planetary science research via access to world-leading ground-based and space-based facilities, resources and infrastructure. We also have members in the faculty of engineering and the school of biological sciences and we are all involved in cross-disciplinary research related to developments in space and planetary science and technology. Together these provide the rationale and motivation for our operations since establishment in 2017. Our future strategic directions depend not just on our continued success in grasping opportunities in HK SAR, the Chinese Mainland and overseas but on our ability to adapt to a rapidly changing environment and our increasing engagement with “NewSpace” activities as reflected in several major grant applications submitted this year to exploit this burgeoning commercial sector. Further strong collaboration with the Mainland remains a key focus in order to take advantage of the strongly emerging Chinese space and planetary science exploration programs and associated ground-based big science initiatives. However, our focus is truly international and we remain committed to a broader global ecosystem as our new partnership with the International Lunar Observatory Association (ILOA) demonstrates.

// Below is an updated 2024 list of the tangible benefits of LSR membership.

- i) Dedicated administrative support for travel, grants, re-imbursments, HR issues and other general administrative assistance
- ii) Ad hoc financial support
- iii) The LSR colloquium series inaugurated in December 2022
- iv) The Distinguished Visitors Scheme inaugurated in February 2023
- v) Access to the LSR’s powerful Quantum computing System
- vi) Use of the LSR’s “Overleaf” license for helping with sharing LaTeX publications and editable papers with collaborators
- vii) Dedicated mail exploder to share news, views, updates and opportunities with members
- viii) Access to all Chinese Mainland Observing facilities as negotiated with the NAOC and enshrined in an MoU
- ix) Access to all the opportunities, projects, collaborations and more from our international partners based on our strategic selection of MoUs and agreements with more signed this year.
- x) Excellent workspaces for students/postdocs in LSR’s Cyberport offices

- xi) Access to free summer research effort via our vibrant internship program
- xii) A website that offers a convenient member forum for the latest news, views, membership matters, general information and more in both English and Chinese and of course a hardcopy of the LSR annual report
- xiii) English to Chinese/Chinese to English translation service when justified
- xiv) Social events such as the LSR research jamboree, internship sharing event with OASA, Christmas party, Kennedy-Town lunches and more
- xv) The LSR offers a strongly supportive, respectful and collegiate environment where every voice is heard and every opinion matters
- xvi) LSR code of conduct and adherence to equity principles. We are committed to making the LSR inclusive, productive and enjoyable for everyone, regardless of age, gender identity and expression, marital status, caring responsibilities, disability, cultural or linguistic diversity, indigeneity, sexual orientation, physical appearance, political affiliation or religion. If anyone is shown to have broken these principals their LSR membership will be revoked.

3. Summary of Current LSR Membership as at 31st August 2024

There were 72 LSR members from 5 departments and 2 faculties including various affiliates from outside HKU (www.lsr.hku.hk/members/) present over the reporting period. This compares with 72 members in the last report 2022-2023, 64 members in 2021-2022 and 15 when first established in 2017. Our membership is stable in terms of overall numbers (the same as last year) but there has been the usual dozen or so arrivals and departures as contracts end and new members begin in a healthy process of renewal.

We remain an open, inclusive and free association that comprised HKU faculty and LSR executives (20), postdocs (9), RPG students (15), RAs (4), Undergraduates (3) and external associates (20) and one special member Anson. There is no pressure to join. The LSR has a flat structure under the executive where collegiality and respect are paramount. Most members are based at HKU’s main campus and are formal HKU staff or students though we retain a few ex-HKU staff as members as affiliates when they move to another institution if they express a strong wish to maintain ties. We have selectively allowed some particularly important outside associates as members where this is seen as beneficial to the LSR, but we limit these. The current membership list does not include interns (32 this summer – yet another record). We have a total of 39 ex-members who have left the LSR since its inception. The full membership for the reporting period is given in Appendix V.

4. Budget Funding and remaining Issues

Despite the strategic move of the LSR to the Faculty of Science in 2023 there is still no formal budget settlement nor any annual HKU budget allocated to support the LSR.

The LSR was first funded by a \$10 million UDF 2016-2018 used to hire 3 exceptional faculty members in Dr's Meng Su, Joe Michalski and Binzheng Zhang and then by a HK\$10 million BRC in October 2018 that included 5 million RMB for our first satellite (the Lobster Eye X-ray satellite launched July 25th 2020). The BRC grant expired in December 2022. Since then the LSR has survived off its Research Matching Grant Scheme (RMGS) success but this comes to the end at the end of 2024. We have submitted a proposal to HKU to emerge as a HKU institute "INSPIRE" – International Space and Planetary Institute for Research Excellence with decision pending. This would provide a future path. A secure, adequate, and more autonomous HKU based funding and support mechanism is required for space and planetary sciences given the interdisciplinary nature of our activities. We cannot rely on one-off schemes for funding like the RMGS to support our mission, vision and needs. The FoS does pay the rent for our offices in Cyberport, a key contribution that is greatly appreciated. The LSR needs a formal HKU settlement for on-going funding unless or until we get success as an Area of Excellence or if some of our other grant applications under RAISE+, ITSP and other schemes are successful. Hopefully we will have positive news to report on these if there is further annual report next year as INSPIRE. Our previous AoE was shortlisted but not ultimately successful while a new AoE proposal involving the LSR but led by Academician Prof. Guochun Zhao under DES has been submitted in preliminary form with Prof. Parker as Co-PI.

4.1 UGC Research Matching Grant Scheme (RMGS)

Our ability to function since 2021 has relied on our RMGS funding (two RMGS grants to PI Parker in rounds 1 and 4) that amounts to ~\$15million originally awarded. The entire set of RMGS funding expires in December 2024 after we successfully appealed for a deadline extension due to the effects of Covid. We hope a new HKU LSR funding and/or funding model will be in place before the end of December 2024 (several decisions on this are imminent at time of writing).

4.2. The RGC General Research Fund (GRF) and other funding including donations

Individual LSR members remain very active in winning RGC, GRF and now NSFC grants with 46 such grants over the last 6 years, including 7 LSR faculty who won grants in the 2024 GRF round relevant to this report. These 2024 GRF grants brought in \$HK6.67 million at an average of \$HK953K/grant. Winning peer reviewed competitive facility access on ground and space based observing facilities (such as FAST, Arecibo, Gemini, SALT, ESO VLT) is also a regular feature of LSR, usually worth several million HKD annually.

5. Selected Research Activities and Initiatives

Members have a vibrant, active and diverse interdisciplinary research program (see: <https://www.lsr.hku.hk/research/>). Members engage in multi-disciplinary research including high-energy astrophysics from ground-based and satellite-based detectors; space-based Earth remote sensing; atmospheric science, near Earth environment, planetary and associated geological sciences with an emphasis on terrestrial planets, and late stage stellar evolution, including planetary nebulae Cpo, supernova remnants and astrochemistry as recent HKU research, awards and press releases show. We continue to perform as a strong and vibrant interdisciplinary entity at HKU.

5.1. The Chang'E 7 Wide field Camera project (special focus)

The Lunar Astronomical Telescope (ILO-C), as one of the approved international payload missions of Chang'E 7 announced at the Wuhan Space Days in April 2024, aims to conduct lunar-based astronomical observations by installing a wide field small aperture telescope camera on the Chang'E 7 lander due to touch down in the South pole Aitken basin region of the moon above 85degrees South latitude in November 2026. By capturing visible light astronomical images, it hopes to attract public interest in lunar exploration, astronomy, and space research, thereby laying a foundation for future lunar exploration scientific missions. The principal investigator (PI) of this mission is the International Lunar Observatory Association (ILOA). To ensure the smooth implementation of the mission, ILOA has partnered with the Laboratory for Space Research at The University of Hong Kong (HKU-LSR). On 16th May, 2024, the two parties signed a Memorandum of Understanding (MOU), establishing HKU-LSR as an equal partner in the ILO-C Chang'E 7 lunar mission that now also includes the NAOC and NARIT (the National Astronomical Research Institute of Thailand).

The scientific capability of any Imager for astronomy depends on 4 key factors:

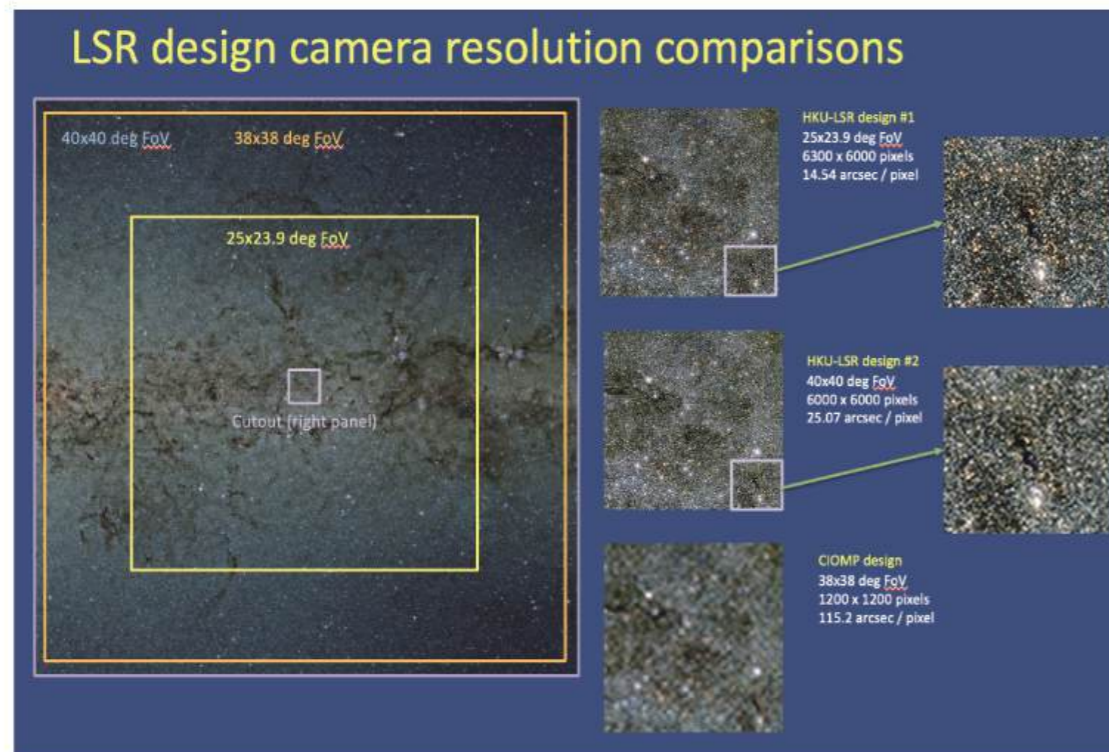
1. Light gathering power (how much light is collected)
2. Sensitivity (faintest stars that can be seen)
3. Angular resolution (how closely 2 stars can be seen as separate sources)
4. Wavelength coverage (blue to red optical range covered)

We have focused on maximizing points 1-4 for two designs we have developed that are optimized for either:

- a. Astronomical performance
- b. Maximising the Field of view

At no stage do we compromise payload technical requirements in terms of weight, dimensions and power needs. Our robust designs are based on space tested components and techniques, so the risks are much lower than for any other of the scientific Chang'E 7 international payloads most of which are specially built for Chang'E 7

Our Rationale: If you are going to the moon at the cost of billions of RMB and have a small payload it might as well be the very best that you can afford and build!



LSR simulation work on various improved camera resolution and field of view options compared with the earlier ILOA-CIOMP versions

// The science that can be delivered likewise depends on several factors:

1. How many exposures can be taken (we use 128 over the camera lifetime assumed as 7 earth days)
2. Optimal exposure time needed to avoid star trails as the camera is fixed
3. How much total sky coverage is achieved and what part of the sky, including the Milky Way is covered

Bearing all these points in mind we believe the following (non-exhaustive) science capabilities are possible with of our chosen camera options

1. Colour maps of the Milky way for KE & public outreach
2. Temporal studies of certain detectable variables/transients whose periods are well sampled during mission lifetime and for areas covered (results compatible with Chinese Antarctic Dome-A CSTAR program)
3. Sensitivity to SuperNovae explosions in any external galaxies imaged by the camera over its lifetime
4. Sensitivity to Near lunar objects that may move across parts of the FoV
5. On lunar surface crater rim sensitivity to “splash” EM radiation from meteoritic impacts

The HKU based team will be working closely with our colleagues in the lead organisation of ILOA (Steve Durst, NAOC (principally Prof. Suijian Xue) and NARIT (Dr. Wiphu Rujopakarn). We will also be liaising closely with the BISM company who have been selected to build and deliver both the test and flight mode versions of the camera to stringent DSEL specifications within a stringent cost envelope of ~\$6million HKD.

New Camera Project Team 项目团队组成

1. Prof. Steve Durst, ILOA: Payload mission lead
2. Prof. Suijian Xue, NAOC: Science advisor
3. HKU LSR camera proposal team as below



INTERNATIONAL LUNAR OBSERVATORY ASSOCIATION
ILOA Hawai'i

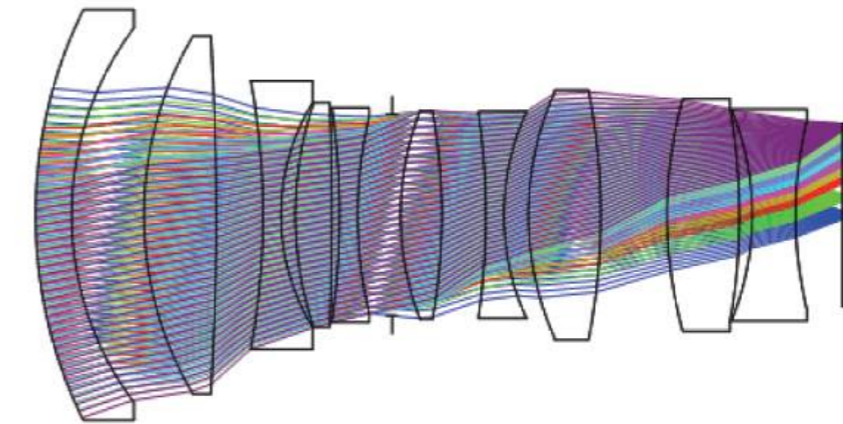
序号	成员	任务	单位
1	Prof. Quentin Parker	Science and project manager	HKU
2	Dr. Meng Su	Science and deputy project manager	HKU
3	Dr. Partha Pal	Science feasibility	HKU
4	Dr. Andreas Ritter	Technical modelling on sky	HKU
5	Mr. Rishank Dirwan	Optical engineering design	HKU
6	Mr. Kees de Kuijper	Optical design checking and performance	HKU
7	Mr. Andy Kong	Electrical engineering design	HKU
8	Dr Xian Wu	Mission Quality Assurance	HKU

HKU's project team dedicated to the mission

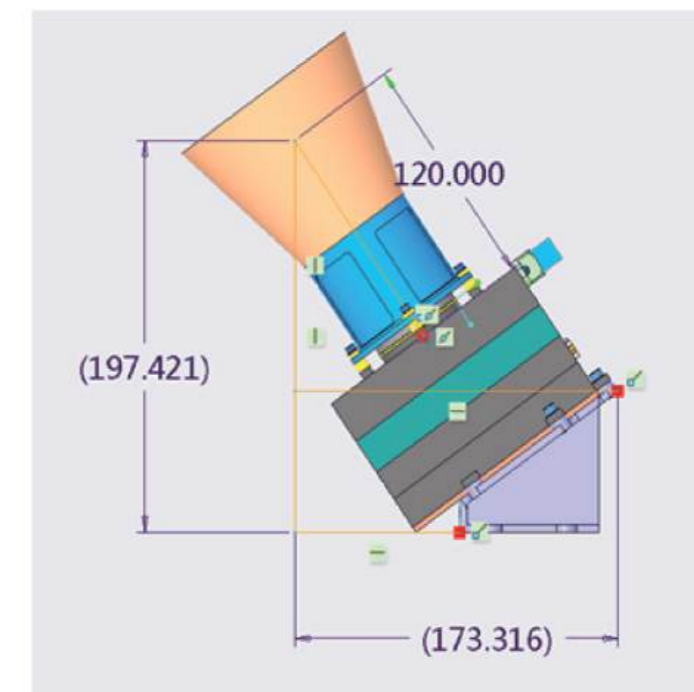
The Lunar Astronomical Telescope uses a high-sensitivity large-format color sCMOS detector with 3.45micron pixels, equipped with features such as long exposure and gain control. It can achieve second-level exposures and, combined with multi-frame stacking technology, enables high-quality astronomical observations with a transmittance of >0.83 and focal length of 40mm.

Indicator Name	Indicator Requirements	Design	Conformity
spectral range	Visible Color	Visible Color 420nm~700nm	compatible
field of view	≥19°×14°	20.0°×14.7°	compatible
effective number of pixels	≥4096×3000	4096×3000	compatible
IFOV	≤20' '	17.8' '	compatible
Sensitivity(Magnitude)	≥10	10	compatible
Signal-to-Noise Ratio	≥3	5.6	compatible
Number of quantization	≥10bit	≥10bit	compatible

- ▶ The ILO-C wide-field, telescope is a integrated high-precision optical camera, featuring a unified lens design, structure, circuitry and thermal control.
- ▶ The lens uses a transmissive optical system for imaging the starry sky and milky way GALAXY.
- ▶ The circuitry employs a CMOS detector to drive the sensor, receive and process images, control the camera, and interface with external systems.



Ray tracing the complex optical lens components of this fast f/2 camera.



Schematic of the full camera body;

The structure consists of three major components: the focal plane circuit assembly, the lens train, and the lens hood. The focal plane assembly uses a board-frame design, comprising the focal plane frame, signal frame, and interface frame. The design takes into account mechanical performance, EMC, heat dissipation, and ensures ease of maintenance, testing, and installation.

5.2. Major funding applications over the period

In order to continue to function the LSR needs funding. This covers posts like the LSR lab manager, IT support including curation of the LSR HASH database used by a large international community and maintaining the LSR Quantum Cube computing cluster, various research posts and travel provision in support of our key activities and even office supplies and printing this annual report! As mentioned our RMGS funding expires at the end of December 2024 and needs to be replaced by other income streams. To this end the LSR executive has been extremely active in pursuing alternative funding arrangements to keep the LSR going. The following grant proposals and schemes have been submitted and all are currently under consideration by various funding bodies.

- ▶ Green Tech Fund application – for ESG remote sensing satellite project
- ▶ RAISE+ proposal with the support of 4 Aerospace companies
- ▶ ITSP proposal for a lunar orbital satellite in collaboration with Shanghai Academy of Spaceflight Technology
- ▶ AoE bid led by Academician Guochun Zhao in DES with the LSR
- ▶ INSPIRE institute bid submitted to HKU SMT
- ▶ BICI investment opportunity
- ▶ Donor support (\$3million HKD offered in August 2024 to help with our participation in the Chang'E

7 mission)

If only a few of these efforts bear fruit they will be sufficient to maintain the LSR going forward for a few more years.

5.3. The Distinguished visitors and colloquium program report

The LSR promotes a vigorous distinguished visitor scheme with up to \$HK23K funding per visit to cover airfares and accommodation if required. We have had 5 distinguished visitors for 2024: Mr. Zhao Chuandong (Taikonaut); Prof. Sun Kwok, Prof. Jean-Paul Kneib, Prof. Richard de Grijps, Prof. Yulin Deng

See: <https://www.lsr.hku.hk/research/fos-lsr-distinguished-visitor-scheme/>



Academician Prof. Yulin Deng from BIT giving a distinguished visiting Prof. colloquium at the LSR 16th May 2024

The LSR colloquia are normally on Friday afternoons and followed by Cheese and Wine. We have hosted 8 speakers over the reporting period as follows:

1. Mr. Zhao Chuandong, October 19th 2023
Chinese trained Taikonaut, Beijing, PRC
Title: How to leverage the advantage of HKs unique position under “One country two systems” for Aerospace
2. Dr. Connor Bottrell, November 3rd 2023
ICRAR, University of Western Australia
Title: Mini mergers with major consequences for star forming galaxies

3. Professor. Sun Kwok, November 24th 2023

University of British Columbia & Hong Kong (emeritus Professor)

Title: Complex Organics in Space: a changing view of the cosmos

4. Professor. John-Paul Kneib, December 5th 2023

Professor of Astrophysics, Director, EPFL Laboratory of Astrophysics

Title: Digital Cosmology – Decoding the Universe

5. Dr. Jeremy Lewis Smallwood, December 8th 2023

Distinguished Postdoc Fellow, Academia Sinica Institute for Astronomy & Astrophysics Taiwan

Title: The stellar environment's influence on protoplanetary discs and planet formation

6. Professor Richard De Grijs, December 12th 2023

Macquarie University, Sydney, Australia & International Space Science Institute–Beijing, China

Title: Unveiling the complexities of massive star clusters

7. Prof. Yulin Deng, May 16th 2024

Chair professor at the School of Medical Technology and Institute of Engineering Medicine, Director of the Institute for Space Biology and Medical Engineering at the Beijing Institute of Technology

Title: Integration of medicine and engineering, Transformation of space Aerospace biomedical engineering and its translational applications.

8. Dr. Gaurav Singh, August 12th 2024

Post Doctoral Fellow, National Astronomical Observatories, Chinese Academy of Sciences (NAOC)

Title: Astronomy from the Moon: Role of LUT onboard Chang'E-3

See: <https://www.lsr.hku.hk/activities/lsr-colloquium-series/>

6. Collaborations and Partnerships

Our ability to function since 2021 has relied on our RMGS funding (two RGMS grants to PI Parker in rounds 1 and 4) that amounts to ~\$15million originally awarded. The entire set of RMGS funding expires in December 2024 after we successfully appealed for a deadline extension due to the effects of Covid. We hope a new HKU LSR funding and/or funding model will be in place before the end of December 2024 (several decisions on this are imminent at time of writing).

6.1. MoUs and agreements signed over the reporting period

Nine MoUs and agreements were signed over the 2023-2024 reporting period including one renewal. In Chronological order they are:

12 Oct 2023: MoU between HKU-LSR and Xiamen Municipal Bureau of Science and Technology

19 Oct 2023: MoU between HKU-LSR and Chengdu ADASPACE Technology Co. Ltd

18 Dec 2023: 2024 National Natural Science Foundation of China and Research Grants Council of Hong Kong Joint Research program Application Agreement

9 Jan 2024: MoU on Hong Kong / Shenzhen Joint funding Scheme for 2023 – 2024 MoU on Project Co-operation Application

18 Apr 2024: MoU between HKU (LSR) and Beijing Genshu Technology Co Ltd

6 May 2024: MoU between HKU (LSR) and Beijing Institute of Technology, Research Center for Smart Aerospace Information Systems and Science

6 June: MoU between HKU-LSR and CAS Space Technology Co. Ltd

14 Jun 2024: MoU between HKU (LSR) and International Lunar Observatory Association Hawai'i (ILOA)

30 Jul 2024: Renewal MoU between HKU's LSR and The Beijing Institute of Space Mechanics and Electricity (BISME)

7. LSR delegation visits at home and abroad

The LSR hosted 9 important delegation visits and also visited 12 Mainland groups during the reporting period as detailed below.

7.1 Visits to the LSR

The LSR hosted 9 important delegation visits and also visited 12 Mainland groups during the reporting period as detailed below.



*Xiamen municipal government visit to LSR for MoU signing 12 Oct. 2023 as precursor to MoU
Shenzhen Polytechnic University 9th January 2024 – no photo available*



JTSpace visit 10th January 2024 to discuss RAISe+ proposal



Asirius Tech Aerospace company visit 12th April to discuss RAISe+ proposal



AdaSpace 22nd September 2023 and 19th March 2024 to discuss RAISe+ proposal



CAS-Space visit to combined LSR-OASA delegation to discuss collaboration and cooperation opportunities – June 4th 2024



Combined BIT, ICC and OASA delegation visit to the LSR, 16th May 2024



Dr. Sadjadi giving an introduction to the LSR to DVC Prof. yang WANG of HKUST on June 25th 2024 – fact finding visit

7.2 Visits to the LSR



Star Vision delegation visit to LSR 17th July 2024 to discuss RAISe+ proposal



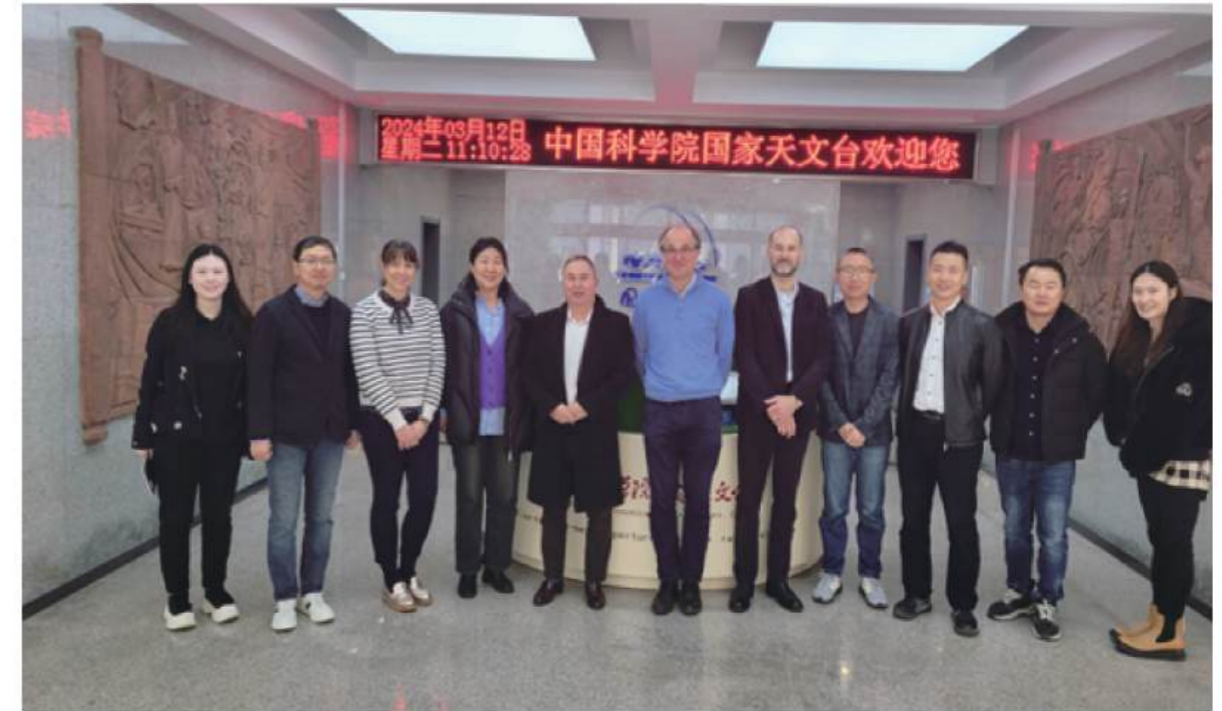
LSR executive delegation visit to Asia-Pacific Space Cooperation Organization (APSCO) in Beijing to explore cooperation opportunities 3rd February 2024.



LSR executive delegation visit to China Space Foundation in Beijing 3rd February 2024.



LSR executive delegation visit to NSF in Beijing 3rd February 2024



LSR visit to NAOC and Space Debris team Beijing with EPFL delegation 12th March 2024



LSR executive visit to Tsinghua University, Beijing 12th March 2024



LSR executive delegation visit to JTSpace in Beijing 13th March 2024



LSR visit to BIT and Prof. Yuln Deng, Beijing 13th March 2024



LSR executive visit to CAS Space Beijing for MoU signing 13th June 2024 – can provide launch capability for our planned RAISe+ remote sensing satellites



LSR visit to DFH Beijing 22nd April



DFH visit Beijing to continue discussion on future co-operation 29th June 2024 around green carbon remote sensing satellites



ICC visit Beijing to discuss possible Education forum at HKU 29th June 2024



LSR visit to DFH Beijing 22nd April

8. Selected Contributions and Achievements from LSR members

Firstly, all our latest achievements, awards, science results and contributions to the national and international science scene are kept updated on our website: <https://www.lsr.hku.hk/news-events/>

(RTHK) Hong Kong's role in space development
 Prof Parker shared his views on Hong Kong's role in space development in the program "Backchat" of RTHK. The podcast was ...
 JUNE 12, 2024 [READ MORE](#)

(HKCNA) Foreign scientists discuss China's "far side of the moon" mission: "Highly challenging" and compensates for humanity's shortcomings in lunar exploration.
 Prof Parker pointed out in an interview with the HKCNA on June 6th that landing on the far side of the moon is already ...
 JUNE 11, 2024 [READ MORE](#)

(HKCNA) Tong Shuo: Hong Kong Racing to the Moon
 Prof Parker has expressed his view on the article "Hong Kong Racing to the Moon". He believes that Hong Kong can play an ...
 JUNE 11, 2024 [READ MORE](#)

(Chengdu Science Association) Set out in the rain! Chang'e 6 went to the back of the moon to "dig soil".
 In the article published by Chengdu Science Association on May 11, 2024, Professor Quentin Parker congratulates the ...
 MAY 11, 2024 [READ MORE](#)

(China Daily) International cooperation a highlight of China's space program
 Prof Parker's article "International cooperation a highlight of China's space program" was posted on China Daily on May 9, ...
 MAY 09, 2024 [READ MORE](#)

(HKU Press) HKU Geologists Reveal Mysterious and Diverse Volcanism in Lunar Apollo Basin, Chang'e-6 Landing Site
 A paper published in Earth and Planetary Science Letters, Dr YUQI QIAN, Professors JOSEPH MICHALSKI and GUOCHUN ZHAO from ...
 MAY 08, 2024 [READ MORE](#)

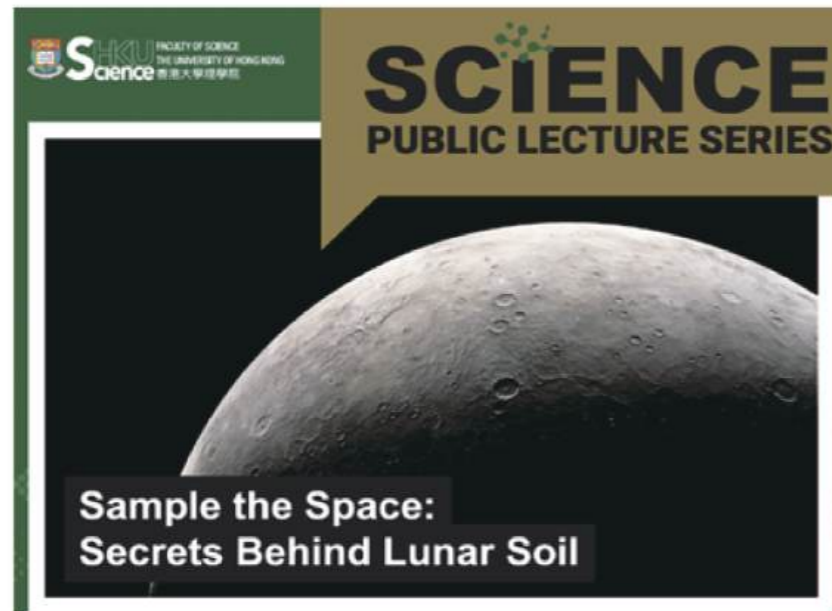
(TVB) Closer look: Lunar exploration project
 The Hong Kong University Laboratory for Space Research (LSR) was interviewed by the television program "Closer look" and the ...
 MAY 09, 2024 [READ MORE](#)

(TKP) 48-Hour Adventure on the Moon: Discovering Radon Gas and Water Sources
 LSR member Dr. Yuqi Qian, has been interviewed by TKP and has been posted on 3 June, 2024. He hoped to quickly apply for ...
 JUNE 03, 2024 [READ MORE](#)

Dr. Alfred Amruth was honorably mentioned in the 2023 IAU PhD Thesis Prize
 LSR member Dr. Alfred Amruth represented Hong Kong and was honorably mentioned in the 2023 IAU PhD Thesis Prize. His thesis ...
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Public Lecture invitation on 12 Oct – Sample the Space: Secrets Behind Lunar Soil

OCTOBER 06, 2023

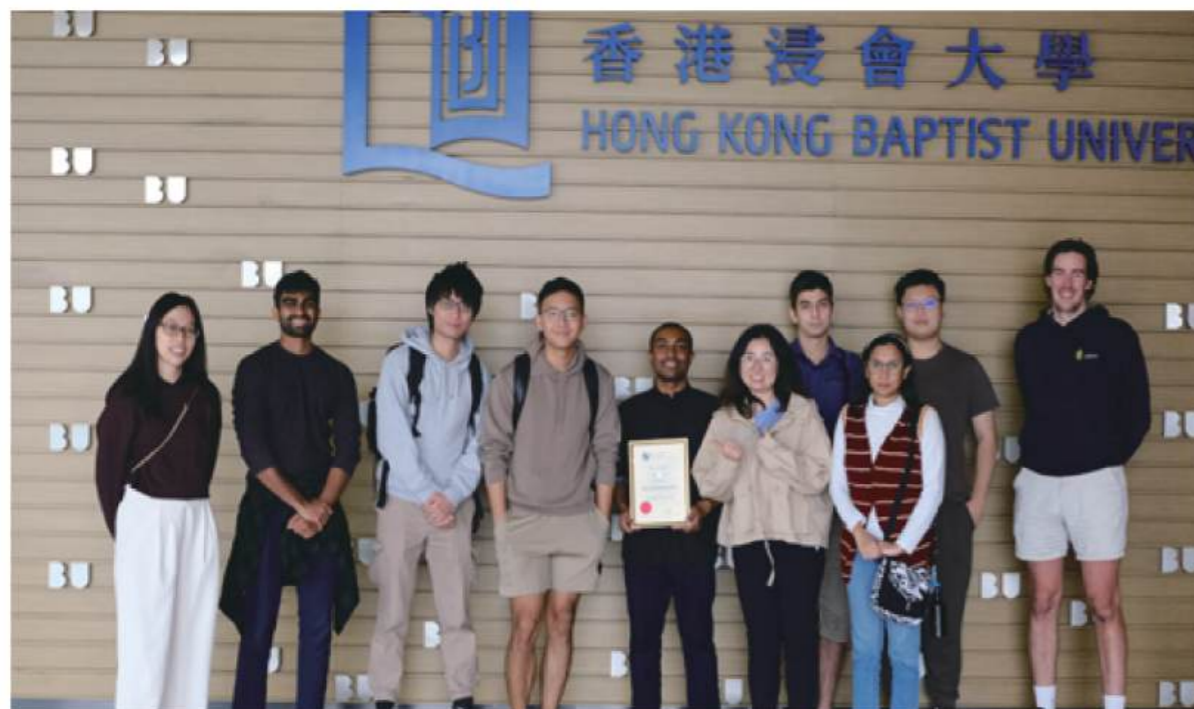


All the people are cordially invited to attend the following HKU Science Public Lecture on October 12, 2023, in which Dr Yuqi QIAN from the Department of Earth Sciences will enlighten us on how lunar samples help us unveil the secrets of the moon.

Below please find the details:

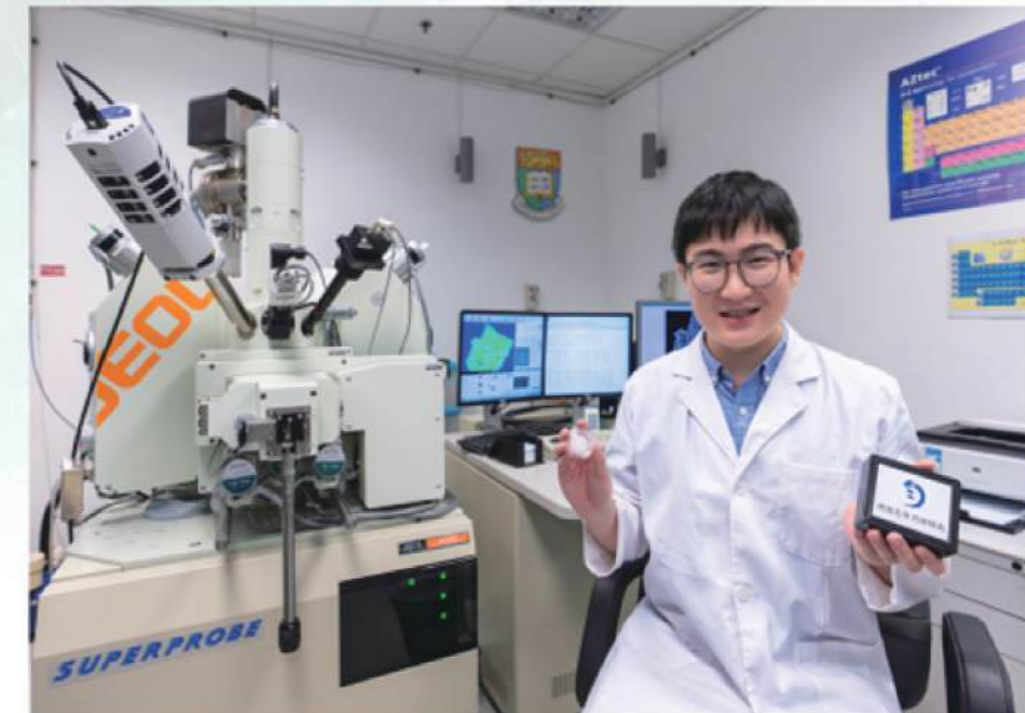
Sample the Space: Secrets Behind Lunar Soil

Speaker: Dr Yuqi QIAN, PhD
 Postdoctoral Fellow of the Department of Earth Sciences at HKU
 Member of Laboratory for Space Research at HKU



LSR member Dr Alfred Amruth receiving the 20234 Young Scientist Award in Physical/mathematic Science on December 2nd 2023.

BUDDING PLANETARY GEOLOGIST BECOMES HONG KONG'S FIRST RESEARCHER TO UNVEIL MOON'S VOLCANIC HISTORY WITH RETRIEVED LUNAR SAMPLES



Dr Yuqi QIAN
 Department of Earth Sciences, and Laboratory for Space Research

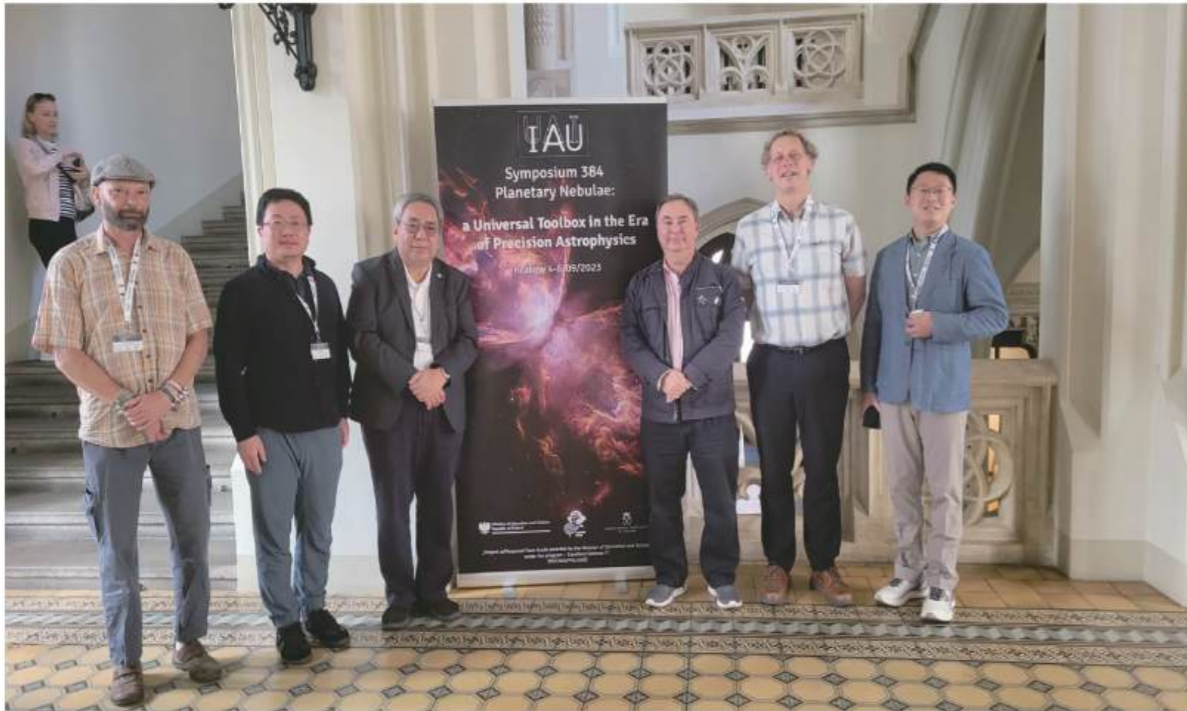
'As a budding planetary geologist, I feel fortunate to be entering my career at a time when the world is rapidly advancing its efforts to colonise the Moon.'

Dr Yuqi QIAN, Postdoctoral Fellow at the Department of Earth Sciences and the Laboratory for Space Research
 Research foci: Planetary Volcanism, Planetary Geology, Planetary Chemistry, China's Lunar and Planetary Exploration

As a child, Dr Yuqi QIAN, Postdoctoral Fellow at the Department of Earth Sciences, would gaze up at the night sky in awe, captivated by its vastness and the mysteries it held. Simultaneously, he would marvel at the Earth and its formation, wondering what secrets lay beyond our world. This sense of wonder never left him, and as he grew older, his passion for unravelling the mysteries of the universe only grew stronger. With the guidance of his supervisor Professor Joseph MICHALSKI, Yuqi formed a team in 2022 and competed for lunar soil samples collected by the Chinese lunar probe Chang'e-5 in 2020. After a rigorous selection process, in June 2023, Yuqi and his team received approval from the China National Space Administration's Lunar Exploration and Space Engineering Centre to study the lunar soil samples, which collectively weigh 822.6 milligrammes. This remarkable achievement marks the first time a research team from Hong Kong has obtained such valuable lunar samples, which hold immense value in unravelling the geological and thermal history of the Moon, as well as its connection to the formation and evolution of other celestial bodies within the Solar System.

Growing up in a small town in northern Zhejiang Province, Yuqi was fascinated by nature and space, nurturing his passion for exploration. His insatiable curiosity led him to delve into books on the origins of life and science fiction, igniting his imagination about humanity's future and our planet. These experiences inspired his deep-seated desire to study geology, a field that explores the origins and destiny of Earth and life itself.

During his undergraduate studies, Yuqi focused on studying volcanism on Earth. It was during this time that lunar and planetary science in China began to flourish, driven by the expanding Chinese lunar programme. Recognising the immense opportunities for lunar research both in China and globally, he firmly believed that these developments would pave the way for scientific and technological breakthroughs that would ultimately benefit all of humanity.



Six LSR team members participated in the IAU Symposium 384 on Planetary Nebulae “A universal Toolbox in the Era of precision Astrophysics” in Krakow, Poland from 4-8th September 2023



Prof. Joe Michalski participated in the opening ceremony of the Macau International forum on Space and Planetary Sciences, 1st November 2023.

Dr. Alfred Amruth was honorably mentioned in the 2023 IAU PhD Thesis Prize

JUNE 03, 2024



LSR member Dr. Alfred Amruth represented Hong Kong and was honorably mentioned in the 2023 IAU PhD Thesis Prize. His thesis is titled "Theoretical Predictions for Observational Signatures of Granulation in Wave Dark Matter."

You can find more details on the IAU website announcement:

<https://www.iau.org/news/announcements/detail/ann24016/>

15 AUG 2024

HKU-LSR Student Team Awarded a Bronze Medal in the 2024 International Space Science and Scientific Payload Competition (ISSSP2024)



A team of dedicated undergraduate astronomy enthusiasts from the Faculty of Science has earned a bronze medal in the International Space Science and Scientific Payload Competition (ISSSP2024). Their commitment to presenting creative space experiments, leading to potential scientific and technological breakthroughs for mankind, is truly inspiring. Their project, which focuses on space sustainability, is a testament to their innovative thinking. Their approach to cleaning up space debris and promoting a sustainable space environment in response to the so-called 'Kessler Syndrome' is impressive. Under the supervision of the Laboratory for Space Research, the team theorised the use of electromagnets and LASERs to de-orbit space debris, a solution that not only promotes space sustainability but also safeguards astronauts' lives during space missions.

The bronze medal serves as a recognition of their innovation and recognises their hard work in contributing to the aims of a sustainable space future for humanity. More importantly, they are invited to join the International Astronautical Congress (IAC) in the coming October about responsible space for sustainability and, of course our very own HKU-LSR organised International conference on Space Sustainability to be held at HKU from December 2-4th (see: <https://ssconf.space/>)

9. Press Releases

We remain very proactive in seeking publicity for our most significant activities, research outputs and initiatives. Over the reporting period we have again had several key HKU LSR press releases that have generated news stories and significant press. LSR members have regularly featured on RTHK and other outlets amounting to 264 different items of media coverage over the period. Together the LSR led 22% of all national and international media links for the entire Faculty of Science over the reporting period. Coverage has been prominent in the Mainland, including TV, video, radio and in print.

Seven LSR Press Releases (September 1st 2023 to 31st August 2024) – a new record. Links to all the seven HKU press releases are given below.

9.1. <https://www.hku.hk/press/press-releases/detail/26746.html>

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HKU Astrophysicists Collaborates with NASA's IXPE Telescope Untangles Theories Surrounding Historic Supernova Remnant
 29 Oct 2023
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A team of international scientists, including Drs Stephen NG and Yi-Jung YANG from the Department of Physics at The University of Hong Kong (HKU), collaborated with NASA on research led by Nanjing University, utilising NASA's IXPE (Imaging X-ray Polarimetry Explorer) telescope to capture the first polarised X-ray imagery of the supernova remnant SN 1006. The new results expand scientists' understanding of the relationship between magnetic fields and the flow of high-energy particles from exploding stars. The discovery has been published in esteemed Scientific Journal *The Astrophysical Journal*.

'Magnetic fields are extremely difficult to measure, but IXPE provides an efficient way for us to probe them,' said Dr Ping ZHOU, an astrophysicist at Nanjing University in Jiangsu, China, and lead author of the new paper on the findings. 'Now we can see that SN 1006's magnetic fields are turbulent but also present an organised direction.'

// 9.2. <https://www.hku.hk/press/press-releases/detail/27089.html>


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HKU Astrophysicists Crack the Case of "Disappearing" Sulphur in Planetary Nebulae

07 Feb 2024

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Two astrophysicists from the Laboratory for Space Research (LSR) at The University of Hong Kong (HKU) have finally solved a 20-year-old astrophysical puzzle concerning the lower-than-expected amounts of the element Sulphur found in Planetary Nebulae (PNe) in comparison to expectations and measurements of other elements and other types of astrophysical objects.

The expected levels of Sulphur have long appeared to be "missing in action". However, they have now finally reported for duty after hiding in plain sight, as a result of leveraging highly accurate and reliable data. The team has recently reported their findings in *Astrophysical Journal Letters*.

// 9.3. <https://www.hku.hk/press/press-releases/detail/27295.html>


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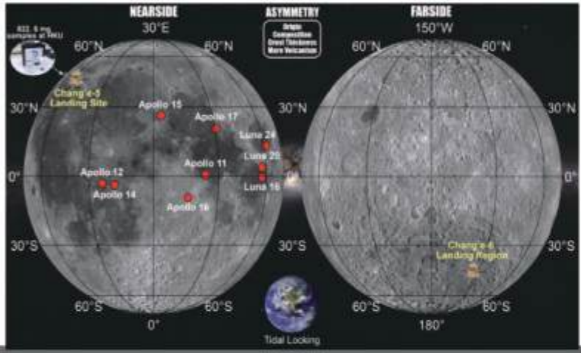
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HKU Geologists Reveal Mysterious and Diverse Volcanism in Lunar Apollo Basin, Chang'e-6 Landing Site

07 May 2024


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The farside of the Moon is a mysterious place that is never visible from the Earth. The most remarkable feature of the Moon is its asymmetry between the lunar nearside and farside in composition, crust thickness, and mare volcanism. Scientists have not yet reached a consensus on the origin of the lunar asymmetry due to the lack of farside samples, which is one of the most significant remaining question of lunar science. Chang'e-6 mission, launched on May 3, 2024, currently heading to the Moon, is the world's first lunar farside sample-return mission. It aims to return ~2 kg lunar soils to the Earth from the southern mare plain of the Apollo basin within the South Pole-Aitken basin, the largest impact feature in the Solar System. These samples contain enormous scientific potentials that can be used to solve the lunar dichotomy conundrum and even reshape human's knowledge of our closest neighbour.

// 9.4. <https://www.hku.hk/press/press-releases/detail/27288.html>


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Asia-Pacific Regional IAU Meeting to be held in Hong Kong in March 2026

06 May 2024 Download All Photos




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The Asia-Pacific Regional IAU Meeting (APRIM), an international meeting of the International Astronomical Union (IAU), will be held in Hong Kong in the spring of 2026. The final decision was made by the IAU Executive Committee at their Meeting in Helsinki on April 25, 2024, and transmitted to the proposers based at the Laboratory for Space Research (LSR) at The University of Hong Kong (HKU) on the same day. This marks the first time that the APRIM is being held in the Hong Kong Special Administrative Region (HKSAR), following the IAU General Assembly held in Beijing in 2013.

Established in 1919, the International Astronomical Union (IAU) is the leading international astronomical organisation that brings together more than 12,000 professional astronomers from over 85 countries.

Taking place once every three years, APRIM is one of the largest regional meetings of the IAU, where astronomers from countries across the Asia-Pacific region (and often beyond) gather to discuss common interests, developments and latest research results.

// 9.5. <https://hku.hk/press/press-releases/detail/27344.html>


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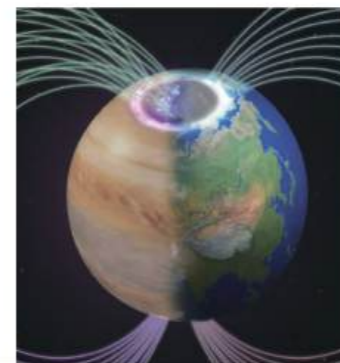
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Cosmic Light Shows Decoded: HKU Space Scientists Unravel the Unified Framework for Diverse Aurorae Across Planets Unlocking Pathways for Better Space Weather Prediction

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The awe-inspiring aurorae seen on Earth, known as the Northern and Southern Lights, have been a source of fascination for centuries. Between May 10th and 12th, 2024, the most powerful aurora event in 21 years reminded us of the stunning beauty of these celestial light shows.

Recently, Space physicists from the Department of Earth Sciences at The University of Hong Kong (HKU), including Professor Binzheng ZHANG, Professor Zhonghua YAO and Dr Junjie CHEN, along with their international collaborators, have published a paper in Nature Astronomy that explores the fundamental laws governing the diverse aurorae observed across planets, such as Earth, Jupiter and Saturn. This work provides new insights into the interactions between planetary magnetic fields and solar wind, updating the textbook picture of giant planetary magnetospheres. Their findings can improve space weather forecasting, guide future planetary exploration, and inspire further comparative studies of magnetospheric environments.

// 9.6. https://www.hku.hk/press/news_detail_27458.html


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HKU and ILOA Signed MoU to Partner on the ILO-C Chang'E-7 Moon Lander Mission Launching 2026
 20 Jun 2024
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The Laboratory for Space Research at The University of Hong Kong (HKU-LSR) signed a Letter of Intent (LoI) with the International Lunar Observatory Association Hawai'i (ILOA) on May 16 2024, establishing an equal partnership to participate in one of the ILOA-led Chang'e 7 lunar missions - a small, wide-field optical telescope named ILO-C. The HKU-LSR telescope design has been formally chosen, and work has begun in earnest. ILO-C will be installed on the approved Chang'E-7 lunar lander in 2026.

A formal MoU signing for broader future cooperation for lunar exploration and education took place in Beijing on June 14. The Founding Director of the mission lead organisation, Steve Durst of ILOA Hawai'i, signed with the Director of the HKU-LSR, Professor Quentin PARKER. Group leader of Sky Survey from the National Astronomical Observatories of Chinese Academy of Sciences (NAOC) Suijian XUE and the National Astronomical Research Institute of Thailand (NARIT) have also joined this MoU under observer status with the intention for its collaboration on the project to expand in the future. The ILOA-HKU partners intend to produce the best possible cost-effective, small wide-field telescope camera for Chang'E-7. This will be in terms of functionality and scientific capability for Milky Way and Galaxy centre imaging from the Moon and for science and education.

// 9.7. https://hku.hk/press/news_detail_27621.html


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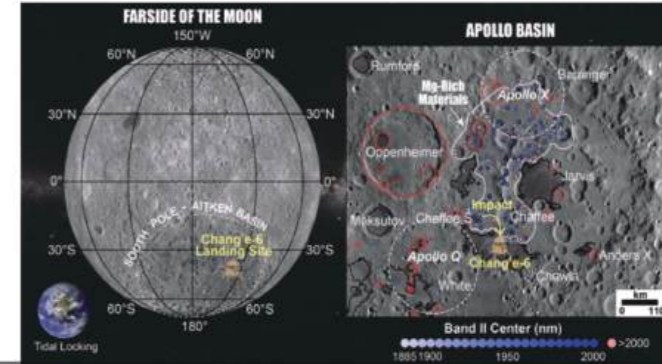
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HKU Geologists Discover Hidden Magmatism at the Chang'e-6 Lunar Landing Site, Shedding Light on Solving Fundamental Scientific Questions Relating Early Evolution of the Moon
 27 Aug 2024
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Lunar igneous activities including intrusive and extrusive magmatism, and their products contain significant information about the lunar interior and its thermal state. Their distribution is asymmetrical on the nearside and farside, reflecting the global lunar dichotomy. In addition to previously returned lunar samples all from nearside (Apollo, Luna, and Chang'e-5), samples from the South Pole-Aitken (SPA) basin on the farside have long been thought to hold the key to rebalancing the asymmetrical understandings of the Moon and disclosing the lunar dichotomy conundrum.

10. Selected Knowledge Exchange, community service and outreach activities

The LSR prides itself on its outreach, Knowledge Exchange and community service activities. We believe these are an important part of our mission to educate and influence students and the public more broadly in Astrophysics, Space and Planetary Sciences and related activities including the emerging NewSpace economy and “astropreneurship”



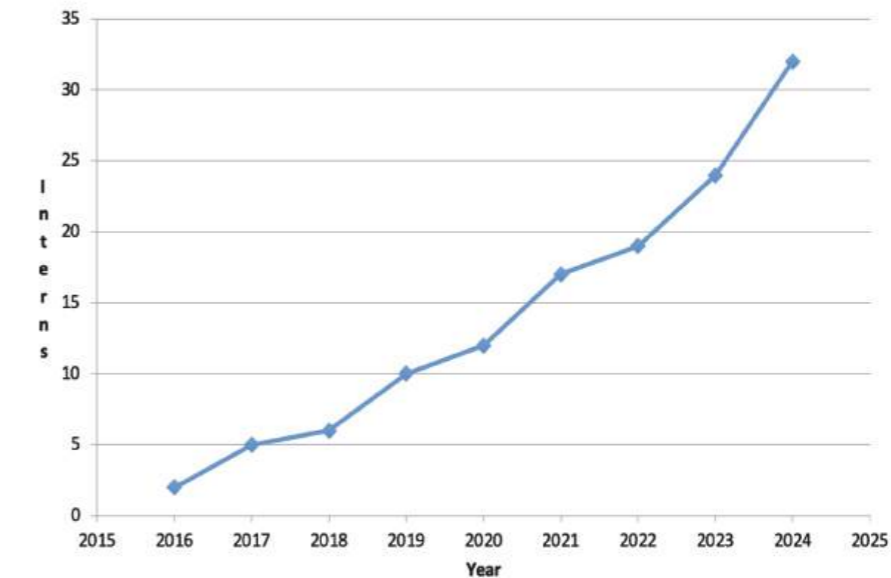
LSR St. Pauls convent school talk on the importance of STEM 29th May 2024

10.1 The LSR summer Research Internship Program

We again remain very proactive in this important Knowledge exchange and outreach area. The LSR research internship program is perhaps the most robust such program at HKU. It has grown rapidly since inception in 2016 with our first two interns to reach a new maximum this summer June-August 2024 of 32, a big 33% increase since 2023. We do not advertise this program so all this growth is by word of mouth. We accept students from STEM subjects such as physics, maths, computing and engineering as befits the interdisciplinary nature of the LSR. Student projects cover work on computer simulations and aerospace design (for CubeSats), late-stage stellar evolution and high-energy astrophysics. Our LSR internships also offer our research staff valuable short-term research support. We have hosted 139 interns since 2016 for periods of between 2-3 weeks and 3 months. Interns come from local high-schools and international schools, HKU (Laidlaw Scholar) and local universities but also from top universities

overseas. This year we welcomed 9 mostly undergraduate interns from the U.K. (Oxford x 2, ICL and Bristol, Dauntsey and Caterham schools), USA (John Hopkins, Kent School), Canada (Waterloo) and 4 from the Chinese Mainland). Special thanks this year to LSR members Dr. Partha Pal, Dr. Andreas Ritter, Dr. Abdi Sadjadi, Mr. Andy Kong and Mr. Rishank Diwan for supervising up to 6 interns each over the summer.

LSR Summer Interns 2016 to 2024



Plot showing the growth of the LSR internship program from its inception in 2016 up to the current reporting period in 2024. We really have now “maxed out”. No further LSR intern growth is possible within the resources available.



Welcome event for some of our summer LSR interns July 5th 2024

Name	Status	Discipline	University/School	Year	LSR supervisor	Dates	#
Ruize Hong	Undergraduate	Applied Physics	Hefei University of Technology	2024	Ziggy	June 3 - August 31	106
Jiaxu Zhang	Postgraduate	Information and Communication System	Sun Yat-sen University	2024	Abdi	April 8 - August 31	107
Ge Zhang	High School	Astronomy	HD Ningbo School	2024	Rishank	July 7 - August 31	108
Tim Soomin Colpaert	Diploma	Astronomy	Discovery College	2024	Andy	July 1 - August 2	109
Ruyi (Sienna) Zhang	High School	Astronomy	UWC Changshu China	2024	Rishank	July 20 - August 15	110
Zhibin (Alexander) You	Undergraduate	Physics	Johns Hopkins University	2024	Partha	June 1 - August 24	111
Wang Dik LEUNG	High School	Astronomy	Island School	2024	Abdi	July 1 - August 2	112
Athena Tang	High School	Astronomy	Kent School (USA)	2024	Abdi	Start at late June or August	113
Samantha So	High School	Astronomy	Hayward High School	2024	Abdi	June 10 - August 10	114
Boyan Cheng	High School	Astronomy	ESF Discovery College	2024	Andy	July 1 - August 9	115
Tsz Shing (Jason) Zhou	High School	Astronomy	St. Paul's College	2024	Andy	June 1 - August 31	116
Jerry Zong	High School	Astronomy	Chinese International School	2024	Rishank	July 16 - August 24	117
Aidan Tang	High School	Astronomy	Caterham School, Surrey, United Kingdom	2024	Ziggy	July 15 - August 16	118
Janey Wang	Undergraduate	Physics	University College London	2024	Partha	June 1 - September 3	119
Oscar Yin Kwan Li	Undergraduate	Physics	University of Oxford	2024	QAP/Ziggy	July 1 - September 30	120
Natalie Berry	Postgraduate	Physics	University of Bristol	2024	QAP/Ziggy	June 10 - September 1	121
Nina Lievore	High School	Astronomy	French International School of Hong Kong	2024		June 17 - June 21	122
WONG Chit Lun, Lucas	High School	Astronomy	National Mathematics & Science College UK	2024	Abdi	July 2 - July 22	123
Kam Ling CHAN, Kamila	PHD	Astronomy	HKU	2024	QAP	June 1 - August 31	124
CHEUNG Julien Chun Hei	High School	Astronomy	German Swiss International School	2024	Ziggy	Jun 22 - Jul 26; Aug 9 - 14	125
Alvin Chan	High School	Astronomy	Dauntsey's School (UK)	2024	Andy	Aug 3-31	126
ROXANNE FUNG (LOK CHING, FUNG)	Postgraduate	Physics	University of Oxford	2024	Partha	July 1 - August 9	127
Zilin Yue	Undergraduate	Mathematics	University of Waterloo	2024	Rishank	Anytime	128
Ruiyang Xie (Sheryl)	Undergraduate	Physics	HKU	2024	Partha/QAP	May 20 - August 31	129
Yongqi Yao	High School	Astronomy	Han Academy	2024	Andy	July 22 - August 12	130
Bocheng Xiao	PHD	Machine learning	HKU	2024	Andy	June 11 - October	131
Christopher Yue	High School	Astronomy	Hong Kong International School	2024	Partha	June 19 - August 1	132
Josh Tsang	High School	Astronomy	International Christian School	2024	Rishank	June 17 -25; July 8 - August 8	133
Yuxuan Yuan	Undergraduate	Astronomy	University of Science and Technology of China	2024	Partha	July 13 - August 20	134
Julia Xie	Postgraduate	Physics	Imperial College London	2024	Ziggy	July 1 - September 20	135
Harry Yeh	High School	Astronomy	Shekou International School	2024			136
Wendy Tsang	High School	Astronomy	Prior Park College	2024	Ziggy	July 17 to August 29	137
Yichuan Zhang	Undergraduate	Physics	HKU	2024	QAP	now	138
Zhang Mohan	High School	Astronomy	The Experimental School Attached to Beijing Normal University	2024	Partha	Anytime	139
Sreyashi Ganguli	Undergraduate	Aerospace Engineering	Hong Kong University of Science and Technology	2024	Partha/Rishank/Andy	September - December	140

List of 32 LSR Interns for Summer 2024. (13/32 are from outside of HK SAR and 10 are undergraduates/postgraduates – with 9 from outside HK)

// Report from three 2023 LSR interns in their own words:

1. Roxanne Fung, Undergraduate intern, University of Oxford, UK.

I am so happy to work with my supervisor Dr. Partha. Under his guidance, I not only learned about the structure and behavior of active galactic nuclei (AGN) and their related phenomena, but also acquired valuable data analytic skills like advanced curve fitting and Markov Chain Monte Carlo (MCMC) techniques. One of the highlights of my work was successfully determining the periods of 11 different

AGN using various methods, including MCMC and Lomb-Scargle Periodogram (LSP) analysis. This accomplishment gave me a great sense of pride and achievement. These data analytic skills will be beneficial to me in the future, as the ability to develop accurate and robust models is crucial to the field of AI and its related advancements, which I am deeply interested in pursuing. The working environment at LSR has been a pleasure to be a part of. The atmosphere is relaxing and welcoming, with all of my colleagues being friendly, supportive, and eager to share their knowledge and expertise. I particularly enjoyed the discussions and scientific experiments led by Dr. Andy, who provided insights into the relationship between AI and astronomy. The collaboration between LSR and OASA has provided interns with numerous opportunities to engage in hands-on, out-of-classroom learning experiences. Furthermore, the strong linkage between LSR and various Chinese universities has allowed interns to delve into the developments in the space industry within China. The tranquil setting of Cyberport, situated along the coastline and surrounded by natural environments, has created an incredible workplace.

2. Christopher Yue, Senior High School Student, Hong Kong International School

In this internship, I have learned so much. Besides from each of the concepts behind the methods that I mentioned earlier, I also improved on so many other things, too. I felt myself getting better and better and coding the more the internship went on. There were so many times when my code wasn't working and completing the code seemed impossible, but I stuck to it, and eventually all of my code was completed. My problem solving skills, resilience, and analytical skills were all put to use, and I feel I have grown in all three of these areas. In addition, my general understanding of astrophysical phenomena such as Active Galactic Nuclei was increased. I have also improved on some other skills too, such as my ability to communicate and work with my supervisors and fellow interns. I highly recommend this internship to anyone who is passionate about both physics and programming. This internship provides a great mix of both. The environment is good to work in, and I think that anyone would learn a lot from this experience.

3. Zhang Mohan, Experimental High School Attached to Beijing Normal University

The internship in LSR is an unforgettable experience for me. I acquired skills like academic writing and Python data processing. I learnt the methods of curve fit and Lorentzian function. I also learnt more about scientific research in the field of astronomy and wrote a report about the AGN periodicity analysis. What's more, I get to know a group of extraordinary scientists, who are not only the best researchers, but also the best mentors. I'm very grateful to have such a great experience here.

10.2 Support of HK's first NewSpace conference under the auspices of OASA – Cyberport October 2023



Left: Mr Andy Kong explaining CubeSats to an onlooker at the LSR and Feilong Aerospace & Technology Co.Ltd booths at the NewSpace 'Tomorrow's Technology Today (TTT)' meeting held in Cyberport on 23rd 2023 – an event co-sponsored by the LSR.



Signing the OASA Tomorrow's Technology Today welcome board

10.3 Major conferences to be run by the LSR in 2024-2026

10.3.1 A Major coup – Our HKU-LSR bid and won right to host major IAU APRIM2026 in HKSAR in 2026

Asia-Pacific Regional IAU Meeting to be held in Hong Kong in March 2026

MAY 08, 2024



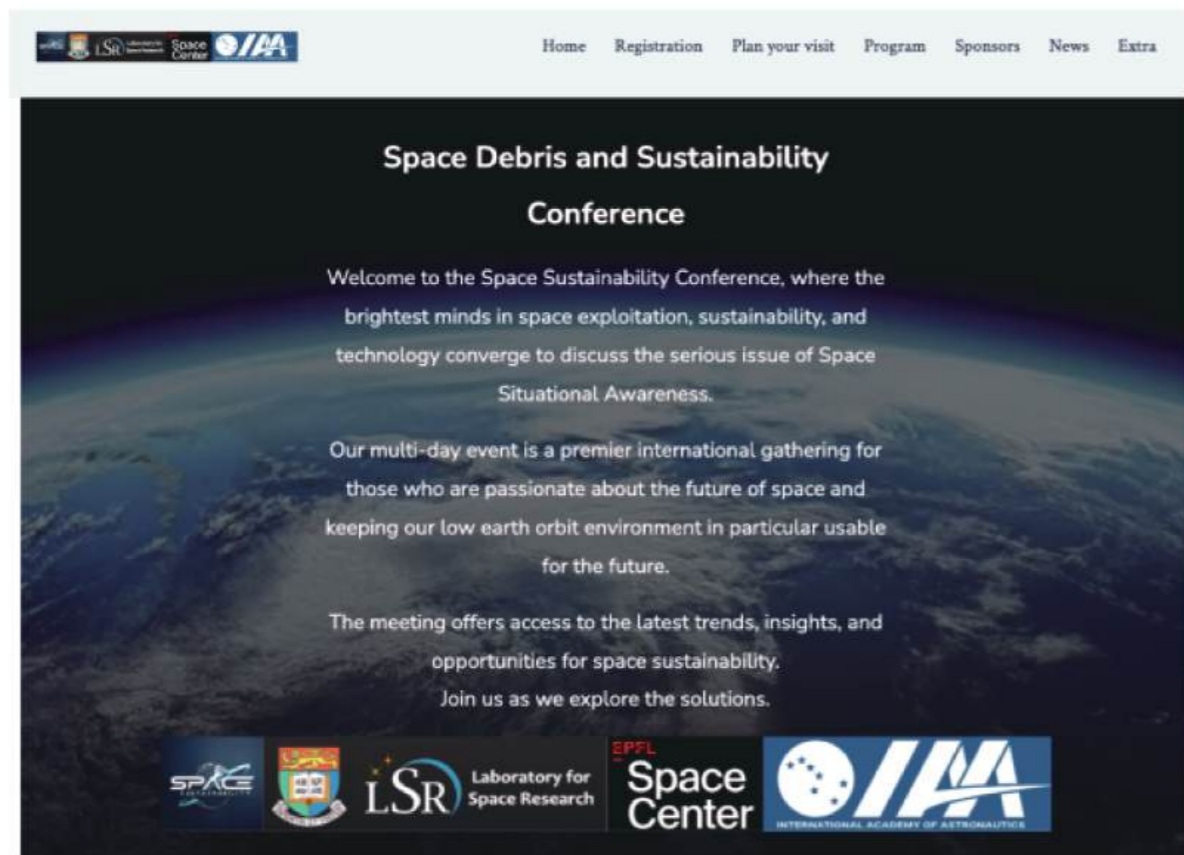
The Asia-Pacific Regional IAU Meeting (APRIM), an international meeting of the International Astronomical Union (IAU), will be held in Hong Kong in the spring of 2026. The final decision was made by the IAU Executive Committee at their Meeting in Helsinki on April 25, 2024, and transmitted to the proposers based at the Laboratory for Space Research (LSR) at The University of Hong Kong (HKU) on the same day. This marks the first time that the APRIM is being held in the Hong Kong Special Administrative Region (HKSAR), following the IAU General Assembly held in Beijing in 2013.

Established in 1919, the International Astronomical Union (IAU) is the leading international astronomical organisation that brings together more than 12,000 professional astronomers from over 85 countries.

Taking place once every three years, APRIM is one of the largest regional meetings of the IAU, where astronomers from countries across the Asia-Pacific region (and often beyond) gather to discuss common interests, developments and latest research results.

Each meeting is attended by 500 to 1,000 people, making it the second-largest international meeting on astronomy in the world after the IAU General Assembly. The first APRIM was held in New Zealand in 1978 and since then, the meeting was regularly held until the COVID-19 pandemic forced APRIM 2020 in Australia to be cancelled. Normal service resumed with the 2023 version was held in Koriyama, Fukushima Prefecture in Japan in the summer of 2023.

// 10.3.2 Space Debris and Sustainability Conference HKU Dec 2-4 2024



Our space sustainability conference now has the support of the International Academy of Astronautics as an official IAA event

10.4 LSR Research Jamboree and XMAS Party Dec 15th 2023

The LSR ran another very successful combined research jamboree and Xmas party – the 3rd such event which is now a firm favourite in our calendar. About 25 LSR members and 4 guest from PolyU and CityU enjoyed about 2 hours of quick-fire sparkler research talks from students, postdocs and faculty followed by prize giving and then the XMAS party.



FINAL VERSION

The LSR's 3rd Research Jamboree & XMAS Party

With special guest appearances from CityU & PolyU

Friday 15th December 2023 starts 3:00pm sharp!

Venue: Cyberport 4, Block A, 4/F

FINAL Program: Each "Sparkler" talk is 5mins (inc. 1min for questions)

Session 1 - Faculty/PDFs

3:00	Introductions and "The LSR - where to next?"	Speaker Quentin Parker (MC)
3:10	Removing Singularities in Numerical Relativity -CityU guest	Moritz Reinjes
3:15	Are PNe aligned across the Galaxy?	Andreas Ritter
3:20	Science & astronomy communication with TV & multimedia in HK	David Hoi Fung Yu
3:25	Lunar Lava Tube: A Habitat for All	Yuqi Qian
3:30	AstrOI - the importance of alcohol in Space	A. Sadjadi (Abdi)
3:35	Searching for Binary Candidates in Fullerene Planetary Nebula	Chih-Hao Hsia
3:40	Decade of heat-pipe Earth hypothesis: implications for terrestrial planets	Alex Webb
3:45	A rare planetary analog: very fine particulates overlying basalt	Shawn Wright

3:50 - 4:00 Short "Bio" Break (10 mins)

Session 2 - PhD/MPhil/RA/intern

4:00	Misnomers in Astrophysics	Speaker Andy Kong (RA)
4:05	AI/ML discovered & Confirmed PNe in the Galactic Bulge	Yushan Li (PhD)
4:10	The sulfur Anomaly in PNe - a solution at last?	Shuyu Tan (RA)
4:15	On relativistic dissipation & shock waves - CityU guest	Adhiraj Chaddha (PhD)
4:20	HKU's 6U Mev CubeSat	Rishank Diwan (RA)
4:25	Harnessing Power of LiDAR for Wildfire Fuel Characterization in HK	Katie Strattman (PhD)
4:30	Hunting for Central Stars of Planetary Nebulae	Shiyu Yue (RA)
4:35	Stellar phase transitions in General Relativity - CityU guest	Ruochen Xia (PhD)
4:40	Identifying CSPN from confirmatory spectroscopy	Eugene Shang (intern)
4:45	Enhancing GNSS ppp optimization with priori info - PolyU guest	Jung Wu (PhD)
4:50	The Drake Equation revisited	Hao Yang Yuan (MPhil)
4:55	END	

~5:00 Wrap-up QAP; Prize ceremony and presentations for 3 best postgraduate/RA talks

Talk Judges for RA, PhD, MPhil & Intern talks: *Dr. Sayedabdolreza Sadjadi & Dr. Chih-Hao Hsia*

FOLLOWED BY OUR LSR XMAS PARTY

11. Future Plans and Opportunities



We believe our future plans for the LSR to emerge as a HKU level are well aligned with the vision for HKU as a whole. Our future depends on support from HKU senior management. Currently we are under the Faculty of Science where we need to be self-financing. We have been quite successful undertaking impactful research projects, building a respected and well recognised brand beyond HKU, maintaining good relations with our external partners and continuing to raise our profile via regular news items, initiatives and press releases we nevertheless have no secure funding stream. A few key future LSR plans, evolved from last year's report, are listed below:

- ▶ Secure meaningful long-term funding
 - this is essential if our future of the LSR as an institute is to be secured
 - We have a Beijing-HKSAR based LSR deputy director for Mainland affairs who is greatly assisting with this
- ▶ Continue to leverage our increased autonomy within the Faculty of Science via fresh MoU, agreements and Mainland linkages that are beginning to pay dividends such as our equal partnership in the ILOA Chang'e 7 lunar lander camera
- ▶ Explore opportunities for an LSR style laboratory in the GBA/Xiamen/Hangzhou via local government funding
- ▶ Seek to establish CAS-HKU joint LSR laboratory in HKU (and Shenzhen)
 - this would be only the 2nd HKU-CAS joint lab in 10 years if realised
 - If joint CAS lab is established re-brand the LSR to at HKU
 - perhaps via conversion to a proper HKU centre or AoE institute

- ▶ Consolidate existing projects and develop our space & planetary science program:
 - Secure remaining funding for our 6U CubeSat MeV Gamma-ray mission (as a pathfinder to the hoped for RMB 1 billion PANGU mission)
 - Investigate CubeSat Commercial missions including via "BEST"

Although we hope to continue to grow our capacity in terms of PDFs, RPG students, RAs and distinguished international visitors a key issue is the question of the availability of sufficient academic staff in the right areas to direct and manage the LSR. Recent recruitment of a key Space Scientist Dr. Zhongua Yao into DES in August 2023 under the HKU 100 talents scheme is a key, positive development. If an LSR HKU level institute is established we will have greater freedom to recruit independently, have an RPG quota and seek to re-start the TPG MSc in Space Science.

// Opportunities for the LSR



- ▶ There are currently various formal channels for opportunities to promote cooperation in science and technology between HK SAR and the Mainland but especially in the GBA. These apply well to an entity like the LSR and we have already seized these with the recent opportunity to apply for a science payload on the Chinese Space Station. We are hopeful.
- ▶ Opportunities are arising it seems with increasing frequency including joint conferences, laboratories, research and technology projects, establishment of State Key labs in HK SAR and the GBA including 'smart city' projects from the Northern Metropolis
- ▶ These emerging strategic activities are a clear indication of the momentum to eventual fuller integration of HK SARs research infrastructure and programs into the Mainland.
- ▶ Strengthening of scientific and technological co-operation under one country two systems is also one specific advantage our LSR science and technology community can enjoy while not preventing/affecting the majority of our global scientific collaborations
- ▶ It is one that we can leverage via our special status and unique placement in this part of SE Asia to enhanced, global effect

12. Glossary of Terms

- BEST – Business Economy for Space Technology LSR led STEM initiative
- BISME – Beijing Institute of Space Mechanics and Electricity
- CAS – Chinese Academy of Sciences
- CSA – Chinese Society of Astronautics
- CCST – Chinese Survey Space Telescope
- CNNC – Chinese National Nuclear Corporation
- CSU – Center for Space Utilisation, Chinese Academy of Sciences
- DES – Department of Earth Sciences
- DFH – DFH Satellite Company Ltd.
- DSEL – Deep Space Exploration Laboratory (Tiandu Laboratory)
- EAO – East Asian Observatory
- ECR – Early Career Researcher
- ESO – European Southern Observatory
- FAST – Five Hundred Meter Aperture Telescope, Guizhou, SW China
- GBA – Greater Bay Area
- GRF – General Research Fund of RGC
- HERD – High Energy Radiation Detector
- HKU – The University of Hong Kong
- ILOA – International Lunar Observatory Association (Hawai'i USA)
- JV – Joint Venture Company
- KE – Knowledge Exchange
- LSR – Laboratory for Space Research
- MoU – Memorandum of Understanding
- NAOC – National Astronomical Observatories of China
- NARIT – National Astronomical Research Institute of Thailand
- OASA – Orion Astropreneur Space Academy
- PANGU – Pair productionN Gamma-ray Unit (a gamma-ray space telescope)
- PDF – Postdoctoral Research Fellow
- PSHK – Physical Society of Hong Kong
- RGC – Research Grants Council
- RMGS – Research Matching Grant Scheme
- RPG – Research Postgraduate
- SCMP – South China Morning Post
- SMT – Senior Management Team, HKU
- STB – Science & Technology Bureau, Xiamen
- SYSU – Sun Yat Sen University, Zuhai
- TPG – Taught Postgraduate Masters
- UDF – University Development Fund, HKU
- VLT – Very Large Telescope (ESO 8m telescopes)

13. Acknowledgments

It is a pleasure to acknowledge and thank Ms. Scorpio Rokumon Wong our LSR laboratory manager for her support during the reporting period and in helping to compile data and information for the report.

We acknowledge the wonderful support and funding from the Research Grants Council for our RMGS and GRF funds and the generous donation from the Dr. Lui family that has enabled the LSR to survive for another year with support for the Chang'E 7 lunar camera mission we are participating in.

We thank Prof. Max Shen for his strong and on-going support of the LSR. We also thank the FoS Secretary Ms. Venus Chu for her professionalism, support and understanding, especially with facilitating quick approvals. Finally, we also express our thanks to Ms. Casey To and Ms. Cindy Chan for their steadfast support of our outreach and publicity activities and to Mr. Man-Fai Lee in the FoS finance office for his excellent on-going support on financial issues.

APPENDIX I

Selected LSR research papers in top journals (in chronological order)

I.1. LSR Led paper

THE ASTROPHYSICAL JOURNAL LETTERS

OPEN ACCESS

Whither or Wither the Sulfur Anomaly in Planetary Nebulae?

Shuyu Tan¹ and Quentin A. Parker¹

Published 2024 January 31 • © 2024. The Author(s). Published by the American Astronomical Society.

[The Astrophysical Journal Letters, Volume 961, Number 2](#)

Citation Shuyu Tan and Quentin A. Parker 2024 *ApJL* 961 L47

DOI 10.3847/2041-8213/ad1ed9

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[Figures](#)
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Article and author information

Abstract

We present a thorough investigation of the long-standing sulfur anomaly enigma. Our analysis uses chemical abundances from the most extensive data set available for 126 planetary nebulae (PNs) with improved accuracy and reduced uncertainties from a $10^\circ \times 10^\circ$ Galactic bulge region. By using argon as a superior PN metallicity indicator, the anomaly is significantly reduced and better constrained. For the first time in PNs we show sulfur α -element lockstep with both oxygen and argon. We dispel hypotheses that the anomaly originates from underestimation of higher sulfur ionization stages. Using a machine-learning approach, we show that earlier ionization correction factor schemes contributed significantly to the anomaly. We find a correlation between the sulfur anomaly and the age/mass of PN progenitors, with the anomaly either absent or significantly reduced in PNs with young progenitors. Despite inherent challenges and uncertainties, we link this to PN dust chemistry, noting those with carbon-dust chemistry show a more pronounced anomaly. By integrating these findings, we provide a plausible explanation for the residual, reduced sulfur anomaly and propose its potential as an indicator of relative galaxy age compositions based on PNs.

Export citation and abstract [BibTeX](#) [RIS](#)

I.2. LSR Led paper

nature astronomy

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Article | [Open access](#) | Published: 12 February 2024

Diverse volcanism and crustal recycling on early Mars

[Joseph R. Michalski](#), [A. Deanne Rogers](#), [Christopher S. Edwards](#), [Aster Cowart](#) & [Long Xiao](#)

[Nature Astronomy](#) 8, 456–462 (2024) | [Cite this article](#)

7489 Accesses | 3 Citations | 469 Altmetric | [Metrics](#)

Abstract

The relatively well-preserved ancient crust of Mars provides a natural window into early planetary evolution not available on Earth due to sustained tectonic recycling and erosion on this planet. Mars has generally been considered a one-plate basaltic planet, though recent evidence suggests magmatic evolution resulting in felsic crust might have occurred sporadically. Here we show multiple lines of evidence for diverse volcanism and complex volcanotectonics in the southern highlands of Mars within and around the ~3.5–4-billion-year-old Eridania basin. Infrared remote sensing reveals bimodal volcanism consisting of olivine-bearing basalts and voluminous, widespread dacitic (64–69% SiO₂, and possibly higher) volcanic deposits within a region of high crustal potassium. The diverse igneous compositions are associated with an extraordinary number and morphological range of volcanic structures, including domes, stratovolcanoes, calderas and pyroclastic shields occurring proximal to large (hundreds of kilometres in diameter) basins within the Eridania region. The 2–4 km-deep topographically concave-up basins have crustal thicknesses 10–20 km thinner than adjacent terrain and disrupt patterns of deeply seated remnant crustal magnetism. The Eridania basins may represent ancient episodes of crustal recycling via lithospheric delamination in which altered, hydrated volcanic materials were cycled downward and melted resulting in magmatic evolution analogous to pre-plate tectonic processes on the Archaean Earth.

I.3. LSR Led paper

nature astronomy

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Article | Published: 20 May 2024

A unified framework for global auroral morphologies of different planets

[B. Zhang](#), [Z. Yao](#) , [O. J. Brambles](#), [P. A. Delamere](#), [W. Lotko](#), [D. Grodent](#), [B. Bonfond](#), [J. Chen](#), [K. A. Sorathia](#), [V. G. Merkin](#) & [J. G. Lyon](#)

Nature Astronomy **8**, 964–972 (2024) | [Cite this article](#)

689 Accesses | 97 Altmetric | [Metrics](#)

Abstract

Planetary magnetic fields control energetic particles in their space environments and guide particles to polar atmospheres, where they produce stunning auroral forms. As revealed by spacecraft measurements of the Earth, Saturn and Jupiter, the pathways of energetic particles to these planetary polar atmospheres are diverse, suggesting that there are different coupling processes between their ionospheres and magnetospheres. These planets all have dipole-dominated magnetic fields, rotate in the same direction and are blown by the solar wind, but what controls the global-scale patterns of energy dissipation remains unknown. Based on three-dimensional magnetohydrodynamics calculations, we reveal that the competition between planet-driven plasma rotation and solar-wind-driven flow convection determines the structure of global auroral morphologies. This unified theoretical framework can reproduce polar aurora from the Earth-type to the Jupiter-type based on transition states that are strikingly consistent with the highly variable aurora patterns of Saturn. This generalized description of fundamental magnetospheric physics, proposed here and validated by decades-long observations, is applicable to exoplanetary systems.

I.4. LSR Led paper

THE ASTROPHYSICAL JOURNAL LETTERS

OPEN ACCESS

Extensive Intrusive Magmatism in the Lunar Farside Apollo and South Pole–Aitken Basins, Chang'e-6 Landing Site

[Yuqi Qian](#)¹ , [James Head](#)² , [Joseph Michalski](#)¹ , [Shengxia Gong](#)³ , [Wei Yang](#)⁴ , [Zilong Wang](#)⁵ , [Long Xiao](#)^{6,7} , [Xianhua Li](#)⁴ , and [Guochun Zhao](#)¹ 

Published 2024 August 15 · © 2024. The Author(s). Published by the American Astronomical Society.

[The Astrophysical Journal Letters](#), Volume 971, Number 2

Citation [Yuqi Qian et al 2024 ApJL 971 L39](#)

DOI [10.3847/2041-8213/ad698f](#)

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[Figures](#) ▾ [References](#) ▾

▾ Article and author information

Abstract

Lunar igneous activities, including intrusive magmatism and extrusive volcanism, and their products contain significant information about the lunar interior and its thermal state. Their distribution is asymmetrical on the nearside and farside, reflecting the global dichotomy. Samples from the South Pole–Aitken (SPA) basin on the farside hold the key to disclosing the dichotomy conundrum and rebalancing the asymmetrical understandings of the Moon, in addition to previously returned nearside samples (Apollo, Luna, Chang'e-5). For the first time, the Chang'e-6 mission obtained ~1935.5 g of lunar soils from the farside in the southern Apollo basin, northeast of SPA, opening a window to solve this long-standing question. However, compared with the well-known mare/cryptomare volcanism in SPA, intrusive activity has a much more obscure presence and origin, due to its unclear surface expression, thus impeding the ongoing Chang'e-6 sample analysis, which is therefore emphasized here. We found evidence that intrusive magmatism is extensive across SPA, including Mg-suite intrusions, floor-modified craters, and linear/ring dikes, consistent with its intermediate crustal thickness, where dike intrusion is favored. Intrusive magmatism is abundant in the Apollo basin, where Chang'e-6 landed. Two obscure craters were discovered (Apollo X and Q) with evidence for subsurface intrusions, strongly suggesting the intensive intrusion in the region. Plutonic materials are very likely to be obtained by Chang'e-6, especially the Mg-suite from the western peak ring of the Apollo basin that delivered and mixed in the soils by the Chaffee S crater, whose components might provide critical new insights into their petrogenesis, early lunar evolution, and the origin of dichotomy.

I.5. LSR co-authored paper

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Article | [Open access](#) | Published: 18 July 2024

In situ evidence of the magnetospheric cusp of Jupiter from Juno spacecraft measurements

[Y. Xu](#), [C. S. Arridge](#), [Z. H. Yao](#), [B. Zhang](#), [L. C. Ray](#), [S. V. Badman](#), [W. R. Dunn](#), [R. W. Ebert](#), [J. J. Chen](#), [F. Allegrini](#), [W. S. Kurth](#), [T. S. Qin](#), [J. E. P. Connerney](#), [D. J. McComas](#), [S. J. Bolton](#) & [Y. Wei](#)

Nature Communications **15**, Article number: 6062 (2024) | [Cite this article](#)

1268 Accesses | 2 Altmetric | [Metrics](#)

Abstract

The magnetospheric cusp connects the planetary magnetic field to interplanetary space, offering opportunities for charged particles to precipitate to or escape from the planet. Terrestrial cusps are typically found near noon local time, but the characteristics of the Jovian cusp are unknown. Here we show direct evidence of Jovian cusps using datasets from multiple instruments onboard Juno spacecraft. We find that the cusps of Jupiter are in the dusk sector, which is contradicting Earth-based predictions of a near-noon location. Nevertheless, the characteristics of charged particles in the Jovian cusps resemble terrestrial and Saturnian cusps, implying similar cusp microphysics exist across different planets. These results demonstrate that while the basic physical processes may operate similarly to those at Earth, Jupiter's rapid rotation and its location in the heliosphere can dramatically change the configuration of the cusp. This work provides useful insights into the fundamental consequences of star-planet interactions, highlighting how planetary environments and rotational dynamics influence magnetospheric structures.

I.6. LSR co-authored paper

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Article | Published: 21 June 2024

Cygnus X-3 revealed as a Galactic ultraluminous X-ray source by IXPE

[Alexandra Veledina](#), [Fabio Muleri](#), [Juri Poutanen](#), [Jakub Podgorný](#), [Michal Dovčiak](#), [Fiamma Capitanio](#), [Eugene Churazov](#), [Alessandra De Rosa](#), [Alessandro Di Marco](#), [Sofia V. Forsblom](#), [Philip Kaaret](#), [Henric Krawczynski](#), [Fabio La Monaca](#), [Vladislav Loktev](#), [Alexander A. Lutovinov](#), [Sergey V. Molkov](#), [Alexander A. Mushtukov](#), [Ajay Ratheesh](#), [Nicole Rodriguez Cervero](#), [James F. Steiner](#), [Rashid A. Sunyaev](#), [Sergey S. Tsygankov](#), [Martin C. Weisskopf](#), [Andrzej A. Zdziarski](#), ... [Silvia Zane](#) [+ Show authors](#)

Nature Astronomy **8**, 1031–1046 (2024) | [Cite this article](#)

735 Accesses | 2 Citations | 229 Altmetric | [Metrics](#)

Abstract

The accretion of matter by compact objects can be inhibited by radiation pressure if the luminosity exceeds a critical value known as the Eddington limit. The discovery of ultraluminous X-ray sources has shown that accretion can proceed even when the apparent luminosity considerably exceeds this limit. A high apparent luminosity might be produced due to the geometric beaming of radiation by an outflow. The outflow half-opening angle, which determines the amplification due to beaming, has never been robustly constrained. Using the Imaging X-ray Polarimetry Explorer, we measured the X-ray polarization in the Galactic X-ray binary Cygnus X-3 (Cyg X-3). We found high, >20%, nearly energy-independent linear polarization orthogonal to the direction of the radio ejections. These properties unambiguously indicate the presence of a collimating outflow from the X-ray binary Cyg X-3 and constrain its half-opening angle to $\leq 15^\circ$. Thus, the source can be used as a laboratory for studying the supercritical accretion regime. This finding underscores the importance of X-ray polarimetry in advancing our understanding of accreting sources.

I.7. LSR co-authored paper


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Article | Published: 18 June 2024

Complex rotational dynamics of the neutron star in Hercules X-1 revealed by X-ray polarization

[Jeremy Heyl](#) , [Victor Doroshenko](#), [Denis González-Caniulef](#), [Ilaria Caiazzo](#), [Juri Poutanen](#), [Alexander Mushtukov](#), [Sergey S. Tsygankov](#), [Demet Kirmizibayrak](#), [Matteo Bachetti](#), [George G. Pavlov](#), [Sofia V. Forsblom](#), [Christian Malacaria](#), [Valery F. Suleimanov](#), [Iván Agudo](#), [Lucio Angelo Antonelli](#), [Luca Baldini](#), [Wayne H. Baumgartner](#), [Ronaldo Bellazzini](#), [Stefano Bianchi](#), [Stephen D. Bongiorno](#), [Raffaella Bonino](#), [Alessandro Brez](#), [Niccolò Bucciantini](#), [Fiamma Capitanio](#), ... [Silvia Zane](#) [+ Show authors](#)

Nature Astronomy **8**, 1047–1053 (2024) | [Cite this article](#)

406 Accesses | 13 Altmetric | [Metrics](#)

Abstract

In an accreting X-ray pulsar, a neutron star accretes matter from a companion star through an accretion disk. The magnetic field of the rotating neutron star disrupts the inner edge of the disk, funnelling the gas to flow onto the poles on its surface. Hercules X-1 is a prototypical persistent X-ray pulsar about 7 kpc from Earth. Its emission varies on three distinct timescales: the neutron star rotates every 1.2 s, it is eclipsed by its companion each 1.7 d, and the system exhibits a superorbital period of 35 d, which has remained stable since its discovery. Several lines of evidence point to the source of this variation as the precession of the accretion disk or that of the neutron star. Despite the many hints over the past 50 yr, the precession of the neutron star itself has yet not been confirmed or refuted. X-ray polarization measurements (probing the spin geometry of Her X-1) with the Imaging X-ray Polarimetry Explorer suggest that free precession of the neutron star crust sets the 35 d period; this has the important implication that its crust is somewhat asymmetric by a few parts per ten million.

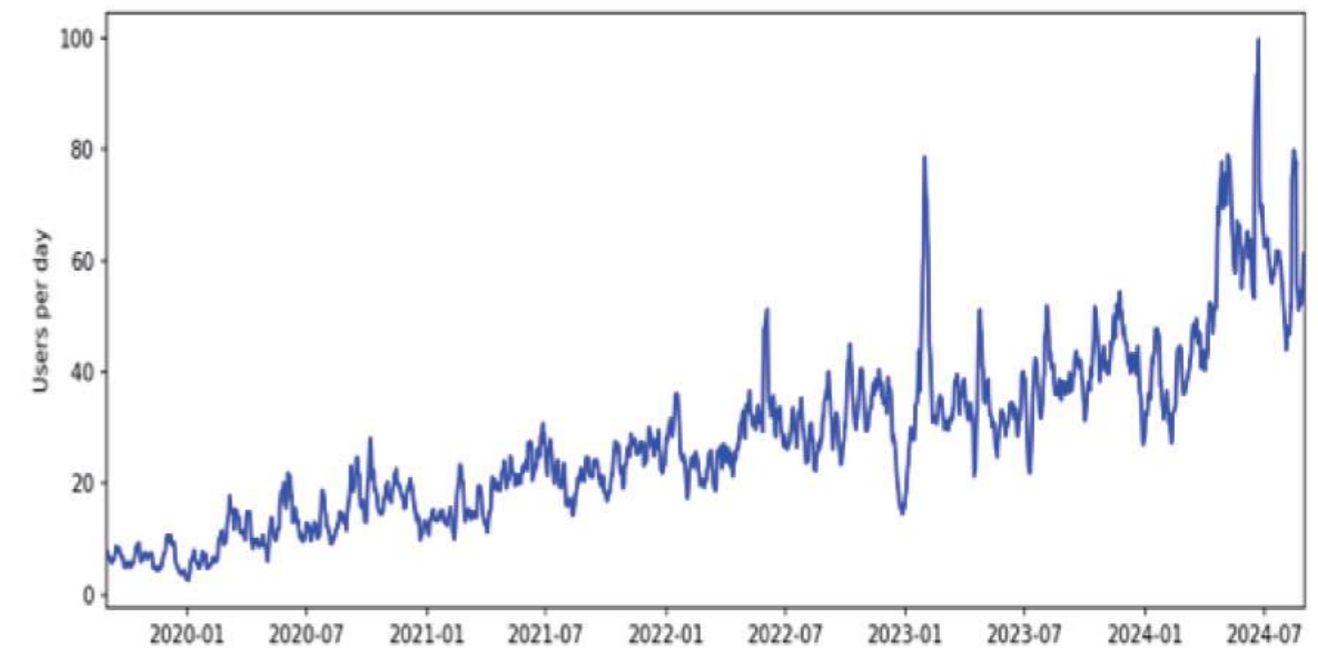
I.8. Plus a further 7 LSR co-authored papers in ApJ Letters

All with Dr. Stephen Ng as a co-author:

APPENDIX II Web Statistics and Information

APPENDIX IIA. Five years of LSR Website traffic Sept. 2019-August 2024

The LSR website (www.lsr.hku.hk) remains our key window to the world. Since the last report there has again been a significant growth in web traffic. We assume this is the result of our on-going and significant press coverage of LSR activities, regular commentary around the burgeoning Chinese Space programme over the last four years and the impact of our press releases and related stories. The number of users has again increased from over the same period last year. Hong Kong users remain the most active and again Mainland China leads the USA in terms of country of origin of access followed by Japan and the UK. Active users have also increased significantly over the last three years as shown in the graphic. Major LSR news events and “system attacks” have led to dramatic access upticks here and there but on a clearly increasing general active user trend.



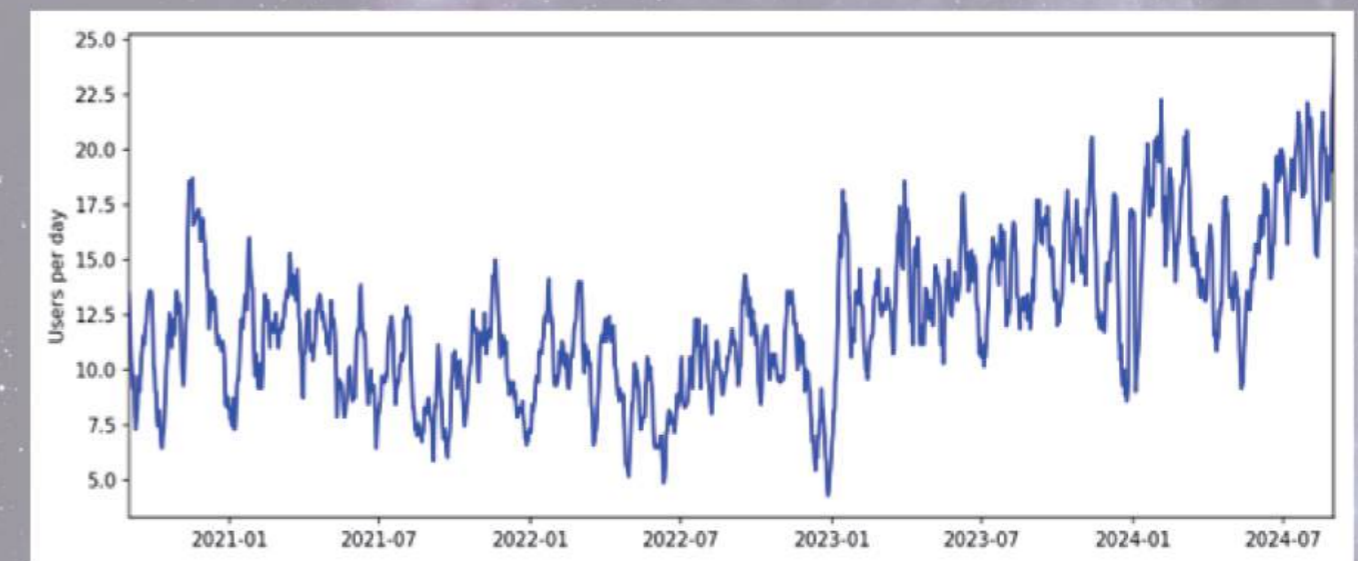
LSR website access sessions by users over the last 5 years showing a strong secular increase in interest in our website and our activities. The narrow spikes are hacking attempts. Over the reporting period the LSR website has had 18,131 visits by 16,288 users from 116 countries.

Country	Users	Sessions
Hong Kong	5328	6422
China	3247	4835
United States	766	1142
United Kingdom	363	477
Japan	320	430
Taiwan	199	280
Singapore	199	271
Canada	148	185
India	141	196
Australia	140	170
Germany	130	183
Macao	125	135
France	89	144
Netherlands	72	139
Italy	67	89
South Korea	62	81
Philippines	50	71
Thailand	45	52
Switzerland	37	51
Russia	34	51

List of top 20 countries accessing the LSR website over the report period

APPENDIX IIB: HASH Website traffic September 2020-August 2024

The HASH database is a key service for our global research community in late-stage stellar evolution. The LSR hosts the “Hong Kong/AAO/Strasbourg H-alpha Planetary Nebulae database” (HASH: www.hashpn.space), a world-class repository for this community. An LSR PDF, Dr. Andreas Ritter curates and manages HASH. We currently have ~1100 users from 60+ countries with ~250 different universities, institutes and affiliations. See below for graphical details of usage statistics of this important LSR community resource.



HASH website access sessions by overlapping users over the last two years for a year showing a clear increase in usage for this reporting period.

Country	Users	Sessions
United States	449	1252
China	424	444
Germany	177	585
Hong Kong	152	1365
France	150	672
United Kingdom	94	407
Mexico	68	248
Spain	54	141
Malaysia	47	17
Australia	43	34
Turkiye	38	506
Netherlands	33	42
Italy	29	280
Canada	28	30
Japan	28	20
Brazil	27	35
Taiwan	24	99
India	20	19
Poland	19	21
Argentina	18	28

List of top 20 countries accessing the HASH website over the report period showing the great diversity in our global user community.

APPENDIX III

Complete list of all LSR Mainland and International MoUs and agreements from October 2017 - August 2024

The LSR continues to engage in a strategically targeted program of Mainland and International partnerships. This is consolidated by signing letters of intent, agreements and MoUs. We have now signed 22 MoUs including one renewal and a further 14 agreements/Letters of Intent. This process helps establish a strong basis for engagement and growth with the best and most relevant groups.

LSR MoUs signed

1. Natural History Museum UK – October 2017
2. Nanjing University - November 2017
3. Padova-CISAS ITALY – March 2018
4. Zhejiang University – December 2018
5. National Astronomical Observatories of China (NAOC) – March 2019
6. Shanghai Academy of Space Flight Technology (SAST) – March 2019
7. CNNC and Chinese Institute for Atomic Energy (CIAE) – September 2019
8. Beijing Institute for Science & Mechanical Electricity (BISME) – Dec. 2019
9. Dongguan Science & Technology Bureau - December 2019
10. DFH Company limited – December 2019
11. CSU – China Space Utilisation – May 2020
12. East Asian Observatory (EAO) – October 2020
13. 3 way MoU with LSR, OASA & HKU Academy for the talented – May 2021
14. Genius Corporation Ltd. August 2023
15. Xiamen Municipal Bureau of Science and Technology – October 2023
16. AdaSpace – October 2023
17. Shenzhen Polytechnic Project co-operation and funding – January 2024
18. Beijing Genshu technology Ltd. – April 2024
19. Beijing Institute of Technology, Research Center for Smart Aerospace Information Systems and Science – May 2024
20. International Lunar Observatory Association Hawai'i (ILOA) – June 2024
21. CAS Space Technology Co. Ltd. – June 2024
22. MoU Renewal (BISME) – July 2024

LSR Agreements or Letters of Intent signed

1. KAVLI institute, PKU, Beijing – May 2018
2. Beijing Institute for Science and Mechanical Electricity (BISME) – December 2018
3. Shenzhen 5 party agreement for Space Payloads - December 2018
4. Greater Bay Space Alliance - March 2019
5. Joint Innovation Centre for Space Science (JICSS) – March 2019
6. China Space Utilization (CSU) – December 2019
7. Orion Astropreneur Space Academy (OASA) – March 2021
8. GBA SYSU Chinese Space Station Telescope Research Centre – March 2022
9. Wuxi Binhu District People’s Government – February 2023
10. United Arab Emirates University – Abu Dhabi – March 2023
11. China Great Wall – 3-way LoI with LSR, OriginSpace & CGWIC- March 2023
12. ZJU, PolyU, UAEU and HKU-LSR collaboration agreement May 2023
13. Chinese Society of Astronautics (CSA) – at Hefei Space Days – April 2023
14. National Natural Science Foundation of China and Research Grants Council of Hong Kong Joint Research Program Application Agreement

APPENDIX IV

Miscellany of additional materials

// IV B: Some recent LSR activities and initiatives



LSR executive visit to Wuhan Space Days 24th April 2024- meeting with Jade Flower, SAST to discuss Space mission opportunities



Special LSR lunches – Kennedy Town; December 2023 (left) and March 2024 (right)

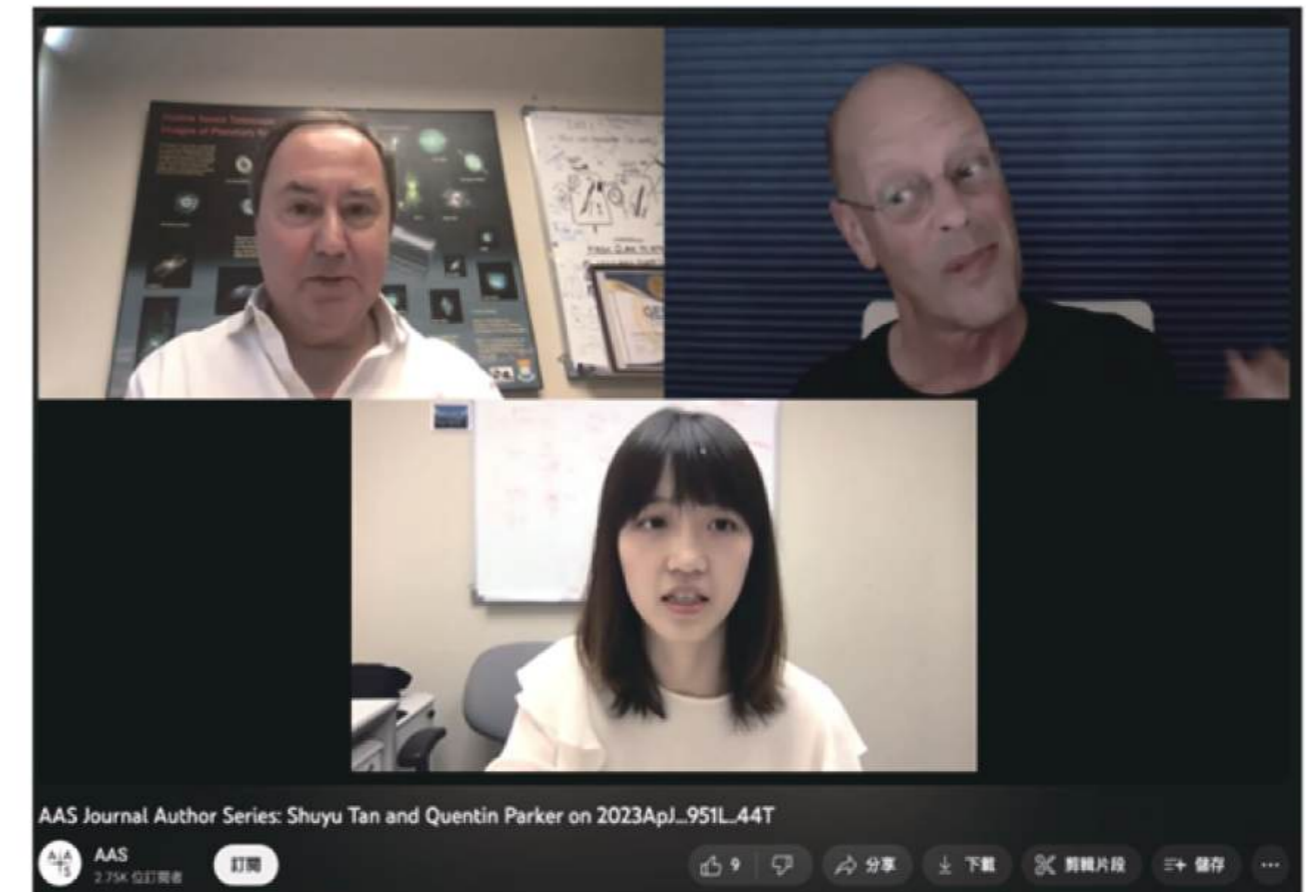
// IV.C Miscellaneous LSR Knowledge Exchange Events (chronological order)



*LSR table at OASA Gala dinner
24th November 2023*

American Astronomical Society (AAS) online interview with Prof Quentin Parker and Ms. Shuyu Tan

SEPTEMBER 19, 2023



American Astronomical Society (AAS) have released a 30 minute video interview with Prof Quentin Parker and Ms. Shuyu Tan on 15 Sep. We shared our our amazing discovery in the centre of our Galaxy.

The interview can be viewed on youtube: <https://www.youtube.com/watch?v=IUuofb4P2VM>

The article mentioned in the interview is "When the Stars Align: A 5σ Concordance of Planetary Nebulae Major Axes in the Center of Our Galaxy". (DOI: 10.3847/2041-8213/acdbcd)

Ms. Shuyu Tan and her ApJ research was mentioned on the science magazine “Research Aether”

OCTOBER 06, 2023



Ms. Shuyu Tan and her ApJ research was mentioned on the science magazine “Research Aether”. The publication was posted online, from page 71: <https://researchaether.com/publication/#pdf-aether-publication-5-september-2023/1/>



Mr. Andy Kong held a hand-made telescopes session in the activity of the Future Science Prize October 6th, 2023. Mr. Andy Kong joined the Screening of the documentary about the winners of the Future Science Prize. He also provided hands-on guidance to the students in making hand-made telescopes in the science practice session. The details was posted on DoNews: <https://www.donews.com/news/detail/4/3712972.html>

(China News) The practical significance of exploring the moon

OCTOBER 06, 2023

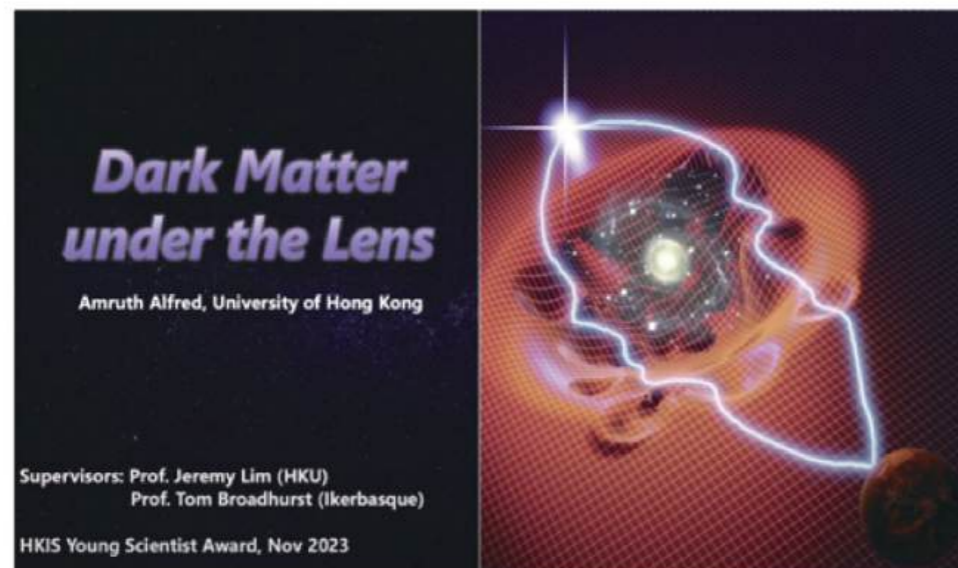


Dr. Yuqi Qian shared his views in the interview "The practical significance of exploring the moon". This interview was posted on China News:

<https://www.chinanews.com.cn/dxw/2023/09-28/10086560.shtml>

2023 Hong Kong Young Scientist Award Finals – "Dark Matter under the Lens"

DECEMBER 11, 2023



LSR member Dr Alfred Amruth has won the 2023 Hong Kong Young Scientist Award Finals.

He was invited to give a talk "Dark Matter under the Lens".

The talk can be viewed on Youtube:



The Local NewSpace Ecosystem
Does HK and indeed China have the right stuff?



The globally emerging NewSpace economy could be worth 1 trillion USD by decades end according to the Bank Morgan Stanley.

How is China faring in this burgeoning ecosystem and and what role could HK SAR play within the one country two systems structures?

These issues are explored and discussed including from the context of STEM education and identifying talents and the opportunity to leverage off HK's innate strengths

Access Information:

Link zoom:

<https://macquarie.zoom.us/j/83330456066>

Meeting ID: 833 304 56066

Speaker:

Prof. Quentin Parker
University of Hong Kong

*On-line seminar under the auspices of the International Space Science Institute,
Beijing, December 13th, 2023*



Mr. Andy Kong giving a talk on CubeSats to a large Mainland student delegation from Huizhou at the LSR April 20th 2024,

(TVB) Closer look: Lunar exploration project

MAY 09, 2024



The Hong Kong University Laboratory for Space Research (LSR) was interviewed by the television program "Closer look" and the interview was aired on the evening of May 8, 2024.

TVB Closer look: Lunar exploration project (Chinese version only)

<https://news.tvb.com/tc/programme/closerlook>

(TKP) 48-Hour Adventure on the Moon: Discovering Radon Gas and Water Sources

JUNE 03, 2024

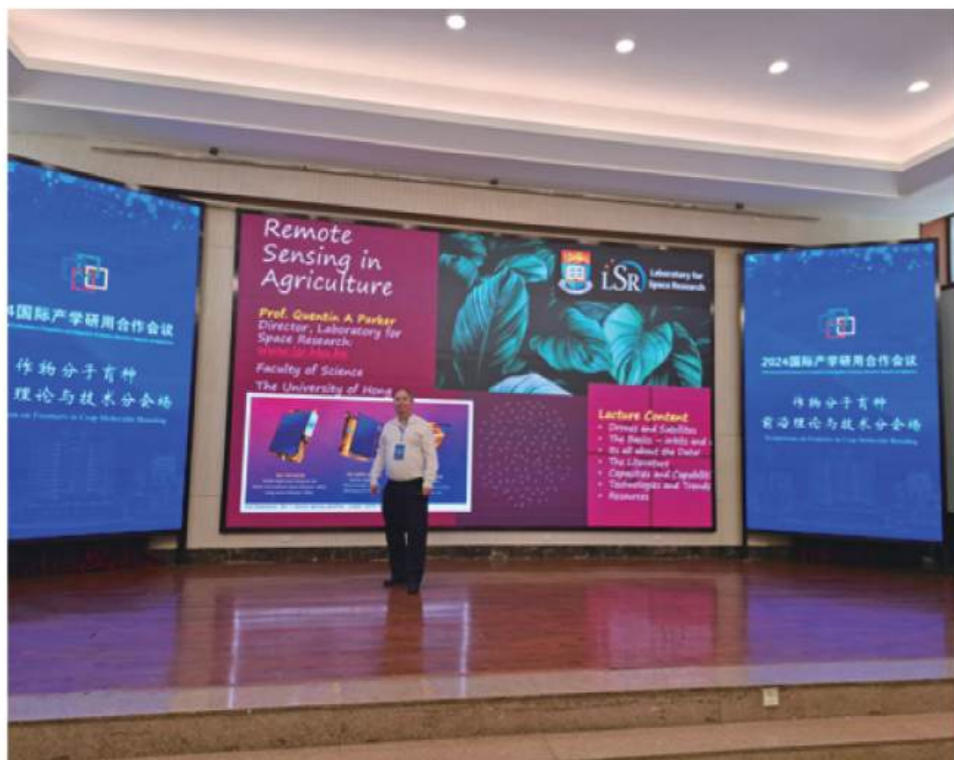


LSR member Dr. Yuqi Qian, has been interviewed by TKP and has been posted on 3 June, 2024.

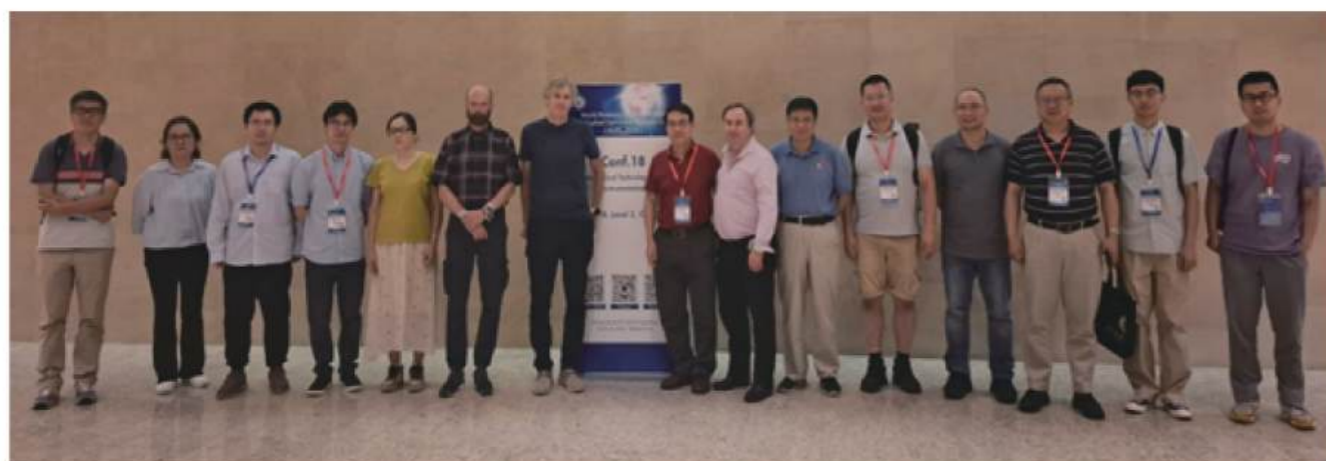
He hoped to quickly apply for lunar samples from the Chang'e-6 mission, so that he could compare them with samples from Chang'e-5. By doing this, he aimed to answer why there was such a distinct difference in the distribution of lunar basalts between the near side and far side of the moon.

Additionally, he aimed to study the volcanic eruption processes and the origin of the moon's dichotomy. He strongly believed that the ongoing fundamental research would contribute to future international lunar research station projects.

The whole article can be downloaded here: [TKP 3 June 2024 A2](#) (Chinese version only)



Prof. Parker giving Conference talk in Baoding on remote sensing. June 28th 2024

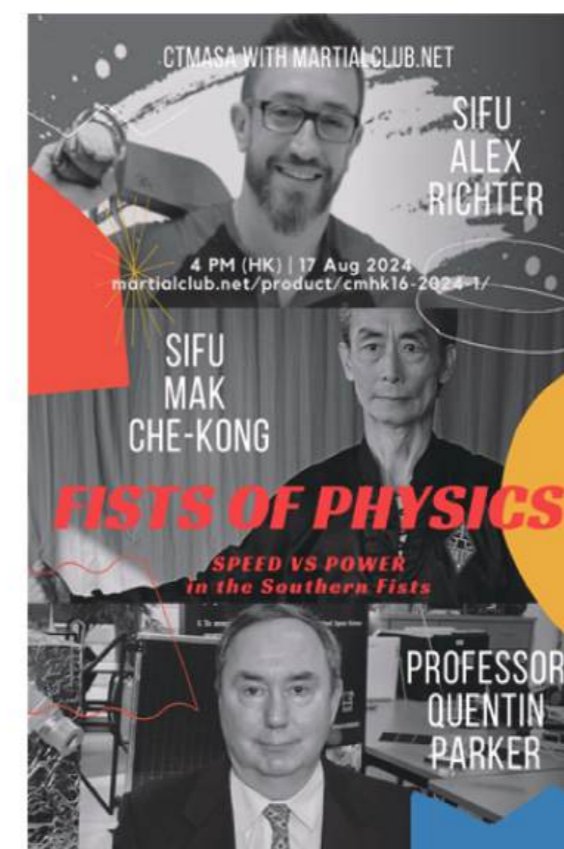


Selected attendees of the AOCN 2024 parallel conference on Astronomical Technology at the Beijing National Convention Centre - attended by LSR members Prof. Parker (session chair and invited talk) and Dr Ritter (contributed talk) 26th July 2024



Professor Quentin Parker was interviewed by CGTN to share his views on the second International Space Science and Scientific Payload Competition in Hong Kong. The interview has been published on 14 August, 2024.

<https://news.cgtn.com/news/2024-08-14/VHJhbnNjcmlwdDgwMjg0/index.html>



3-way Interview and podcast for Martial arts – Wing Chun 17th August 2024 “The Physics in Martial Arts; Fists of Physics” Kwai Fong Dojo

Organised by: **OASA AAIL** ASIAN ACADEMY OF INTERNATIONAL LAW

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KEYNOTE SPEAKER

Prof. Quentin Parker
Director, Laboratory for Space Research, HKU

Prof. Meng Su
Deputy Director, Laboratory for Space Research, HKU

PANELISTS

Dr. Anthony Neoh, SC JP
Senior Counsel and Co-Chairman of AAIL

Ms. Iris Tang
International Advisor, OASA

Mr. Allan Niu
Vice President, International Cooperation, USPACE Tech (1725.HK)

MODERATOR

Prof. Gregg Li
President of OASA; Adjunct Professor at HKU and Advisor, Lab for Space Research, HKU

30 August 2024 (Fri) 3:15pm to 5:45pm
(Registration starts at 3pm)

Former French Mission Building
(1 Battery Path, Central, Hong Kong)

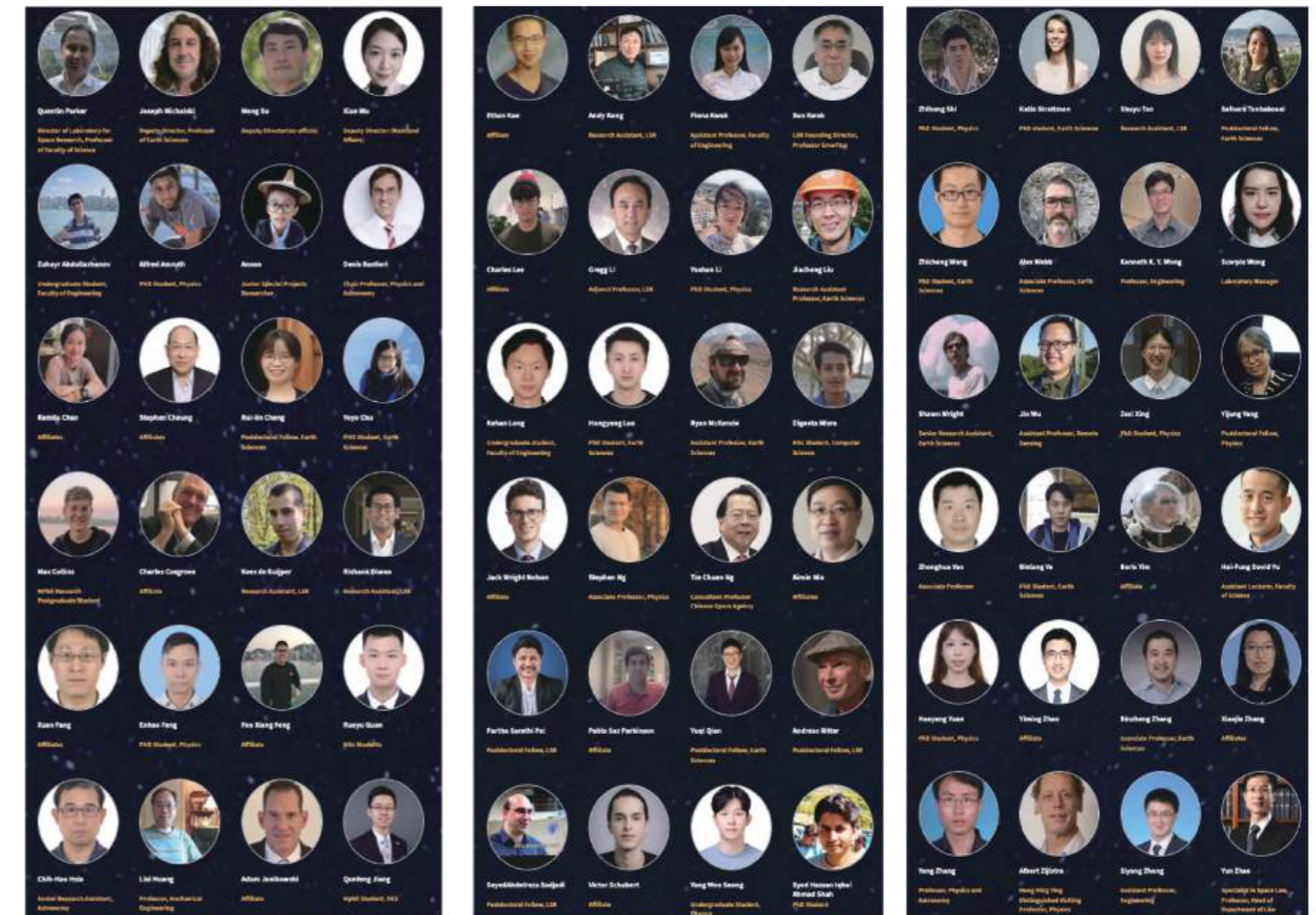
CPD points for the Law Society of Hong Kong is under application

info@oasahk.org | +852-6263 2400 | www.oasahk.org



APPENDIX V

Putting a face to our LSR membership.



*A montage of all current 72 LSR members as at end August 2024

APPENDIX V

Appendix Current Membership list

Name	Title	University/ Institute	Faculty	Department
Quentin Parker	Director, Professor	HKU	Science	Faculty of Science
Joseph Michalski	Deputy Director, Associate Professor	HKU	Science	Earth Science
Meng Su	Ex officio Deputy Director, Hon. Associate Professor from March 2021	HKU	Science	Physics
Xian Wu	Deputy Director (Mainland Affairs)	Beijing based	N/A	LSR
Scorpio Wong	Lab Manager	HKU	Science	LSR
Zuhayr Abdullazhanov	Undergraduate Student	HKU	Engineering	
Alfred Amruth	PhD Student	HKU	Science	Physics
Anson	Junior Special Projects Researcher	N/A	N/A	N/A
Denis Bastieri	Chair Professor	University of Padova (Italy) & Guangzhou	Science	Physics and Astronomy
Kamila Chan	Affiliate	HKU	Science	LSR
Stephen Cheung	Affiliate	N/A	N/A	OASA
Ruilin Cheng	Postdoctoral Fellow	HKU	Science	Earth Sciences
Yoyo Chu	PhD student	HKU	Science	Earth Sciences
Charles Cosgrove	Affiliate	HKU	Forensic Science	Faculty of Science
Max Collins	MPhil Research Postgraduate Student	HKU	Science	Earth Sciences
Rishank Diwan	Research Assistant	HKU	Science	LSR
Kees de Kuijper	Research Assistant	HKU	Science	LSR
Xuan Fang	Affiliate	HKU	Science	Physics

Name	Title	University/ Institute	Faculty	Department
Enhao Feng	PhD Student	HKU	Science	Physics
Foo Xiang Feng	Affiliate	HKU	Science	Physics
Ruoyu Guan	MSc Student	HKU	Science	Physics
Chih-Hao Hsia	Senior Research Assistant	HKU	Science	Physics
Lixi Huang	Professor	HKU	Engineering	Mechanical Engineering
Adam Janikowski	Affiliate	Colorado School of Mines	N/A	Space Resources
Qunfeng Jiang	Mphil Student	HKU	Science	Earth Science
Ethan Kao	Affiliate	University of College London	Science	Physics & Astronomy
Andy Kong	Research Assistant	HKU	Science	LSR
Fiona Kwok	Assistant Professor	HKU	Engineering	Civil Engineering
Sun Kwok	LSR Founding Director, HKU Professor Emeritus	UBC, Canada / HKU	Science	Earth, Ocean Atmospheric
Charles Lee	Affiliate	HKU	Science	Earth Sciences
Gregg Great Ka Lok LI	Adjunct Professor	HKU	Science	LSR
Yushan Li	PhD Student	HKU	Science	Physics
Jiacheng Liu	PhD Student	HKU	Science	Earth Sciences
Kehan Long	Undergraduate Student	HKU	Engineering	Engineering
Hongyang Luo	PhD Student	HKU	Science	Physics

Name	Title	University/Institute	Faculty	Department
Ryan McKenzie	Assistant Professor	HKU	Science	Earth Sciences
Diganta Misra	MSc Student	Montreal Institute of Learning Algorithms	Engineering	Computer Science
Jack Wright Nelson	Affiliate	McGill University	Institute of Air and Space Law	
Stephen Ng	Associate Professor	HKU	Science	Physics
Tze Chuen Ng	Consultant Professor Beijing Spacecrafts	Chinese Space Agency/ HKU	Design	N/A
Aimin Niu	Affiliates	N/A	N/A	OASA
Partha Sarathi Pal	Postdoctoral Fellow	HKU	Science	LSR
Pablo Saz Parkinson	Affiliate	HKU	Science	Physics
Yuqi Qian	Postdoctoral Fellow	HKU	Science	Earth Science
Andreas Ritter	Postdoctoral Fellow	HKU	Science	LSR
SeyedAbdolrez a Sadjadi	Postdoctoral Fellow	HKU	Science	LSR
Victor Schubert	Affiliate	CUHK	Business Administration	Global Econ & Finance
Yang-woo Seong	Undergraduate Student	HKU	Science	Physics
Syed Hassan Iqbal Ahmad Shah	PhD Student	HKU	Science	Earth Science
Zhihong Shi	PhD Student	HKU	Science	Physics
Katie Strattmann	PhD Student	HKU	Science	Earth Sciences
Shuyu Tan	Research Assistant	HKU	Science	LSR

Name	Title	University/Institute	Faculty	Department
Safoura Tanbakouei	Postdoctoral Fellow	HKU	Science	Earth Sciences
Zhicheng Wang	PhD Student	HKU	Science	Earth Science
Alex Webb	Associate Professor	HKU	Science	Earth Sciences
Kenneth K. Y. Wong	Professor	HKU	Engineering	Electrical & Electronic Engineering
Shawn Wright	Postdoctoral Fellow	HKU	Science	Earth Sciences
Jin Wu	Assistant Professor	HKU	Science	Biological Sciences
Zexi Xing	PhD Research Postgraduate Student	HKU	Science	Physics
Yijung Yang	Postdoctoral Fellow	HKU	Science	Physics
Zhonghua Yao	Associate Professor	HKU	Science	Earth Sciences
Binlong Ye	PhD Student	HKU	Science	Earth Sciences
Boris Yim	Affiliate	HKUST	Science	Physics
David Hoi-Fung Yu	Assistant Lecturer	HKU	Science	Faculty of Science
Hao Yang Yuan	Mphil Student	HKU	Science	Physics
Yiming Zhao	Affiliate	HKU	Science	Physics
Yun Zhao	Specialist in Space Law, Professor, Head of Department of Law	HKU	Law	Law
Binzheng Zhang	Assistant Professor	HKU	Science	Earth Sciences
Yong Zhang	Professor	Sun Yat Sen University	Science	Physics and Astronomy
Siyang Zhong	Research Assistant Professor	HKUST	Engineering	Mechanical & Aerospace Engineering

APPENDIX VI

List of all press, TV, videos, radio stories and interviews with LSR members during the reporting period

This reporting period has seen a continuation of the high number of press, television, radio and interviews or quotes from LSR members and specific written opinion pieces too. The 88 specific press/media items reported below are a 75% increase from the 51 reported last year and 52 the year before that. This is largely thanks to the burgeoning Chinese Space program and emerging new space race and exciting Astronomy and planetary science discoveries over the reporting year. This does not include the numerous press items emerging from our 7 press releases.

// Series of SCMP and China Daily articles

Between Sept 2023 and August 2024 Prof. Quentin Parker has again been very active with a series of 33 China daily and 6 SCMP articles largely but not exclusively associated with the Chinese Space program and STEM education issues and other science related stories. For details of most of the China Daily opinion pieces see: https://www.chinadailyhk.com/hk/article/quentin_parker

// 1st September 2023 - 31st August, 2024

► 1. September 2023

- (1 Sep) Dr. Joe Michalski was interviewed by RTHK to share his views on the HKU moon rock coup and LSR in Vibrant Hong Kong Episode 14 on 2 Sep. The interview started from 25:00 in this video: <https://www.youtube.com/watch?v=VPZbxQs98os>
- (15 Sep) American Astronomical Society (AAS) have released a 30 minute video interview with Prof. Quentin Parker and Ms. Shuyu Tan on 15 Sep. Shared our our amazing discovery in the centre of our Galaxy based on the new published paper "When the Stars Align: A 5 σ Concordance of Planetary Nebulae Major Axes in the Center of Our Galaxy". The interview can be viewed on youtube: <https://www.youtube.com/watch?v=IUuofb4P2VM>
- (10 Sep) LSR members Dr. Yuqi Qian and Dr. Joseph Michalski were mentioned in the article "Feature: Chang'e-5 lunar samples to open new chapter in Hong Kong's lunar scientific research" on Xinhua Net on 10 Sep:
<https://english.news.cn/20230910/18171cfc58f44c62826d14554f9242fe/c.html>
- (10 Sep) 新華網, 香港故事 | 月壤重臨 開啓香港月球科研新篇章
http://www.news.cn/gangao/2023-09/10/c_1129855078.htm

Name	Title	University/Institute	Faculty	Department
Xiaojia Zhang	Affiliate	HKU	Science	Earth Science
Albert Zijlstra	Hung Hing Ying HKU Distinguished Visiting Professor (til Dec 2022)	University of Manchester/HKU	Jodrell Bank Centre for Astrophysics	Physics and Astronomy



Andy Kong is illustrating the software system and hardware design of a cubeSat to young engineers and scientists at the LSR

- (20 Sep) Prof. Parker, has shared his view on the Hong Kong candidates entered to the final round of China's astronaut selection drive. This interview was posted by SCMP on 20 Sep: <https://www.scmp.com/news/hong-kong/society/article/3235167/more-1-hong-kong-candidate-final-round-chinas-astronaut-selection-drive-citys-technology-minister>
- (27 Sep) Prof. Parker shared his insights on the article "Did India's Chandrayaan-3 spacecraft really land near the moon's south pole? Top Chinese scientist claims it didn't". It was posted on SCMP: <https://www.scmp.com/news/china/science/article/3236022/did-indias-chandrayaan-3-spacecraft-really-land-near-moons-south-pole>
- (27 Sep) Ms. Shuyu Tan and her ApJ letters research was featured in the UK science magazine "Research Aether". The publication was posted online, from page 71: <https://researchaether.com/publication/#pdf-aether-publication-5-september-2023/1/>
- (28 Sep) Dr. Yuqi Qian shared his views in the interview "The practical significance of exploring the moon". This interview was posted on China News: <https://www.chinanews.com.cn/dxw/2023/09-28/10086560.shtml>
- (28 Sep) 中国新闻网, 港大“月壤博士”探究“天上宫阙今夕何年” <https://www.chinanews.com.cn/tp/hd2011/2023/09-28/1081589.shtml>
- (30 Sep) Mr. Andy Kong joined the Screening of the documentary about the winners of the Future Science Prize. He also provided hands-on guidance to the students in making hand-made telescopes in the science practice session. The details was posted on DoNews: <https://www.donews.com/news/detail/4/3712972.html>

► 2. October 2023

- (6 Oct) Prof. Parker's article "Hong Kong's success hinges on its distinct advantages" was posted on China Daily: <https://www.chinadailyhk.com/article/354808>
- (12 Oct) Public lecture "Sample the Space: Secrets Behind Lunar Soil" was held by Dr Yuqi QIAN, the PhD. Postdoctoral Fellow of the Department of Earth Sciences and Member of Laboratory for Space Research at HKU.
- (12 Oct) Signing of MoU between HKU-LSR and Xiamen Municipal Bureau of Science and Technology

- (18 Oct) Prof. Parker's article "As people live longer, fewer babies can be good for the planet. Hong Kong can show how." in SCMP: <https://www.scmp.com/comment/opinion/article/3237858/people-live-longer-fewer-babies-can-be-good-planet-hong-kong-can-show-how>
- (20 Oct) Prof. Parker was invited to give a speech on the OASA NewSpace Conference 2023 in Cyberport on 20 Oct 2023. The topic of the speech was "The "Right Stuff" for the Future "Science" Economy in HKSAR". This speech was uploaded to youtube: <https://www.youtube.com/watch?v=Gd9jC8artVg>
- (26 Oct) Prof. Parker's article "When it comes to the space economy, Hong Kong must reach for the stars" was posted on SCMP: https://www.scmp.com/comment/opinion/article/3238915/when-it-comes-space-economy-hong-kong-must-reach-stars?campaign=3238915&module=perpetual_scroll_0&pgtype=article
- (28 Oct) LSR member Mr. Andy Kong represented LSR to join the the Information Day of HKU for Undergraduate Admissions 2023 on 28 Oct. The details of the information day can be viewed here: <https://www.hku.hk/press/press-releases/detail/26750.html>

► 3. November 2023

- (1 Nov) Prof. Parker and LSR member Prof. Gregg Li have shared their view on "Hong Kong's role in China's space" in RTHK Backchat programme on 1 November 2023. The programme can be listened online: <https://www.rthk.hk/radio/radio3/programme/backchat/episode/915150>
- (2 Nov) Prof. Quentin Parker's article "Cooperation in space could be next step for Belt and Road" published in China Daily 2 November 2023. The article can be viewed online: <https://www.chinadailyhk.com/article/359265#Cooperation-in-space-could-be-next-step-for-Belt-and-Road>
- (9 Nov) The article "HK, Macao add thrust to nation's space exploration" mentioned the Lunar soil samples collected by the Chang'e 5 probe are displayed at the University of Hong Kong has been posted on China Daily on 9 November 2023. The article can be viewed online: <https://www.chinadaily.com.cn/a/202311/09/WS654c1f24a31090682a5ed338.html>
- (24 Nov) Dr. Yuqi Qian and Dr. Joseph Michalski from Laboratory for Space Research, The University of Hong Kong, has published a paper in Icarus on Nov. 24, 2023. The title is "First magnetic and spectroscopic constraints on attenuated space weathering at the Chang'e-5 landing site". The paper can be viewed online: <https://doi.org/10.1016/j.icarus.2023.115892>

- (27 Nov) Prof. Parker's article "HK can help lead the turbocharging of greener growth for ASEAN and GBA" was published in China Daily on 27 November 2023. The article can be viewed online:

<https://www.chinadailyhk.com/article/363415#HK-can-help-lead-the-turbocharging-of-greener-growth-for-ASEAN-and-GBA>

- (28 Nov) Professor Parker's article "Taikonauts' visit will hopefully kickstart a major policy shift in HK" was posted on China Daily on 28 November, 2023. The article can be viewed online:<https://www.chinadailyhk.com/article/363790>

► 4. December 2023

- (4 Dec) LSR member Dr Alfred Amruth won the 2023 Hong Kong Young Scientist Award Finals. He was invited to give a talk "Dark Matter under the Lens". The talk can be viewed on

Youtube:<https://youtu.be/IXwjd92X1oQ?si=RMaqQc44IwxC4Xb>

- (8 Dec) 行星科学, 嫦娥五号月壤磁学性质揭示其不成熟特征

<https://www.ceshigo.com/article/11987>

- (10 Dec) 中国新闻网, 中美专家联合测得嫦娥五号月壤成熟度指标

<https://www.chinanews.com.cn/gn/2023/12-10/10125903.shtml>

- (13 Dec) Prof. Parker was invited to hold a Joint LSR & ISSI-Beijing online seminar - Infinite Horizons Seminar: The local NewSpace ecosystem - Does HK and indeed China have the right stuff?

- (14 Dec) Prof. Parker's comment was mentioned in the RTHK article "Shooting stars to rain down in Geminid meteor shower" on 14 December 2023. The article can be viewed online:

<https://news.rthk.hk/rthk/en/component/k2/1732273-20231214.htm>

► 5. January 2024

- (Jan 5) Prof. Parker, gave interview on BBC radio 4 about China's Chang'e 6 mission and has been closely monitoring its progress. The programme can be listened online (Begin at 16mins):

<https://www.bbc.co.uk/programmes/m001tsdd>

- (Jan 24) Prof. Parker was invited to share his views on ozone pollution in the podcast of RTHK on 24 January 2024. The podcast can be listened online:

<https://www.rthk.hk/radio/radio3/programme/backchat/episode/931239>

- (Jan 29) Prof. Parker's article "Macao is leaving Hong Kong behind in the space race" was published in China Daily on 29 January 2024. The article can be viewed on:

<https://www.chinadailyasia.com/article/373792>

► 6. February 2024

- (Feb 7) The press release "HKU Astrophysicists Crack the Case of the "Disappearing" Sulphur in Planetary Nebulae" was posted on HKU FoS website on 7 February 2024. It can be viewed on:

<https://www.scifac.hku.hk/press/release/hku-astrophysicists-crack-the-case-of-the-disappearing-sulphur-in-planetary-nebulae>

- (Feb 20) Prof. Parker, was invited to a podcast hosted by Noreen Mir on RTHK Radio 3 to discuss our recent findings on solving a 20-year-old astrophysical puzzle: the "disappearing" sulfur in planetary nebulae. The podcast can be viewed on Facebook:

<https://www.facebook.com/NoreenMirRTHKradio3/videos/768972701757777/>

- (Feb 23) "奥德修斯" 着陆月球为美国打"前哨", 人类为何如此执着于登月

https://www.sohu.com/a/759621252_121627717

► 7. March 2024

- (Mar 20) IEEE Spectrum, The 5 Spacecraft Behind China's Moon Rock Sample Mission > Chang'e-6's trip to the lunar far side and back is no easy task.

<https://spectrum.ieee.org/china-moon-landing-uncrewed-chang-e6>

► 8. April 2024

- (Apr 15) 香港青年科學家協會, 國家安全教育日 | 香港青年科學家進校園宣講國家航空航天科技發展 <http://www.yasa.hk/nd.jsp?id=108>

- (Apr 15) 香港新聞網, 國安教育日, 香港這間小學迎來特別的科普訪客

<http://www.hkcna.hk/docDetail.jsp?id=100649869&channel=4371>

- (Apr 17) Prof. Parker's article "Vindication of HKU's leader an important victory for due process" published in China Daily on 17 April. It can be viewed online:

<https://www.chinadailyhk.com/hk/article/581153#Vindication-of-HKU%E2%80%99s-leader-an-important-victory-for-due-process-2024-04-17>

- (Apr 25) Prof. Parker expressed his views on "China Space Day" on 25 April 2024 on Backchat. The podcast can be found listed online:

<https://www.rthk.hk/radio/radio3/programme/backchat/episode/948665/autoplay/contentindex/2>

- (Apr 25) Prof. Parker's article "China's lunar missions exciting time for space exploration" was published in China Daily on April 25, 2024. It can be viewed online:

<https://www.chinadaily.com.cn/a/202404/25/WS662a3cc6a31082fc043c408e.html>

- (Apr 25) Announcement that the Asia-Pacific Regional IAU Meeting (APRIM), an international meeting of the International Astronomical Union (IAU), will be held in Hong Kong in the spring of 2026. The final decision was made by the IAU Executive Committee at their Meeting in Helsinki on April 25, 2024, and transmitted to the proposers based at the Laboratory for Space Research (LSR) at HKU on the same day.

► 9. May 2024

- (May 3) Prof. Parker was interviewed by CNA on the programme "East Asia Tonight" to share his views on China's Chang'e-6 moon exploration on May 3, 2024. The interview is available for viewing online.
https://www.channelnewsasia.com/watch/east-asia-tonight/fri-3-may-2024-4311521?cid=internal_sharetool_iphone_06052024_cna
- (May 3) SpaceNews.com, China launches Chang'e-6 mission to collect first samples from the moon's far side.
<https://spacenews.com/china-launches-change-6-mission-to-collect-first-samples-from-the-moons-far-side/>
- (May 3) 大公文匯, 嫦娥六號發射 錢煜奇: 冀盡快申得月背樣品助最新科研
<https://www.tkww.hk/a/202405/03/AP6634c23fe4b0e3971d6f9889.html>
- (May 3) 文匯報, 港大團隊受邀 今觀嫦娥六號發射 同日發表聯合研究成果 研著陸區地質助採樣
<https://www.wenweipo.com/a/202405/03/AP6633f318e4b066fd043035e6.html>
- (May 3) 大公報, 嫦娥六號將徹底改寫人類對月球認知
<https://www.takungpao.com.hk/news/232108/2024/0503/968057.html>
- (May 3) 無線新聞, 嫦娥六號探月任務採樣裝置由本港學者研發 科學家期待協助解開不少未解之謎
https://news.tvb.com/tc/local/6634bd1d35bb43a5eca1b33e?utm_source=newswebshare&utm_medium=referral
- (May 8) The Hong Kong University Laboratory for Space Research (LSR) was interviewed by the television program "Closer look" and the interview was aired on the evening of May 8, 2024. TVB Closer look: Lunar exploration project / 無線新聞, 【時事多面睇】探月工程 (Chinese version only)
<https://news.tvb.com/tc/programme/closerlook>
- (May 8) 大公報, 嫦娥六月背採月壤 冀申樣本研究助驗證 港大將破解月球正反面差異之謎
<https://www.takungpao.com.hk/news/232109/2024/0508/969345.html>

- (May 8) 無線新聞, 【時事多面睇】有議員冀政府助本地大學及青少年參與國家航天項目
https://news.tvb.com/tc/greaterchina/663b8cc135bb43a5eccda382?utm_source=newswebshare&utm_medium=referral
- (May 9) Prof Parker's article "International cooperation a highlight of China's space program" was posted on China Daily on May 9, 2024. It can be viewed online.
<https://www.chinadailyhk.com/hk/article/582709#International-cooperation-a-highlight-of-China%E2%80%99s-space-program-2024-05-09>
- (May 10) Space.com, China's Chang'e 6 probe to the moon's far side has a big lunar mystery to solve.
<https://www.space.com/china-chang-e-6-lunar-probe-moon-far-side-mystery>
- (May 10) Universe Today, Here's Where China's Sample Return Mission is Headed.
<https://www.universetoday.com/166920/heres-where-chinas-sample-return-mission-is-headed/>
- (May 11) In the article published by Chengdu Science Association on May 11, 2024, Prof. Parker congratulates the successful launch of the Chang'e 6 lunar probe and expresses that if this mission succeeds, it will become another major event in the scientific community. The detailed article can be viewed at the following link (Chinese version only).
https://www.thepaper.cn/newsDetail_forward_27340416
<https://www.163.com/dy/article/J1U2O16I0514CLPV.html>

► 10. June 2024

- (Jun 3) Dr. Yuqi Qian, has been interviewed by TKP and has been posted on the article "48-Hour Adventure on the Moon: Discovering Radon Gas and Water Sources" on 3 June, 2024. He hoped to quickly apply for lunar samples from the Chang'e-6 mission, so that he could compare them with samples from Chang'e-5. 大公報, 港大學者擬申請月背樣本科研 助力月球基地建設 「蟾宮」挖寶48小時 探氦氣尋水源
<https://www.takungpao.com.hk/news/232108/2024/0603/977718.html>
- (Jun 3) LSR member Dr. Alfred Amruth represented Hong Kong and was honorably mentioned in the 2023 IAU PhD Thesis Prize. His thesis is titled "Theoretical Predictions for Observational Signatures of Granulation in Wave Dark Matter." You can find more details on the IAU website announcement:
<https://www.iau.org/news/announcements/detail/ann24016/>

- (Jun 3) The New York Times, China Launches Spacecraft to the Far Side of the Moon.
<https://www.nytimes.com/2024/06/02/world/asia/china-moon-landing.html>
- (Jun 3) 文匯報, 嫦娥六號歷時30天著陸月背採壤 港高校團隊冀盡快申得樣品 深入研究月球「正反面」
<https://www.wenweipo.com/epaper/view/newsDetail/1797325025628524544.html>
- (Jun 4) Prof. Parker interviewed live on BBC Television news to express his opinions on the Chang'e 6 Chinese moon mission.
- (Jun 4) 無線新聞, 本港有學者冀參與嫦娥六號科研工作 料有助更好了解月球結構及演化
https://news.tvb.com/tc/greaterchina/665f0af1b08fa1987b5cd903?utm_source=newswebshare&utm_medium=referral
- (Jun 7) Prof. Parker has expressed his view on the article "Hong Kong Racing to the Moon". He believes that Hong Kong can play an important role in the space economy in the future. The article was posted by HKCNA on June 4, 2024. It can be viewed on:
<http://www.hkcna.hk/docDetail.jsp?id=100697203&channel=2803>
- (Jun 7) Prof. Parker pointed out in an interview with the HKCNA on June 6th that landing on the far side of the moon is already "highly challenging." The successfully collected soil samples from the far side of the moon have further compensated for the previous shortcomings in human exploration of the moon. The interview video has been posted on June 7, 2024:
<http://www.hkcna.hk/docDetail.jsp?id=100697159&channel=2811>
- (Jun 11) Prof. Parker shared his views on Hong Kong's role in space development in the program "Backchat" of RTHK. The podcast was posted on June 11, 2024.
<https://www.rthk.hk/radio/radio3/programme/backchat/episode/957452>
- (Jun 20) The Laboratory for Space Research at The University of Hong Kong (HKU-LSR) signed a Letter of Intent (LoI) with the International Lunar Observatory Association Hawai'i (ILOA) on May 16 2024, establishing an equal partnership to participate in one of the ILOA-led Chang'e 7 lunar missions - a small, wide-field optical telescope named ILO-C. The HKU-LSR telescope design has been formally chosen, and work has begun in earnest. ILO-C will be installed on the approved Chang'e-7 lunar lander in 2026. The details can be found here:
<https://hku.hk/press/press-releases/detail/27458.html>
- (Jun 25) Prof. Quentin Parker interviewed on BBC news channel live concerning the Chang'e 6 sample return mission.

- (Jun 25) South China Morning Post, China's Chang'e-6 moon mission returns to Earth with historic lunar far side cargo
<https://www.scmp.com/news/china/science/article/3267939/chinas-change-6-moon-mission-returns-earth-historic-lunar-far-side-cargo>
- (Jun 25) The New York Times, China Becomes First Country to Retrieve Rocks From the Moon's Far Side
<https://www.nytimes.com/2024/06/25/science/change-6-china-earth-moon.html>
- (Jun 25) CNN, China's Chang'e-6 moon mission returns to Earth with historic far side samples.
<https://www.cnn.com/2024/06/25/china/china-change-6-moon-mission-return-scen-intl-hnk/index.html>
- (Jun 26) Prof. Parker interviewed live on Sky News television UK about the Chang'e 6 sample return lunar mission.
- (Jun 26) 紐約時報中文網, 嫦娥六號實現世界首次月球背面採樣返回
<https://cn.nytimes.com/science/20240626/change-6-china-earth-moon/zh-hant/>
- (Jun 26) 文匯報, 【文匯專訪】港科學家盼可研究嫦娥六月壤
<https://www.wenweipo.com/a/202406/26/AP667b26ede4b02128fc815b53.html>
- (Jun 26) 大公報, 「嫦娥」飛天攬明月 香港貢獻載史冊
<https://www.tkw.com/a/202406/26/AP667b4fafe4b0519806872e57.html>
- (Jun 27) 知識分子的財新博客, 嫦娥六號的48小時和中國探月的17年
<https://zhishifenzi.blog.caixin.com/archives/276096?big=1>
- (Jun 28) 文匯報, 人類第一抔月背樣品今揭曉
<https://www.wenweipo.com/a/202406/28/AP667dc8f0e4b02128fc819f5d.html>

► 11. July 2024

- (Jul 1) 大公報, 積極探索/珍貴月背樣品 港科研團隊競相申請
<https://www.takungpao.com.hk/news/232108/2024/0701/986617.html>
- (Jul 3) Prof. Parker's article "Chang'e missions have changed the face of lunar exploration" has been posted on China Daily on 3 July, 2024.
<https://lb7.chinadailyhk.com/hk/article/587115>

► 12. August 2024

- (Aug 5) CNN, China moon samples reveal water molecules in groundbreaking discovery, scientists say.

<https://edition.cnn.com/2024/08/05/science/china-moon-samples-water-intl-hnk/index.html>

- (Aug 12) In an interview with CNA's Otelli Edwards, Prof. Parker provided his insights on the comparison between China's newly launched satellite constellation, Thousand Sails, and Elon Musk's Starlink. The interview has published on 13 August, 2024.

<https://www.channelnewsasia.com/watch/china-does-things-pretty-quickly-and-successfully-professor-4541981>

- (Aug 13) 今日香港地, 香港大学月球演化取得进展, 计划申请嫦娥六号月背土壤

https://www.sohu.com/a/800622269_211762

- (Aug 14) Prof. Parker was interviewed by CGTN to share his views on the second International Space Science and Scientific Payload Competition in Hong Kong. The interview has been published on 14 August, 2024.

<https://news.cgtn.com/news/2024-08-14/VHJhbnNjcmlwdDgwMjg0/index.html>

- (Aug 16) Prof. Parker's article "Chinese photonics industry is a beacon of light for all" has been posted on China Daily on 16 August, 2024. The article can be viewed here.

<https://www.chinadailyasia.com/hk/article/590702#Chinese-photonics-industry-is-a-beacon-of-light-for-all-2024-08-16>

- (Aug 23) Prof. Parker's opinion has been quoted in the article "Breakup of Chinese Rocket Prompts Warnings About Space Junk" in The Wall Street Journal on 23 August, 2024. The article can be viewed after logged in WSJ website:

https://www.wsj.com/world/china/china-rocket-space-debris-5e02a603?st=1gm245wx4k9i23b&reflink=desktopwebshare_permalink

- (Aug 23) 文匯報, 1噸月壤產逾50千克水 助建月球基地

<https://www.tkww.hk/epaper/view/newsDetail/1826685731481980928.html>

- (Aug 23) 大公報, 嫦五科研新發現 1噸月壤產50公斤水

<https://www.takungpao.com/231106/2024/0823/1003583.html>

- (Aug 27) LSR member, Dr Yuqi QIAN's research has been posted on HKU Press Release on 27 August, 2024. The full article can be viewed here:

https://hku.hk/press/news_detail_27621.html

- (Aug 27) Mirage News, HKU Geologists Uncover Hidden Magmatism at Chang'e-6 Site.

<https://www.miragenews.com/hku-geologists-uncover-hidden-magmatism-at-1303410/>

- (Aug 27) Phys.org, Geologists discover hidden magmatism at the Chang'e-6 lunar landing site.

https://phys.org/news/2024-08-geologists-hidden-magmatism-lunar-site.html#google_vignette

- (Aug 28) 文匯報, 港大析嫦六著陸點岩漿 助解月背之謎

<https://www.wenweipo.com/a/202408/28/AP66ce32e4e4b0ef179eb65fdb.html>

APPENDIX VII

Member focus: Ms. Yushan Li in her own words



The Laboratory for Space Research is located in Cyberport, far from the hustle and bustle of the city. It boasts spacious and bright office environments, adjacent to beautiful and serene seaside parks and numerous dining and shopping facilities. Here, you will find an efficient and professional research team comprising experts in all exciting cutting-edge fields, including planetary nebulae, high-energy astrophysics, planetary exploration, satellite payloads and astronomical instrument manufacturing, artificial intelligence, and automation algorithms, among others.

We have the best mentors and supervisors who always offer unique insights in research work and provide straightforward directions when students encounter difficulties, while also paying close attention to the work-life balance of the staff. There are also many quirky gadgets here, including fully automated observation telescopes and a LEGO space station, making each day full of novelties and fun. Every student and intern who comes here will gain a lot, not only in terms of work and research but also in their worldview and outlook on life.

We are not just a working team; we are more like a loving big family. Each person has their uniqueness (we come from around a dozen different countries and regions!), yet we can work and relax harmoniously together. Every Friday afternoon is a not-to-be-missed happy hour, where we gather to drink, snack, chat, announce the good news of the week, and discuss plans for the weekend. Sometimes, we dine together at Hong Kong's gourmet restaurants or take a boat trip to the outlying islands to enjoy leisurely moments together.

Yushan Li, Physics-LSR PhD student

Member focus: Dr. Yuqi Qian in his own words



I'm an active member of the Laboratory for Space Research at HKU from the Department of Earth Sciences. At the moment, I'm a post-doctoral fellow DES/LSR, and dedicated my studies to unravel the secrets of the Moon through remote sensing approaches and returned lunar samples, especially those collected by Chinese Lunar Exploration Program. In this academic year (Sept. 1, 2023, to Aug. 31, 2024), I have studied Hong Kong's first Chang'e-5 lunar samples, which mission launched in the end of 2020, and the landing site of the Chang'e-6 mission with two publications in EPSL and ApJLetters. Change'-6 is the world's first lunar far side sample return mission, which launched in May 3 of 2024. I disclosed the mysterious and diverse volcanism as well as extensive intrusive magmatism in the Chang'e-6 landing site, with significant implications for the ongoing Chang'e-6 sample analysis.

Yuqi Qian, Postdoc Fellow

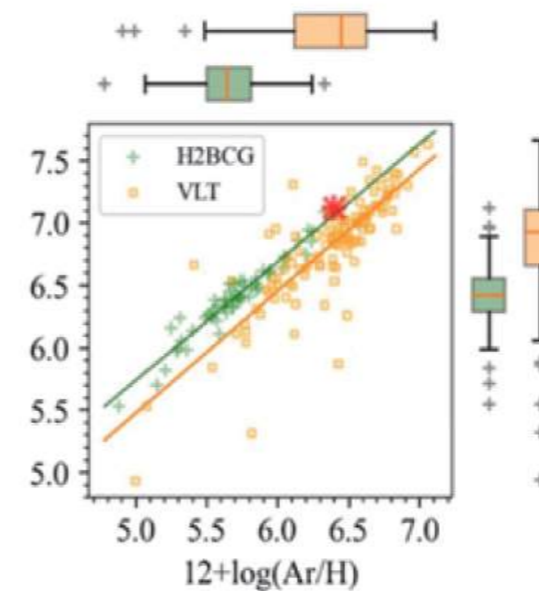
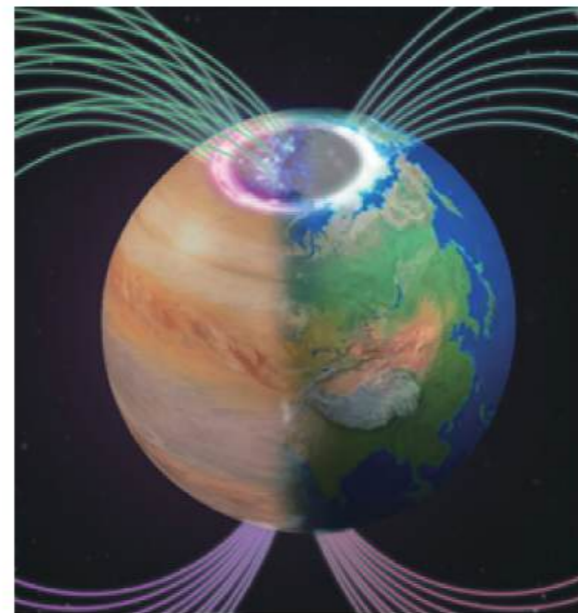
Department of Earth Sciences & Laboratory for Space Research

Details for the image montage on the front cover.

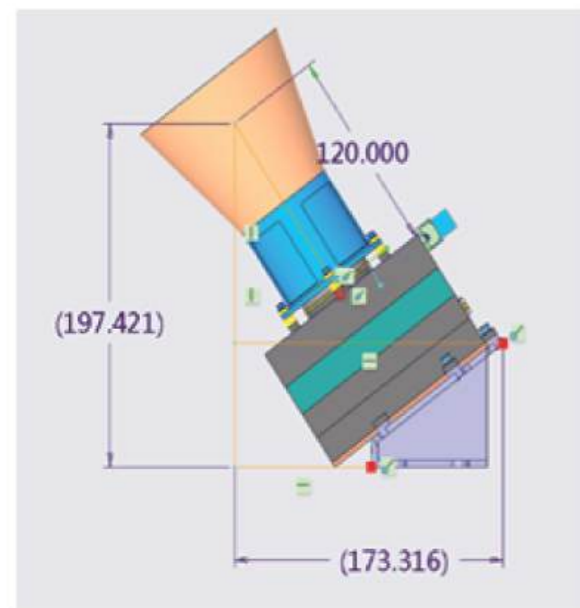
All images were taken from some of the top LSR papers and press releases over the reporting period.

1. Top left: Taken from HKU press release of Nature paper. A conceptual image

A conceptual image showing different aurora between Earth and Jupiter. Image credit: Professor Zhonghua YAO. For related a story refer to official HKU press release:
<https://hku.hk/press/press-releases/detail/27344.html>



3. Bottom Left in montage: Image taken from ApJ Letters paper led by LSR MPhil student and RA Ms, SHuyu TU that shows an effective solution to the so-called sulphur anomaly in planetary Nebulae. Press release:
<https://www.hku.hk/press/press-releases/detail/27089.html>



2. Top Right in montage: Schematic image of the Chang'E 7 lunar lander wide field camera project on which HKU-LSR is an equal partner. See LSR press release:
https://www.hku.hk/press/news_detail_27458.html

4. Bottom right in montage:
 Upper left circle shows the IXPE observed area. The IXPE 2—4 keV emission is shown with the purple colour, with magnetic field orientation denoted with white lines. The red and white represent the soft and hard X-ray emission, respectively, taken with the Chandra X-ray observatory. The golden colour denotes the Spitzer infrared emission. Image Credits: X-ray: Chandra: NASA/CXC/SAO, IXPE: NASA/MSFC/P. Zhou et al.; Infrared: Spitzer. See press release”
<https://www.hku.hk/press/press-releases/detail/26746.html>

