

Laboratory for Space Research Annual Report 2023

Faculty of Science
The University of Hong Kong



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From 1st September 2022 to 31st August 2023

Prof. Quentin Parker
Director LSR

Dr. Joe Michalski, Dr. Meng SU and Ms. Xian Wu
Deputy Directors LSR

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2023 LSR Annual Report

From 1st September 2022 to 31st August 2023

Foreword by the LSR director, Prof. Quentin Parker



It again gives me great pleasure to present the fourth annual report for the Laboratory for Space Research. Finally, the global Covid pandemic is behind us and we have emerged into more normal operations. Many of us have taken opportunities to re-engage with our collaborators in person, attend conferences in “non-zoom” mode at last and undertake field trips to remote sites to gather scientific data. There have also been major changes to report in what has been another very successful year for the LSR - hence this bumper edition! None of the content summarized here would be possible without the on-going support and contributions from our members. I hope you will see just how well this report encapsulates the breadth and importance of our research, capacity and collaborations! The

LSR remains, as ever, a free and open association of like-minded scientists, technologists and engineers who stay because they want to. We continue to improve along with our footprint and influence.

The most significant change has been the decision of the HKU SMT to make the LSR an independent cost centre within the FoS and to move me and about 10 other LSR members and my research grants across to the FoS. I now report directly to the Dean. I have also been given a further 3-year contract till the end of June 2026. I believe this represents a clear and strong vote of confidence in the future of the LSR enabling us to function with greater autonomy and security for a brighter future. Many benefits such as streamlined and much more efficient approvals and grants spends are already evident.

I would like to express sincere thanks to our new Laboratory manager Ms. Scorpio Rokumon Wong for her excellent support since taking over from the equally excellent Bianca Chan, including with helping gathering content for this annual report. I also want to express my very deep appreciation to my deputy director Dr. Joe Michalski whose on-going support for the LSR has been enormously appreciated and also to Dr. Meng Su, LSR deputy director (ex-officio) who has once more been very active in bringing mainland opportunities to our attention. I would also like to sincerely welcome Ms. Xian Wu (“infinity”) as our new LSR Deputy director responsible for Mainland affairs – I believe she will help consolidate and grow our Mainland footprints through new links and opportunities. I would like to add a special welcome to Dr. Zhonghau Yao – a superb new faculty appointment in DES in planetary space sciences with very strong Mainland links and a keen LSR member. He was brought to HKU under the wonderful 100 talents scheme. Finally, I would like to express our pride and excitement at being selected to host the IAU Regional Pacific meeting in 2026 – a huge honor and opportunity for HKU and our city.

I hope you appreciate this report and the value the LSR has brought to HKU over the last few years. I remain privileged, proud and grateful to be able to continue to have the opportunity to serve the LSR and Faculty of Science at our great university.

With my best wishes,



September 25th 2023

1. Executive Summary of LSR activity 2022-2023 by the numbers

- ◆ 72 LSR members across 5 departments and 2 faculties (c.f. 64 in 2021 - a stable but changing membership over the reporting period as 12 have come and 12 have left)
- ◆ \$8.6HKD Million in grants and prizes: \$5.4 million from 5 GRF and 2 NSF Cplus a further \$3.2 million to Dr. Michalski for his 2023 Tencent Xplorer prize – c.f. \$9.1 & 6.4 HKD million in 2021-2022 and 2020-2021
- ◆ 6 MoUs, strategic cooperation agreements and letters of intent signed
- ◆ 9 Professional University, Government or professional group delegation visits to the LSR in Cyberport
- ◆ 6 publications by LSR members in top journals: 4 in Nature Astronomy, 1 in ApJ letters and a further 1 in Nature Communications
- ◆ 84+ refereed publications
- ◆ 5 press releases and the significant associated news stories (some viral)
- ◆ 49 TV interviews, newspaper articles, radio/TV show contributions and local/international media links –this number does not include the 310 separate media links emerging from our press release on the moon rock nor the 207 links that emerged from these 49 main stories.
- ◆ 34% (566) of all 1670 Faculty of Science media items over the reporting period involved or were led by LSR members (up from 24% last year)
- ◆ 5 major initiatives currently in-train:
 - o 6U MeV CubeSat program under RMGS funding (special focus)
 - o Application to Chinese Space Station for a science payload
 - o New distinguished visitors program introduced
 - o Implementation of LSR colloquium series
 - o HKU-LSR selected to run the 2026 IAU Pacific Regional Meeting
- ◆ 6 Key LSR achievements over the reporting period:
 - o Excellent GRF/CRF grant results again obtained
 - o Robust research publication record, including LSR leading one front cover of Nature Astronomy and with LSR co-authors on another
 - o Hosted 24 LSR interns over the summer – another record
 - o Significant progress made with 6U CubeSat MeV Telescope project
 - o Dr. Qian Yuqi of DES and the LSR acquired Chang'E 5 moonrock
 - o Dr. Michalski became the only non-Chinese recipient of the Tencent Xplorer prize while also winning a major UGC fellowship

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

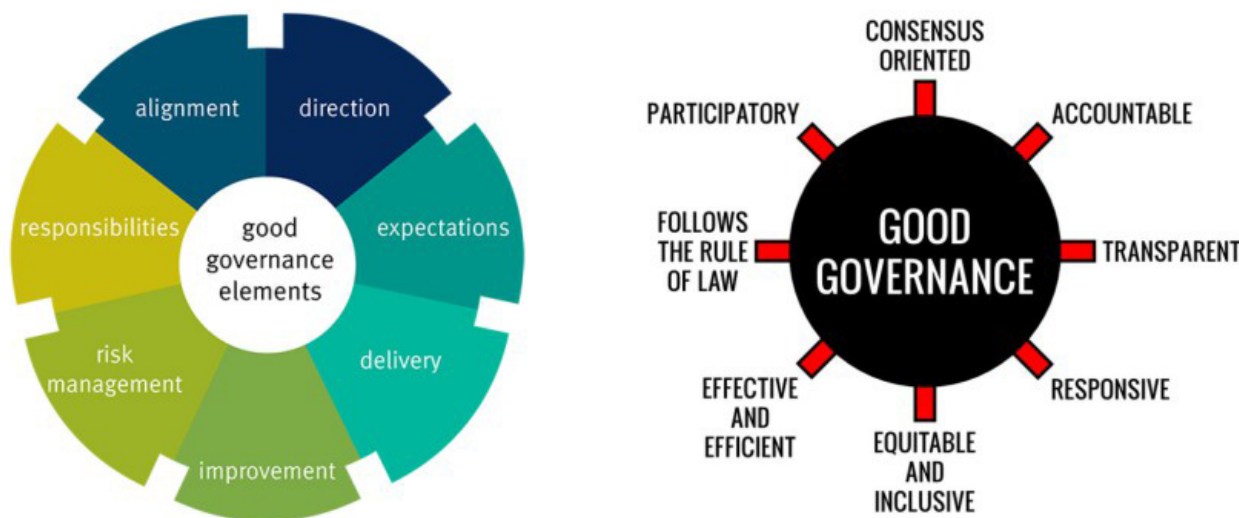
2.1 Curated LSR website with Chinese traditional and simplified Versions

A weekly update to the LSR website occurs to both English and Chinese parallel versions. This is necessary to keep on top of reporting all our key developments and news stories which have again further ramped up this year. Our web site is actively curated and has an increasingly 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).

➤ Current LSR operational parameters

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.

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

agreements, contracts, MoUs etc. following established procedures

- This includes, where relevant, approval by the Faculty Board and/or involvement and checking by TTO and/or Research Services
- 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:

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

➤ Membership of the LSR Advisory Board

The Membership of the LSR Advisory Board is as follows:

- Dean or Associate Dean (Research and Graduate Studies) of Faculty of Science (Chairperson).
- The Director of the LSR or his/her delegate (to be one of the Deputy LSR Directors).
- 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).
- 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).
- 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 focii 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 are involved in cross-disciplinary research related to developments in space and planetary science and technology. Together they provide the rationale and motivation for our operations since establishment in 2017 under the previous Dean of Science Prof Sun Kwok. Our future strategic directions depend on our continued success in grasping opportunities in HK SAR, the Chinese Mainland and overseas. A LSR aim is to further collaboration with China to take advantage of the strongly emerging Chinese space and planetary science exploration programs and associated ground-based big science initiatives. We remain open and committed to a broader global footprint too. LSR members have close relationships with a number of senior and emerging Chinese leaders in this area. Our LSR mission fits perfectly into the desire of VC Prof. Zhang Xiang to place HKU-Mainland collaboration at the centre of HKU's plans.

➤ Below is an updated 2023 list of the tangible benefits of LSR membership.

- i) Dedicated administrative support for travel, grants, re-imbursements, HR issues and other general administrative assistance
- ii) Ad hoc financial support
- iii) A new LSR colloquium series inaugurated in December 2022
- iv) A new 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
- x) Excellent work spaces for students/postdocs in LSR's Cyberport offices

- xi) Access to 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) Finally and importantly the LSR offers a strongly supportive collegiate environment where every voice is heard and every opinion matters

2.4. New external Mainland Affairs Deputy Director appointed

Due to our increasing focus on the burgeoning Chinese Space and Planetary science exploration program and our many collaborations already established with elite Mainland partners, the LSR executive had an opportunity to recruit a talented Mainland Beijing based high-level program facilitator, negotiator and organisor in Ms. Xian Wu (her English name is aptly "Infinity").



Infinity has >15 years work experience in government background associations and 10 years plus experience in investment related projects, with a special focus on M&A and private fund management. She also has close connections with central and local governments, like the National Development and Reform Commission, Ministry of Commerce, Development Research Center of the State Council & Ministry of Foreign Affairs.

She has good understanding of the operating rules and processes of relevant government departments. E-mail contact: wuxian0429@vip.163.com. She is currently unremunerated. This may change depending on future funding.

3. Summary of Current LSR Membership as at September 2023

There are currently 72 LSR members from 5 departments and 2 faculties including various affiliates from outside HKU (www.lsr.hku.hk/members/). This compares with 72 members in the last report, 64 members in 2021 and 15 when first established in 2017. Our membership is now 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 currently comprises HKU faculty (17), postdocs (9), RPG students (13), RAs (6), Undergraduates (7) and external associates (21). 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 (24 this summer – another record). We have a total of 33 ex-members who have left the LSR since its inception. The full membership list is given in Appendix V.

4. Budget Funding and remaining Issues

Despite the strategic move of the LSR to the FoS 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. Regrettably the new FoS BRC plan did not include any consideration to the LSR. Although we are formally no-longer under departmental oversight many of our members remain in DES and Physics. DES has just recruited an exceptional space scientist in Dr. Zhonghua Yao under the 100 talents scheme and he is a strong supporter of the LSR. However, in terms of astrophysicists in Physics, posts have declined from 6 to 4 as other physics faculty numbers have grown from 16 to 27 over the last 3 years. We believe this threatens the viability of this previously recognised HKU research strength that is also important for the LSR. It is clear a secure, adequate, and more autonomous

HKU based funding and support mechanism is required for astrophysics and space and planetary sciences under both the LSR and DES/Physics given the interdisciplinary nature of our activities. We cannot rely on one-off schemes for funding like the RMGS or rely on departments 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/FoS settlement for on-going funding unless or until we get success as an Area of Excellence (proposal pending).

4.1. UGC Research Matching Grant Scheme (RMGS)

Our ability to function continues to rely on our RMGS funding (two RGMS grants to PI Parker in rounds 1 and 4) that amounts to ~\$15million originally awarded. Further LSR affiliated applications from Michalski and Webb (round 5) provided a further HK\$1.9 and HK\$10.6 million respectively. The entire set of RMGS funding expires in Dec 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.

4.2. The RGC General Research Fund (GRF) and Collaborative Research Fund (CRF) and other funding (e.g. NSFC) and prizes

Individual LSR members remain very active in winning RGC, GRF and now NSFC grants with 39 such grants over the last 5 years, including 5 LSR faculty who won grants in the 2023 GRF/CRF round relevant to this report (cf 6 LSR faculty last year). These GRF grants brought in \$HK3.9 million at an average of \$HK782K/grant for the 5 GRFs while Dr J. Liu also brought in a further \$HK590K for 2 grants from the NSFC for total of \$HK4.5million. Dr. Michalski also won \$HK3.2million for the Tencent Xplore prize 2023. 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 (see July 26th 2023 Manchester University press release on HKU-LSR led work), supernova remnants and astrochemistry. This is 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 6U CubeSat MeV Gamma-ray Telescope project (special focus)

The LSR has a mature novel CZT crystal based design to develop and launch a novel 6U CubeSat for MeV Gamma-ray astronomy. There have been some key changes since the last report. Due to problems sourcing the silicon tracker technology from Padova we have pivoted to new CZT crystal technology for our detector. With these crucial modifications, we are still proposing an MeV telescope as a "pathfinder" for a next generation MeV satellite but now over a slightly reduced energy range. Our preliminary designs (Lucchetta et al., 2017, Rando et al., 2019, Prochilo et al., 2020 and now Dirwan et al., 2023) suggest that we can achieve a sensitivity better than the last MeV space telescope (COMPTEL), in a significantly smaller volume, significantly lowering costs. Our RMGS funded project, at 1/3rd share with our partners, will enable us to demonstrate cutting-edge CST detector technology and develop the necessary partnerships to give us a leading role in a future large MeV space partners in Zhejiang University micro-satellites research group in the Mainland and the National Space Science and Technology Centre in the United Arab Emirates and now PolyU here in HK SAR (for a add-on timing and Navigation payload) has brought these three key partners on board in this shared mission underpinned by our first major Workshop the LSR organized and that was held at Zhejiang University in Hangzhou over 2-days from 16-17th May 2023.



The 6U MeV CubeSat Workshop attendees from the LSR (7), ZJU (3), PolyU (3), UAE (1) and OriginSpace (1) held on 16-17th May 2023 in Hangzhou

(a) Long-term impact of this LSR led project

Enabling the development of the next generation MeV gamma-ray satellite and cementing the strategic partnership between HKU-LSR and our key partners of Zhejiang University, UAE University and PolyU.

(b) Project objectives

- i) Demonstrate the new CZT crystal technology that will be used in our planned 6U MeV gamma-ray telescope.
- ii) Strengthen the existing partnerships for building such low-cost science space missions at HKU and proposing for larger space missions such as PANGU (e.g. between China and Europe).
- iii) Integrate the latest research in satellite and space science into HKU's Research goals.

(c) Deliverables

- i) We will design, build, test, launch, and operate a 6U CubeSat for detecting MeV gamma rays using a CZT crystal array as a detector.
- ii) A Mission Operations Centre at HKU-LSR/Shenzhen, to receive, process, and store CubeSat data.
- iii) We will present results at relevant conferences and publish our investigations (including CubeSat design and analysis of CubeSat data) in refereed journal articles and technical reports.

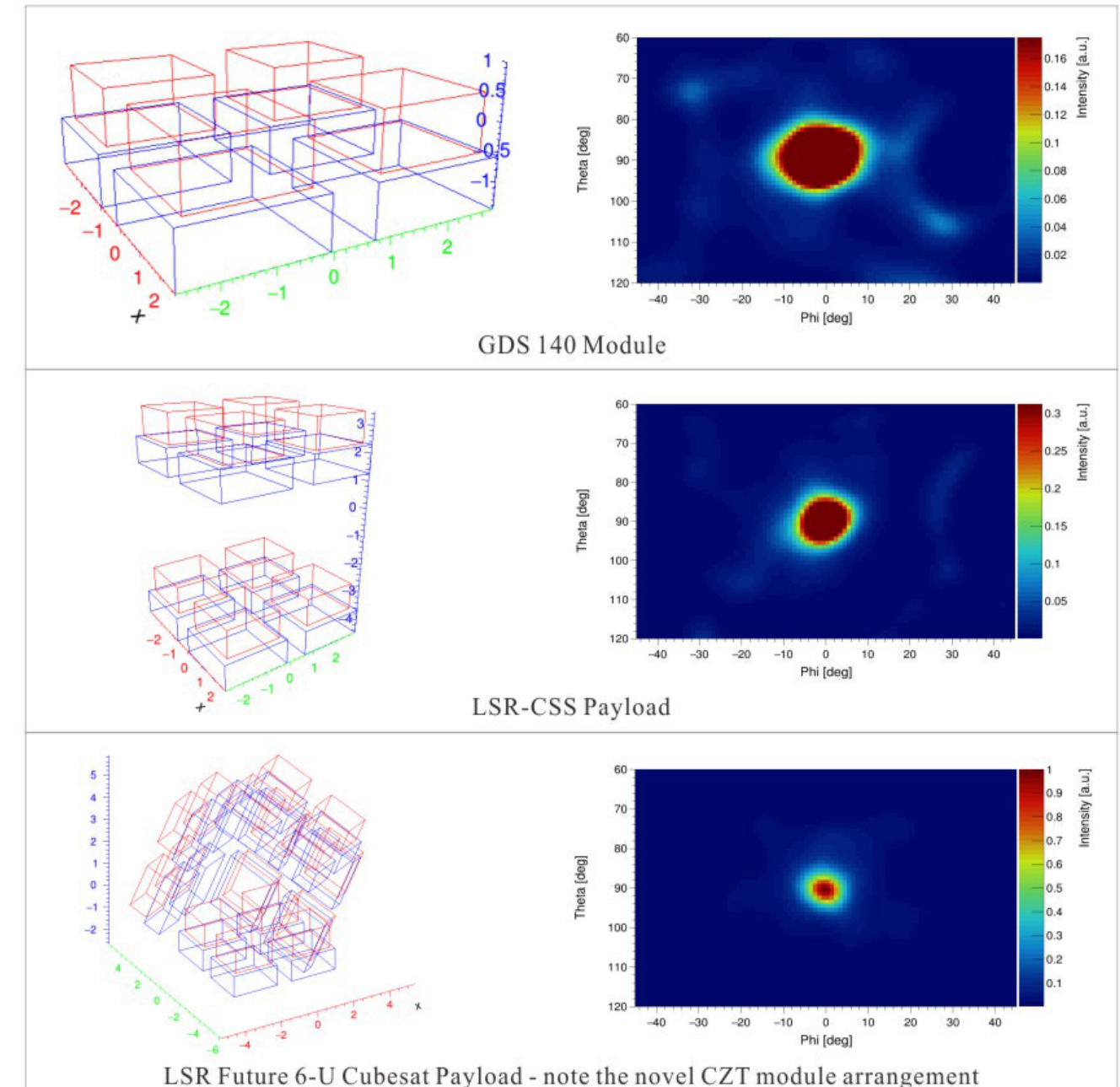
iv) We will engage in KE via public talks in primary and secondary schools, and in the community as a whole (e.g. as part of the FoS Science Talks and Public Lecture Series), and through our social media presence, disseminating and publicizing the results of our efforts.

- Prof. Quentin Parker – LSR Director, Overall project leader
- Dr. Partha Sarathi Pal – Project Scientist
- Dr. Andreas Ritter – Project IT/Data support
- Dr. Alex Leung – HKU Dept. Physics - AI data tools
- A/Prof. Zhinghua Yao – LSR senior scientist and consultant
- Mr. Andy Kong – Project Engineer & CZT gamma-ray detector
- Mr. Kees de Kuijper – Detectors & simulations
- Mr. Rishank Diwan – Detectors & simulations
- Ms. HaoYang Yuan – MSc Student High energy Physics
- Intern effort over summer 2023 (2-3 students)

List of LSR 6U CubeSat project members and their current roles – Dr. Saz Parkinson was Project Scientist until August 15th 2022 – Dr. Partha Pal has now taken over this role with Dr. Saz Parkinson's departure



Rendered diagram of the assembled proposed payload on the CSS in its CubeSat style configuration.



Comparative simulated source reconstruction of the basic GDS 140 module and then the different LSR payload designs for the CSS (middle panel) and eventual 6-U CubeSat (bottom panel). While the overall sensitivity of each panel improves by a factor of ~ 2.5 from top to bottom due to the increased effective area the key gain is in the Angular Resolution Measure (ARM) that will permit better source directional constraints for astrophysical sources. (work by Dirwan, De Kuijper, Pal)

◆ HKU Laboratory for Space Research(HKSAR, PRC) Lead Organisation

Main responsibilities: Project Management, Simulations, Science, Funding

◆ Zhejiang University(ZJU) Microsatellites Research Centre.

Under Leadership of Prof. Huiquan Wang ZJU will provide the satellite platform components for the overall mission together with their expertise in assembly, testing and integration of platform and payload.

◆ United Arab Emirates University National Space Science&Technology Centre(N SSTC)

Based in Al Ain in the UAE-wil provide Engineering expertise, science collaboration and funding

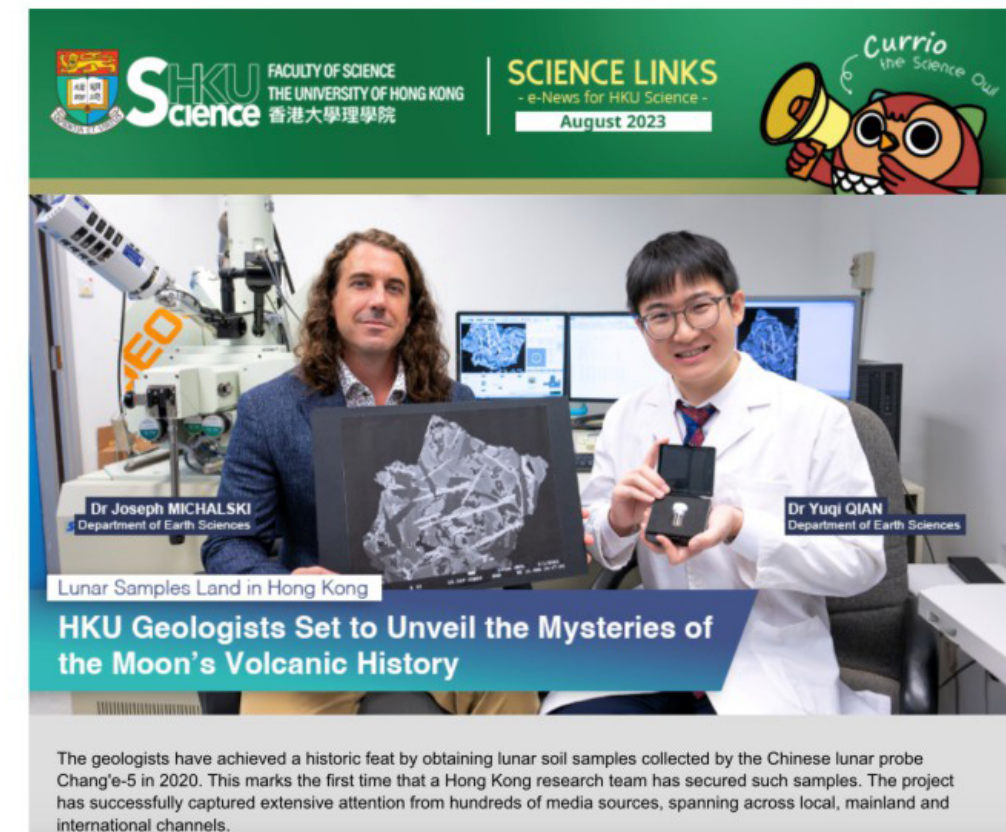
◆ Polytechnic University(PolyU) (HK SAR, PRC)

Will provide an add-on payload for timing and Navigation as well as engineering expertise and funding

The 6U CubeSat international collaboration and areas of responsibility.

5.2. Mainland transfer of ChangE'5 moon rock to PSML lab (special focus)

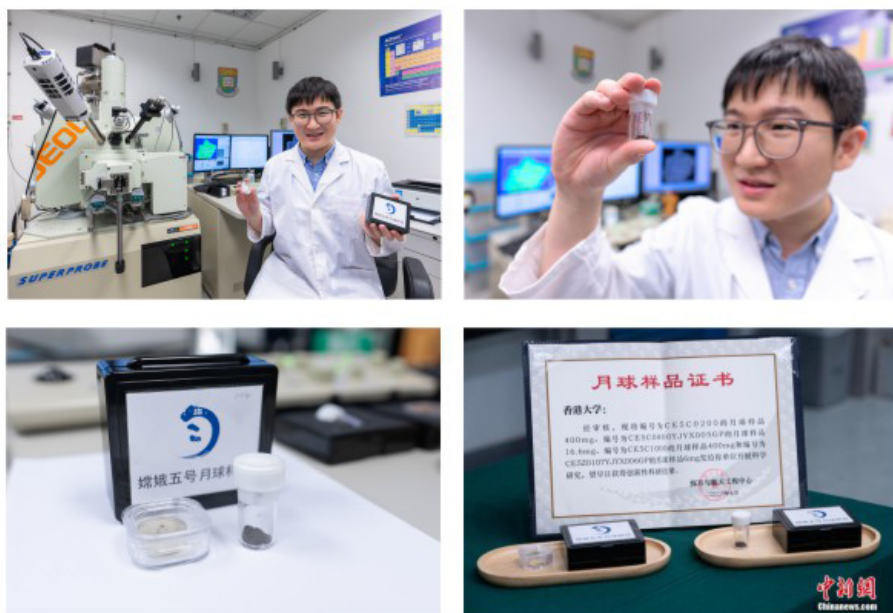
A huge congratulations to Dr Qian Yuqi for securing a sample of moon rock to study at HKU in Dr. Michalski's PSML laboratory



LSR members Dr. Yuqi Qian and Dr. Joe Michalski have achieved a historic feat by obtaining lunar soil samples collected by the Chinese lunar probe Chang'e-5 in 2020.

This marks the first time that any Hong Kong research team has secured such samples. The team led by postdoctoral fellow Dr. Yuqi QIAN from the Department of Earth Sciences, Faculty of Science, obtained approval from the China National Space Administration's Lunar Exploration and Space Engineering Centre to study the lunar soil samples. Dr. Qian personally travelled to Beijing to retrieve the samples, which weigh 822.6 milligrams in total. These lunar samples offer valuable insights into the Moon's geological and thermal history and its connection to the formation and evolution of planetary bodies in the Solar System. The achievement by the HKU-LSR team underscores the university's growing contributions to China's lunar and planetary exploration efforts.

‘This is a dream come true for us and Hong Kong's space science community,’ said Qian, who is eager to analyse the samples using state-of-the-art instruments at the university. ‘We hope to reveal the secrets of the Moon and gain insights into the early Earth, which could have important implications for our understanding of the Solar System and beyond.’



Previous Study on the Chang'e-5 Landing Site Paves the Way

Dr Qian is making waves in the field of planetary geology with his exceptional research on the Chang'e-5 landing site. Having published the first paper documenting the site and constructing a complete picture, he has been focusing on different aspects such as regolith properties, volcanic history and the provenance of lunar soils. His research work has been published in top-tier journals and widely cited, with over 400 citations, solidifying his position as an emerging expert. Recently, Dr Qian joined HKU as a postdoctoral fellow after obtaining his doctoral degree in Planetary Geology from China University of Geosciences.

For further details see:

FoS video: <https://www.youtube.com/watch?v=ibLG1tSU7FM>

HKU: <https://www.hku.hk/press/press-releases/detail/26437.html>

China Daily: <https://www.chinadailyasia.com/article/344588>

XinhuaNet: <https://english.news.cn/20230910/18171cfc58f44c62826d14554f9242fe/c.html>

South China Morning Post: <https://www.scmp.com/news/hong-kong/health-environment/article/3230268/hong-kong-scientists-have-lift-research-project-after-expert-wins-bid-use-moon-rocks-and-dust-study>

Ta Kung Pao: https://dw-media.tkww.hk/epaper/tpk/20230628/A1_Screen.pdf

Wen Wei Po: <https://dw-media.tkww.hk/epaper/wwp/20230808/a01-0808.pdf>

5.3. The LSR colloquium series

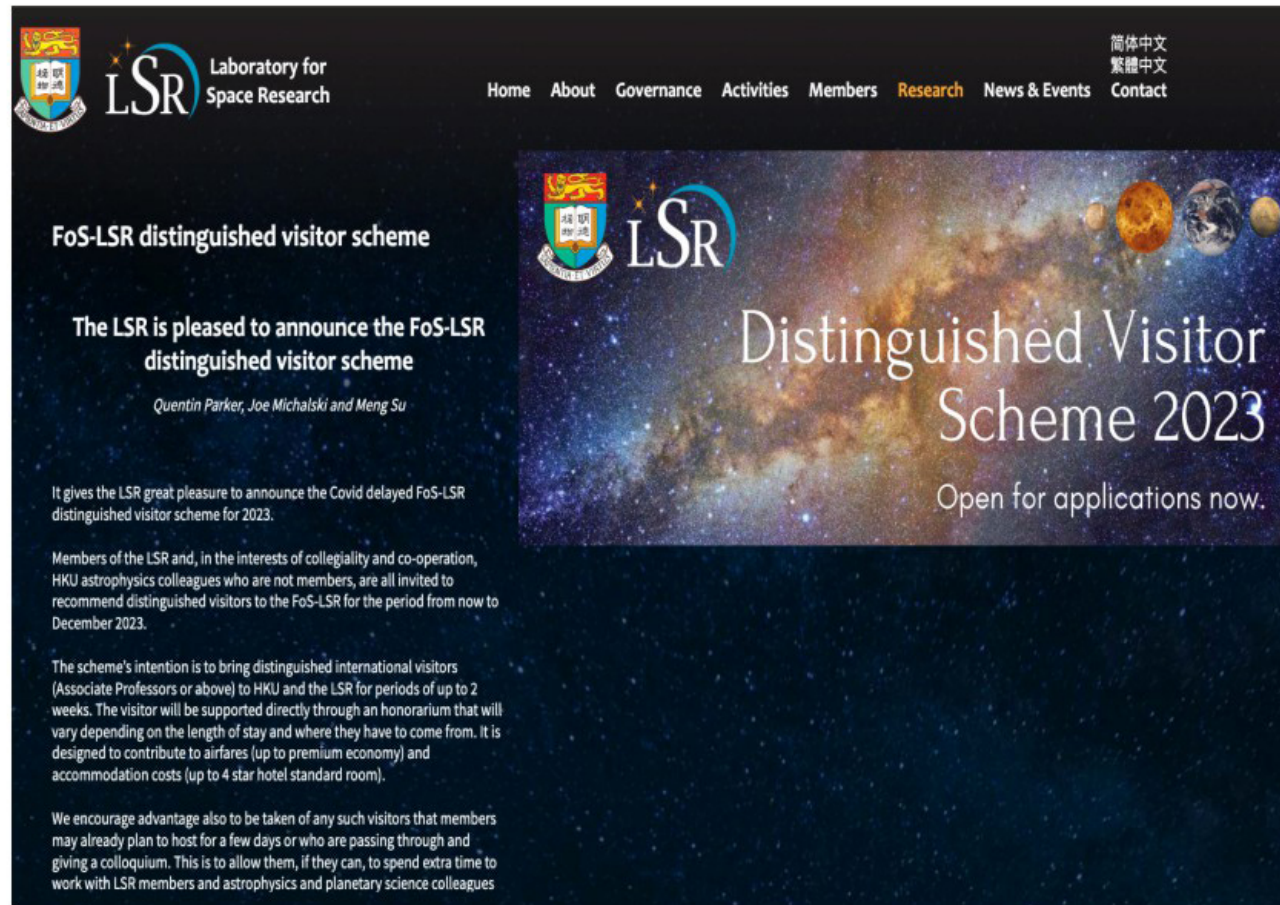


This new initiative began in December 2022. The colloquia are normally on Friday afternoon and followed by Cheese and Wine. We have hosted 4 speakers over the reporting period as follows:

1. Dr. Moritz Reintjes, City University, Hong Kong, “On the regularity implied by the assumption of Geometry – Removing Crinkles in Space-time”, Friday 2nd December 2022.
2. Prof. Kong Chung To, FoE, HKU, “Hacking Astronomy using AI”. Friday 2nd March 2023
3. Dr. Pablo Saz Parkinson, University of Santa Cruz, USA, X-ray and Gamma ray observations of PSR J021_0426 – the 1st pulsar seen by FERMI Large Area Telescope”, Friday 16th June 2023
4. Prof. Peng Jia, Taiyuan University of Technology, China, Discovery of Astronomical Phenomena with Artificial Intelligence and the Digital Twin”, Tuesday August 1st 2023

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

5.4. A new LSR Distinguished Visitors Program was launched in 2023



In previous years the LSR promoted a vigorous general visitor program with modes support. Now that Covid restrictions have passed we have been able to host international visitors again this year and have now inaugurated a more prestigious Distinguished visitor Scheme with up to \$HK23K funding per visit to cover airfares and accommodation. We have two distinguished visitors for 2023: Dr. Pablo Saz Parkinson (UC Santa Cruz) and Prof. Sun Kwok (UBC, Canada) with more scheduled for 2024 including Prof. Alber Zijlstra (Univ. Manchester, UK)

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

6. Ongoing Collaborations and Partnerships

The LSR currently has 27 MoUs and agreements starting with the first in October 2017 and the most recent being in August 2023. We have been proactive and highly strategic in establishing key international collaborations and partnerships that often lead to MoUs. We have committed to only signing “meaningful”, highly targeted MoUs and agreements where our partners can commit real intent and resources to create joint, impactful endeavors. We only team-up with the highest quality partners – the most influential, leading, and significant.

6.1. MoUs and agreements over the reporting period

Six MoUs and agreements were signed over the 2022-2023 reporting period. In Chronological order they are:

1. Wuxi-Binhu Government. 3 way letter of Intent with LSR, OriginSpace and Wuxi-Binhu 7th February 2023
2. United Arab Emirates University NSSTC (letter of Intent) signed at JOCIC 2023, Abu Dhabi 7th March 2023
3. China Great Wall – 3 way letter of Intent with LSR, OriginSpace and CGWIC – 21st March 2023
4. Chinese Society of Astronautics (Strategic Collaboration Agreement) signed at Hefei Space Days 25th April 2023
5. Zhejiang University, Hangzhou, 4-way collaboration agreement for 6U MeV CubeSat project with LSR, ZJU, PolyU and OriginSpace 16th May 2023
6. Hong Kong-based Genius Development group who teach independently intensive STEM education to young HK SAR children: <https://www.geniusdevelop.com/about-us>. (MoU) 7th August 2023

7. LSR delegation visits at home and abroad

The LSR hosted several important delegation visits and also visited several overseas establishments during the reporting period as detailed below.

7.1. Nanjing Government delegation visit 7th February

The LSR hosted several important delegation visits and also visited several overseas establishments during the reporting period as detailed below.



Round table of several hours of discussions on collaboration and funding opportunities

7.2. Wuxi-Binhu Government delegation visit 7th February & August 1th 2023



Signing of letter of intent for Government level collaboration with the LSR

7.3. Hangzhou delegation visit 22nd February 2023



Hangzhou delegation visit LSR

7.4. Visit to UAE Al-Ain, Abu Dhabi & Dubai March 6-18th 2023



Signing of 3-way LoI at JOCIC 2023 in Special Industrial Zone Abu Dhabi, between LSR, Origin Space and NSSTC 7th March 2023

7.5. Visit by Prof. Hakeem Oluseyi & NASA/US Consulate 15th March 2023



7.6. China Great Wall Industry Corporation (CGWIC) 21st March 2023



Visit to Dubai Space Conference & meeting with UAEU National Space Science and technology Centre 8th March 2023



Signing of 3-way Letter of Intent between the LSR, Origin Space and CGWIC

7.7 China Society of Astronautics 22nd March 2023



Deep discussion on opportunities for the LSR to engage with the CSA

7.8. PolyU Astronautics Group visit to the LSR 29th April 20



Visit of Prof, Wen's PolyU Astronautics group to the LSR to discuss collaboration on the LSR led 6U MeV CubeSat project

7.9 LSR invitation, presentation & round table discussion 24-26th April 2023 at Hefei Space Days, PRC.



Visit at invitation of CSA included the LSR signing a strategic cooperation agreement between the Chinese Society of Astronautics and the LSR

7.10. HASSE visit 9th May 2023



HASSE delegation visit to LSR 9th May 2023 with CEO James- discussion of STEM NewSpace education projects

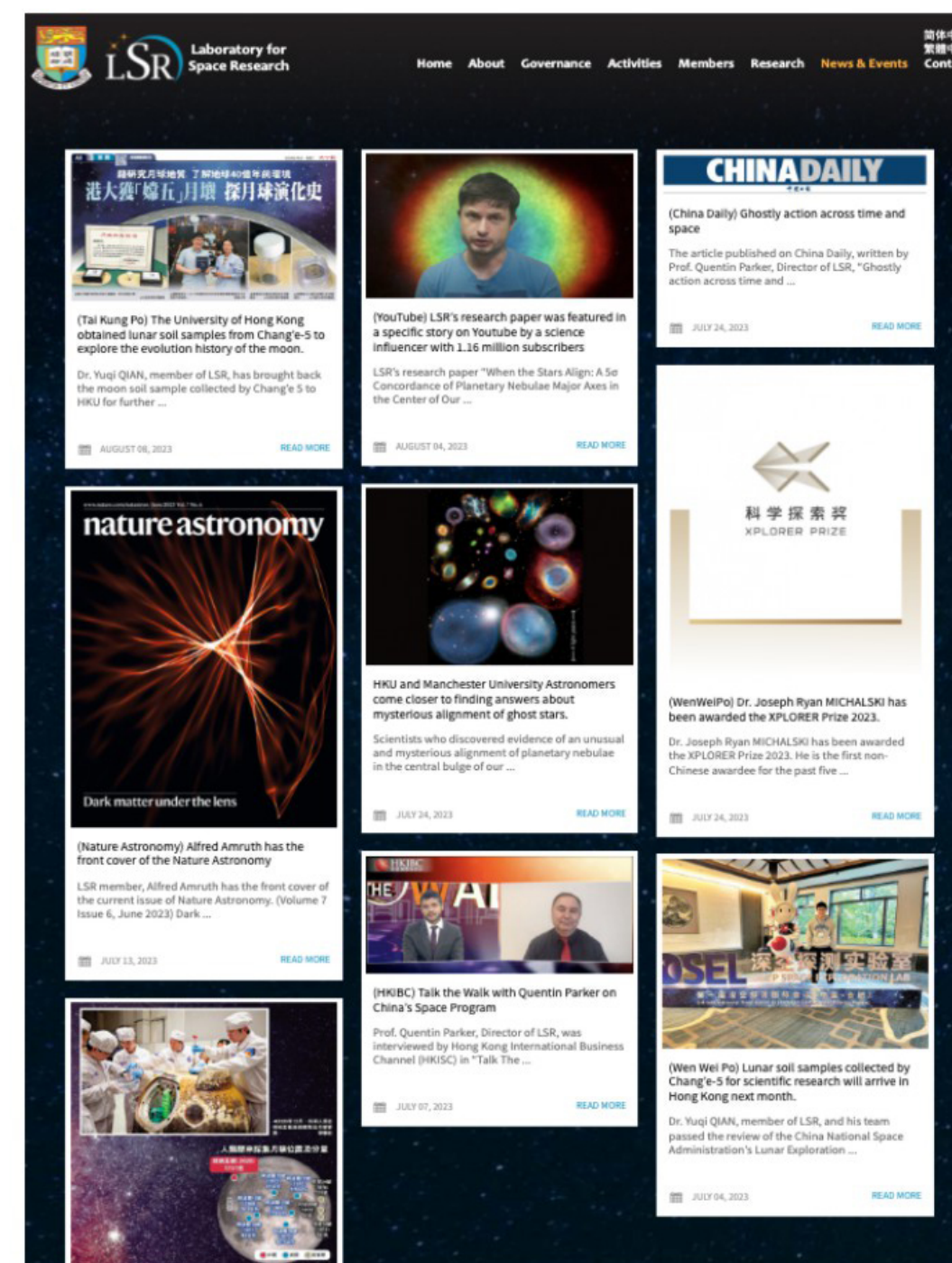
7.11. Shanghai USTC visit 17th August 2023



Visit of Shanghai USTC visit 17th August 2023 to discuss collaboration opportunities and links with LSR members Dr. Binzheng Zhang, Dr Zhonghua Yao and Prof. Quentin Parker

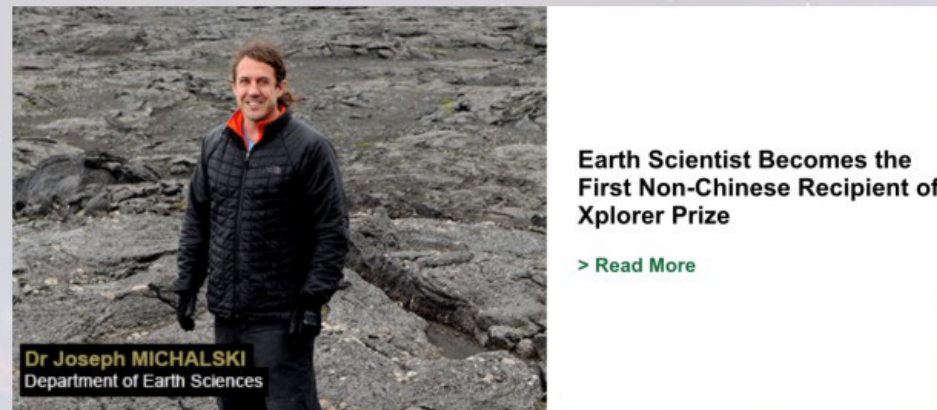
8. Selected Contributions and Achievements from LSR members

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/>



➤ One of our sparkling stars: Dr Joe Michalski.

This has been a very special year for LSR deputy Director Dr. Joseph Michalski who has had 2 big wins over the period not including the Moon rock acquisition from this postdoc Yuqi (see special focus item in sec 5.2).



Dr. Joe Michalski became the first non Chinese Scientist to win a Tencent Xplorer prize in 2023 in recognition of a sustained record of distinguished, global contributions to the geosciences with strong future potential.

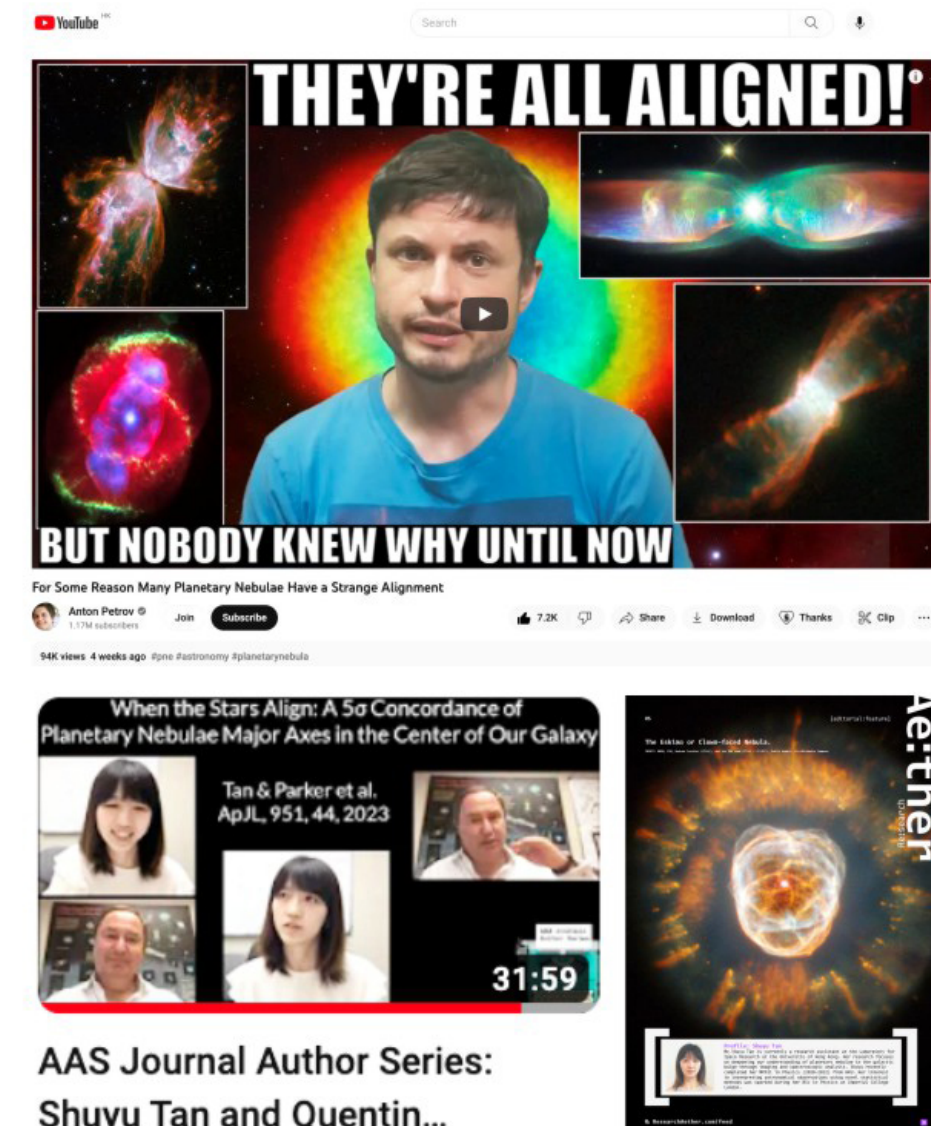
See HKU press release: https://www.hku.hk/press/news_detail_26420.html



Dr. Michalski was also the recipient of a prestigious RGC Research fellowship

See: <https://www.scifac.hku.hk/news/hku-science-academics-recognised-for-research-excellence-and-innovation-in-rgc-funding-schemes>

➤ When the stars align – A remarkable Science Result: Ms Shuyu Tan

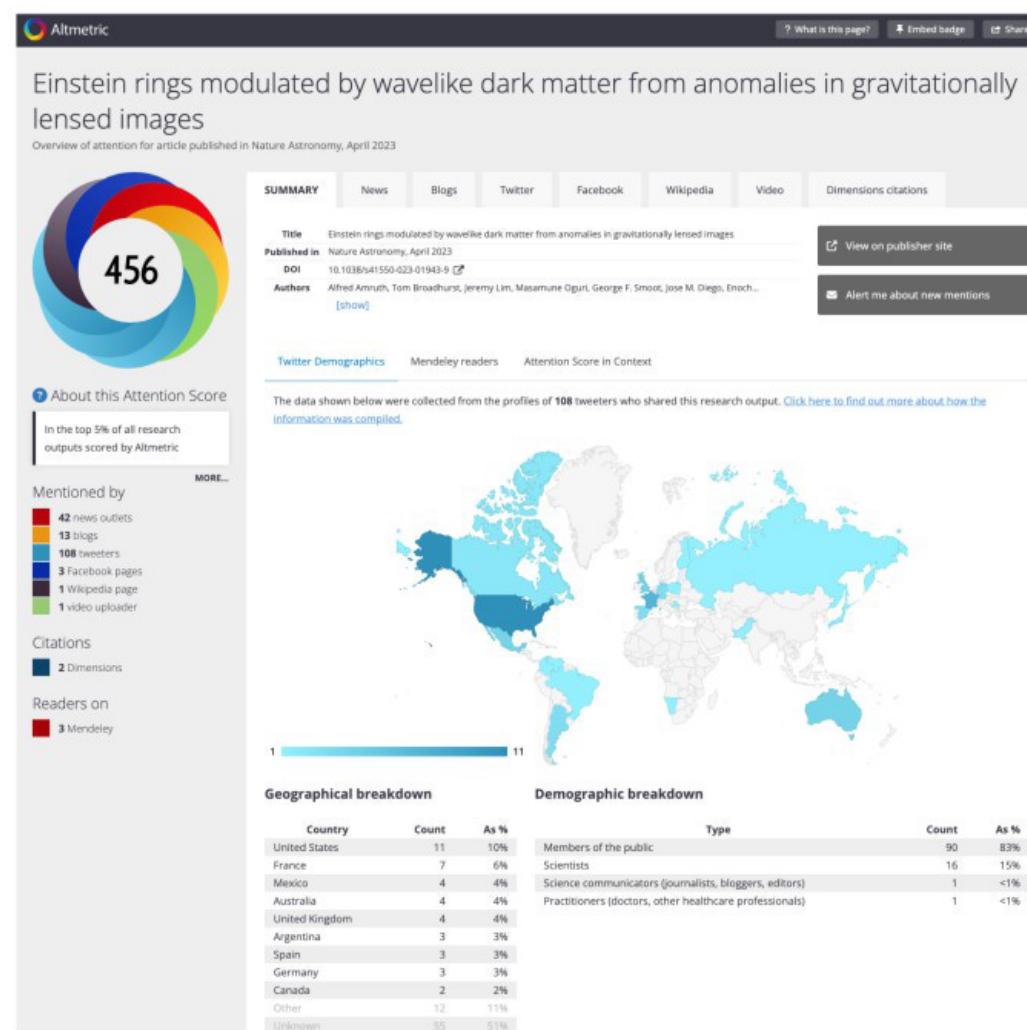


Remarkable coverage of an amazing science result led by Ms. Shuyu Tan of the LSR and FoS published in Ap.J Letters, 951, 2023 in July 2023. – this led to viral press coverage, a 10min YouTube video from a famous Science Influencer Anton Petrov who has 1.2 million subscribers and has been viewed ~97,000 times,

<https://www.youtube.com/watch?v=r8WlvrnU624> a special AAS Youtube 30min video

<https://www.youtube.com/watch?v=IUuofb4P2VM&t=1660s> and a UK “Aether” Science magazine article: <https://researchaether.com/publication/>

New Physics may be needed according to the LSR's Alfred Amruth first author of an exciting Nature Astronomy paper in 2023.



Exceptional Altmetric results for the Amruth et al. 2023 Nature Astronomy paper.

The Nature paper press, media and publicity info can be found here: <https://nature.altmetric.com/details/146217081>. Alfred's paper is within the top 1% of all research articles published in all journals in terms of how much media attention it generated.

Quoting Alfred "Dark matter (DM) is likely made up of ultralight particles rather than the conventional heavy particle DM interpretation - an attempt at changing the paradigm towards new physics!"

9. Our Media Footprint and Science based 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 566 different items of media coverage over the period. This includes the 310 media links for the HKU Moon rock scoop. Together the LSR led 34% of all national and international media links for the entire Faculty of Science over the reporting period – up from 24% last year.



Left: Much of the Chinese Media picked up on the story of HKU LSR members Dr. Yuqi QIAN and Dr. Joe Michalksi acquiring samples of moonrock from the Chang'E 5 sample –return mission following a press conference called by HKU on the matter – in total it alone produced over 310 global news stories. Right: Professor Quentin Parker, Director of LSR, was featured on the RTHK TV Programme 'Our Scientists' on the work of his team on the Lobster-eye X-ray Satellite & CubeSat projects. He also talked about his Business & Economy in Space Technology (BEST) programme and shared his insights on STEM education in Hong Kong.


Our coverage has been especially prominent in the Mainland, including TV, video, radio and in print.

Five LSR Press Releases (September 1st 2022 to 31st August 2023)

Links to all 5 of the HKU press releases are given below while selected excerpts from the viral list of the key media coverage arising from these and all other media coverage involving the LSR (including relevant web links) are provided in Appendix VI.

9.1. HKU geologist proposes the number of ancient Martian lakes might have been dramatically underestimated by scientists - J.Michalski

https://hku.hk/press/news_detail_25044.html 16th September 2022


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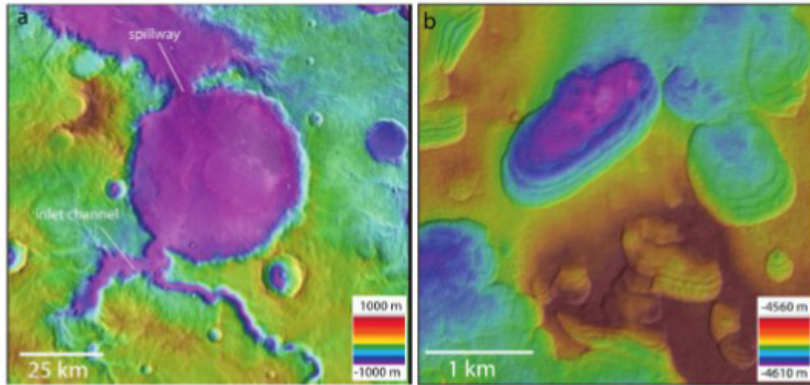
Home > Media > All News > HKU geologist proposes the number of ancient Martian lakes might have been dramatically underestimated by scientists

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HKU geologist proposes the number of ancient Martian lakes might have been dramatically underestimated by scientists
16 Sep 2022

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Lakes are bodies of water fed by rainfall, snowmelt, rivers and groundwater, through which, Earth is teeming with life. Lakes also contain critical geologic records of past climates. Though Mars is a frozen desert today, scientists have shown that Mars contains evidence of ancient lakes that existed billions of years ago, which could contain evidence for ancient life and climate conditions on the red planet. Through a meta-analysis of years of satellite data that shows evidence for lakes on Mars, Dr Joseph MICHALSKI, a geologist in the Department of Earth Sciences, The University of Hong Kong (HKU) proposed that scientists might have dramatically underestimated the number of ancient Martian lakes that once existed.

Michalski and the international team recently published their results in *Nature Astronomy*, which describe a global analysis of ancient Martian lakes. "We know of approximately 500 ancient lakes deposited on Mars, but nearly all the lakes we know about are larger than 100 km²," explains Michalski. "But on Earth, 70% of the lakes are smaller than this size, occurring in cold environments where glaciers have retreated. These small-sized lakes are difficult to identify on Mars by satellite remote sensing, but many small lakes probably did exist. It is likely that at least 70% of Martian lakes have yet to be discovered." Scientists monitor these small lakes on Earth in order to understand climate change. The missing small lakes on Mars might also contain critical information about past climates.

The recent paper also reports that most known Martian lakes date to a period 3,500 to 4,000 million years ago, but each of the lakes might have lasted only a geologically short time (10,000 to 100,000 years) during this time span. This means that ancient Mars was probably mostly cold and dry as well, but it warmed episodically for short periods of time. Michalski adds, "Because of the lower gravity on Mars and the pervasive, fine-grained soil, lakes on Mars would have been very murky and might not have allowed light to penetrate very deeply, which could present a challenge to photosynthetic life, if it existed."

9.2. HKU Astrophysicists Reveal the Nature of Dark Matter through the Study of Crinkles in Spacetime – Alfred Amruth

https://hku.hk/press/news_detail_26056.html 25th April 2023


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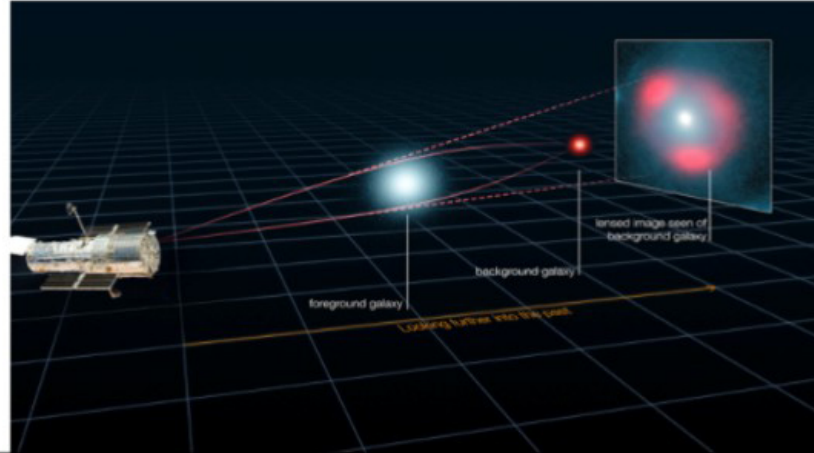
Home > Media > All News > HKU Astrophysicists Reveal the Nature of Dark Matter through the Study of Crinkles in Spacetime

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HKU Astrophysicists Reveal the Nature of Dark Matter through the Study of Crinkles in Spacetime
25 Apr 2023

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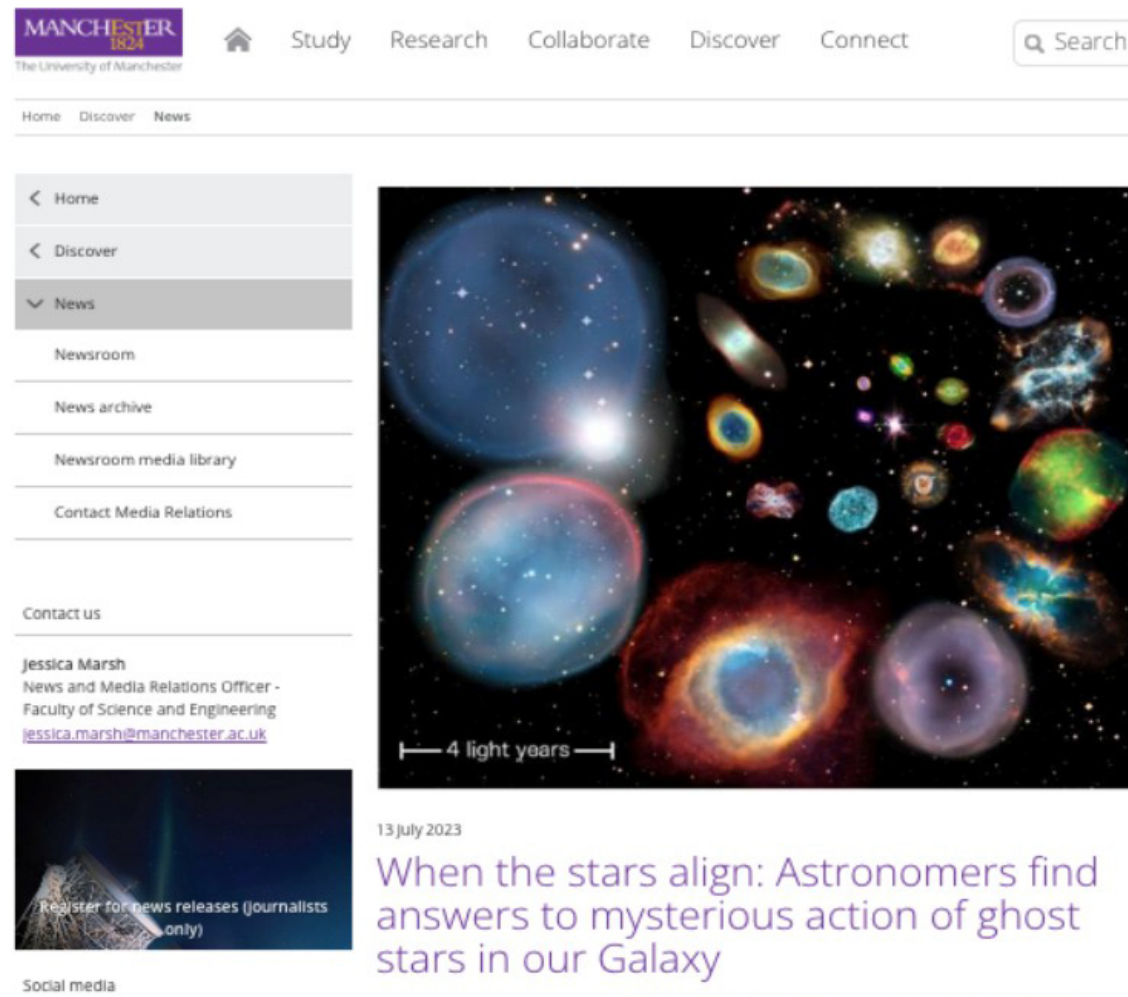
Show caption ^

Most of the matter in the universe, amounting to a staggering 85% by mass, cannot be observed and consists of particles not accounted for by the Standard Model of Particle Physics (see remark 1). These particles are known as Dark Matter, and their existence can be inferred from their gravitational effects on light from distant galaxies. Finding the particle that makes up Dark Matter is an urgent problem in modern physics, as it dominates the mass and, therefore, the gravity of galaxies – solving this mystery can lead to new physics beyond the Standard Model.

While some theoretical models propose the existence of ultramassive particles as a possible candidate for Dark Matter, others suggest ultralight particles. A team of astrophysicists led by Alfred AMRUTH, a PhD student in the team of Dr Jeremy LIM of the Department of Physics at The University of Hong Kong (HKU), collaborating with Professor George SMOOT, a Nobel Laureate in Physics from the Hong Kong University of Science and Technology (HKUST) and Dr Razieh EMAMI, a Research Associate at the Center for Astrophysics | Harvard & Smithsonian (CFA), has provided the most direct evidence yet that Dark Matter does not constitute ultramassive particles as is commonly thought but instead comprises particles so light that they travel through space like waves. Their work resolves an outstanding problem in astrophysics first raised two decades ago: why do models that adopt ultramassive Dark Matter particles fail to correctly predict the observed positions and the brightness of multiple images of the same galaxy created by gravitational lensing? The research findings were recently published in *Nature Astronomy*.

9.3. When the stars align: Astronomers find answers to mysterious action of ghost stars in our Galaxy – led by LSR members Shuyu Tan and Quentin Parker

<https://www.manchester.ac.uk/discover/news/when-the-stars-align-astronomers-find-answers-to-mysterious-action-of-ghost-stars-in-our-galaxy/>



The screenshot shows the University of Manchester website. The main navigation bar includes links for Home, Study, Research, Collaborate, Discover, and Connect. A search bar is located on the right. The left sidebar contains a 'News' section with links to Newsroom, News archive, Newsroom media library, and Contact Media Relations. Below this is a 'Contact us' section with the name Jessica Marsh, her title as News and Media Relations Officer, and her email address. The main content area features a large image of a galaxy with a scale bar indicating '4 light years'. The article title is 'When the stars align: Astronomers find answers to mysterious action of ghost stars in our Galaxy', dated 13 July 2023. The text describes a collaboration between the University of Manchester and the University of Hong Kong, led by Shuyu Tan and Quentin Parker, which has found a source for the mysterious alignment of stars near the Galactic Centre. The article mentions that the alignment was discovered ten years ago by a Manchester PhD student, Bryan Rees, but has remained unexplained. It also notes that new data obtained with the European Southern Observatory Very Large Telescope in Chile and the Hubble Space Telescope, published in *Astrophysical Journal Letters*, has confirmed the alignment but also found a particular group of stars that is responsible, namely close binary stars. The article explains that planetary nebulae are clouds of gas that are expelled by stars at the end of their lives - the Sun will also form one about five billion years from now. The ejected clouds are 'ghosts' of their dying stars and they form beautiful structures such as an hourglass or butterfly shape. The team studied a group of so-called planetary nebulae found in the Galactic Bulge near the centre of our Milky Way. Each of these nebulae are unrelated and come from different stars, which were born at different times, and spend their lives in completely different places. However, the study found that many of their shapes line up in the sky in the same way and are aligned almost parallel to the Galactic plane (our Milky Way). This is in the same direction as found by Bryan Rees a decade ago.

9.4. Earth Science scholar Dr Joseph Michalski becomes the first non-Chinese recipient of Xplorer Prize


https://www.hku.hk/press/news_detail_26420.html 26th July 2023



The screenshot shows the HKU press release page. The main navigation bar includes links for Home, Study, Research, Collaborate, Discover, and Connect. A search bar is located on the right. The left sidebar contains a 'News' section with links to Newsroom, News archive, Newsroom media library, and Contact Media Relations. Below this is a 'Contact us' section with the name Jessica Marsh, her title as News and Media Relations Officer, and her email address. The main content area features a large image of Dr Joseph Michalski standing in a desert landscape. The article title is 'HKU Earth Science scholar Dr Joseph Michalski becomes the first non-Chinese recipient of Xplorer Prize', dated 26 Jul 2023. The text describes Dr Michalski's research centers on Mars' ancient crust, which he believes contains vital information about the origins of life on Earth and pre-plate tectonic processes. It also mentions that Dr Michalski is the first non-Chinese recipient of the prestigious Xplorer Prize 2023. The article explains that Mars and Earth had similar geological environments, so life could have formed there just the same as it formed here on Earth. Because Earth has plate tectonics and Mars does not, the crust of this planet has been almost completely recycled, but it is preserved on Mars. That means that our only hope to discover the steps that led to origins of life might only be found on Mars, not on Earth. This is why it is so important to study the ancient crust of Mars," explained Dr Michalski, adding that Mars and Earth shared remarkably similar geological environments approximately 3.8 to 4 billion years ago, suggesting that life could have formed on the Red Planet as it did on Earth. The article also mentions that Dr Michalski and his team at HKU focus on uncovering new discoveries about the volcanology, geochemistry, tectonics, and mineralogy of Mars. He has established the Planetary Spectroscopy and Mineralogy Laboratory (www.clays.space/lab) at HKU. This cutting-edge facility offers laboratory support for past, current, and future missions to Mars, the Moon, and asteroids in China and beyond. Dr Michalski also serves as Deputy Director of HKU's Laboratory for Space Research (https://www.lsr.hku.hk/).

9.5. Geologists Team at HKU Becomes First in Hong Kong to Retrieve Lunar Samples - Set to Unveil the Mysteries of the Moon's Volcanic History

<https://www.hku.hk/press/press-releases/detail/26437.html> 7th August 2023


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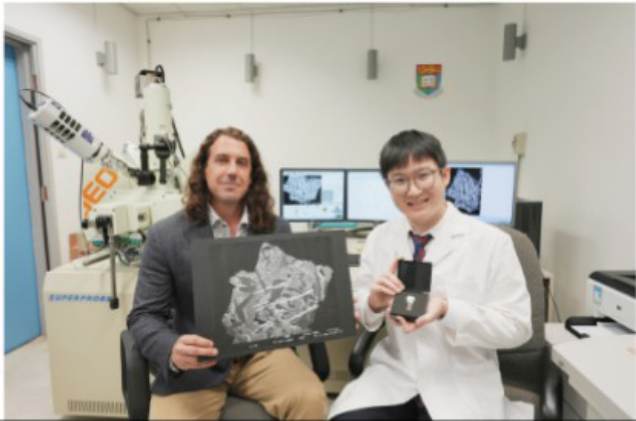
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Geologists Team at HKU Becomes First in Hong Kong to Retrieve Lunar Samples - Set to Unveil the Mysteries of the Moon's Volcanic History
07 Aug 2023

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The geologists at The University of Hong Kong (HKU) have achieved a historic feat by obtaining lunar soil samples collected by the Chinese lunar probe Chang'e-5 in 2020. This marks the first time that a Hong Kong research team has secured such samples.

Led by postdoctoral fellow Dr Yuqi QIAN from the Department of Earth Sciences, Faculty of Science, the team obtained approval from the China National Space Administration's Lunar Exploration and Space Engineering Centre to study the lunar soil samples. Dr Qian personally travelled to Beijing to retrieve the samples, which weigh 822.6 milligrams in total. These lunar samples offer valuable insights into the Moon's geological and thermal history and its connection to the formation and evolution of planetary bodies in the Solar System. The achievement by the HKU team underscores the university's growing contributions to China's lunar and planetary exploration efforts.

'This is a dream come true for us and Hong Kong's space science community,' said Qian, who is eager to analyse the samples using state-of-the-art instruments at the university. 'We hope to reveal the secrets of the Moon and gain insights into the early Earth, which could have important implications for our understanding of the Solar System and beyond.'

Previous Study on the Chang'e-5 Landing Site Paves the Way

Dr Qian is making waves in the field of planetary geology with his exceptional research on the Chang'e-5 landing site. Having published the first paper documenting the site and constructing a complete picture, he has been focusing on different aspects such as regolith properties, volcanic history and the provenance of lunar soils. His research work has been published in top-tier journals and widely cited, with over 400 citations, solidifying his position as an emerging expert. Recently, Dr Qian joined HKU as a postdoctoral fellow after obtaining his doctoral degree in Planetary Geology from China University of Geosciences.

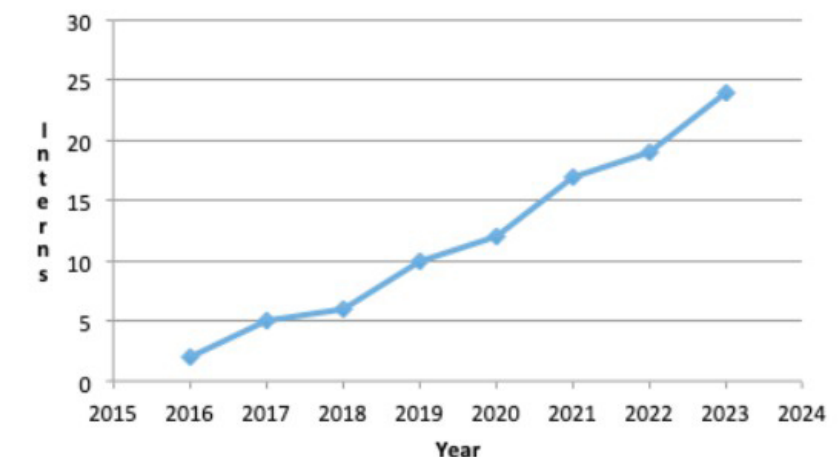
10. Selected Knowledge Exchange, community service and outreach activities

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"

10.1. The LSR summer Internship program

We again remain very proactive in this important Knowledge exchange and outreach area. The LSR 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 2023 of 24 – a 20% increase since 2022. We do not advertise this program. 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 97 interns since 2016 for periods of between 2-3 weeks and 3 months. Interns come from local high-schools and international schools, HKU and local universities but also from overseas (e.g. this year U.K., India, Chinese Mainland and Kenya).

LSR Summer Interns 2016 to 2023



Plot showing the growth of the LSR internship program from its inception in 2016 up to the current reporting period in 2023. We have now "maxed out" and without additional resources no further intern growth is possible.

Name	Status	Discipline	University/School
Cheng Li	Undergraduate	Computer Science	Macau University of Science and Technology
Yuqing Lu	Undergraduate	Astrophysics	University of St Andrews, Scotland, UK
Ma Yue	Undergraduate	Geophysics	Southern University of Science and Technology, China
Shyui Yue	Undergraduate	Phys & Astro	Sun Yat Sen University China
Joel Chan	High School 11th grade	Astrophysics	Victoria Shanghai Academy (HK)
Tonia Kim	High School 11th grade	High Energy Astro	Hong Kong International School (HK)
Christopher Yue	High School 11th grade	Astrophysics	Hong Kong International School (HK)
Evanson Wamheu Gichimu	High School	Astronomy	Nairobi, Kenya
Panav Kalra	High School 11th grade	Engineering	Sha Tin College (HK)
Jefferson Cheung	High School	CubeSat	Victoria Shanghai Academy (HK)
Yuyang Tang (Michael)	High School	CubeSat	Victoria Shanghai Academy (HK)
Nicole Tse	High School	CubeSat	Victoria Shanghai Academy (HK)
Ethan Choi	High School	CubeSat	Victoria Shanghai Academy (HK)
Lorraine Cheng Yi Shien	High School	Astrophysics	Li Po Chun United World Colleges Hong Kong
Patrick Fu	High School	Astrophysics	Canadian International School of (HK)
Tina Huang	High School	Astrophysics	Gyeonggi Suwon International School S.Korea
Ho Kong Peng (Jack)	6th form college	Astrophysics	Oxford International College, Oxford, UK
Colin Siriu Chen	High School	Maths/Phys	Singapore International School (HK)
Zhang Ziqi	High School	Coding/IT	Singapore International School (HK)
Xuanyu Lin (Austin)	High School	Astropreneur?	Singapore International School (HK)
Huan Jiarong	High School	Creative/artistic	Singapore International School (HK)
Hsiang-Chun Yeh (Harry)	High School 11th grade	Astrophysics	Shekou International School (Shenzhen) China
Thalesh Gupta	High School 11th grade	Astrophysics	Local High School (HK)
Eugene Shang	High School year 13	Astrophysics	KGV school (HK)

List of 24 LSR Interns for Summer 2023. On third (8/24) are from outside of HK SAR and 4 are undergraduates – all from outside HK

➤ Report from two 2023 LSR interns in their own words:

I spent a little over a month at LSR and I learned a lot about research in this field. Most significantly, I learned Python from scratch; I had zero experience in coding prior to the internship. But LSR set me up for a great learning experience, as my supervisors gave me lots of initial guidance and then also a lot of independent work for me to explore on my own while still offering help when I got stuck. I was exposed to some really cool science, getting to analyse raw data from NASA's telescopes. The faculty was all very friendly and had super interesting stories and ideas to share, and we had many wonderfully weird discussions about physics. This internship gave me a glance into what research in this field is like, and I got to see how different disciplines come together on projects during their meetings. Overall, great experience!

Tongyon Kim, Hong Kong International School

Throughout this entire internship, I learned many, many things, and this was an amazing experience for me. I learned a lot about Python: numpy, matplotlib, astropy, and even a bit of scipy as well. I learned a bit more about how to research: how to go through Google Scholar to help me find information, analyze a research paper and extract the information that was important for me and understand relatively jargon-filled and specialized language. One of the most important parts of an internship, in my opinion, is the experience. In this internship, I experienced the highs and lows of coding, the experience of not necessarily knowing everything, the experience of having to learn something new entirely from scratch, and the experience of 9-5 work hours, all of which I didn't necessarily experience before this internship. But arguably most importantly, I learned some "soft" skills: this was my first ever internship, and I learned how to communicate with my supervisor, communicate with fellow interns, and conduct myself in a different academic environment from what I was used to. I find that in general, the environment at the LSR is different from that in my school, so I learned a lot in that regard as well.

Overall, this internship was an amazing experience for me. I got to meet many great people, experienced many new things, and learned a lot. Although there were ups and downs, like sometimes when my code wasn't working, or when I didn't feel like my process was going anywhere, I still managed to persevere and produce a tangible report at the end which I was proud of. This was my first ever internship, and as far as first internships go, this was a very good experience. I particularly enjoyed programming in Python and learning new topics in astrophysics, like high-energy astrophysics. I loved this internship, and I highly recommend this internship to anyone interested in astrophysics or physics.

Christopher Yue, Hong Kong International School

10.2. Shared Internship Jamboree with OASA

For the first time this year the LSR and OASA organised a joint sharing session of summer interns. Each intern had 5 minutes to present the work they did during their internships to an audience of about 40 of their peers and LSR and OASA members. It was an excellent event appreciated by all attendees and finished off with a wonderful Pizza party.



Photo of LSR and OASA interns at our first –ever joint intern sharing session held on 10th August 2023 from summer including a prize giving and Pizza party.

10.3. The HKPRC activities

The LSR has participated in several events with the Hong Kong Productivity Council during the reporting period. This includes Prof. Parker giving a series of lectures associated with their initiative of STEM education in cultivating HK aerospace talents.



Visit to HKPC 28th April 2023



Prof. Parker gave a series of talks at the Inno Space, Hong Kong Productivity Council, STEM event on July 20th 2023

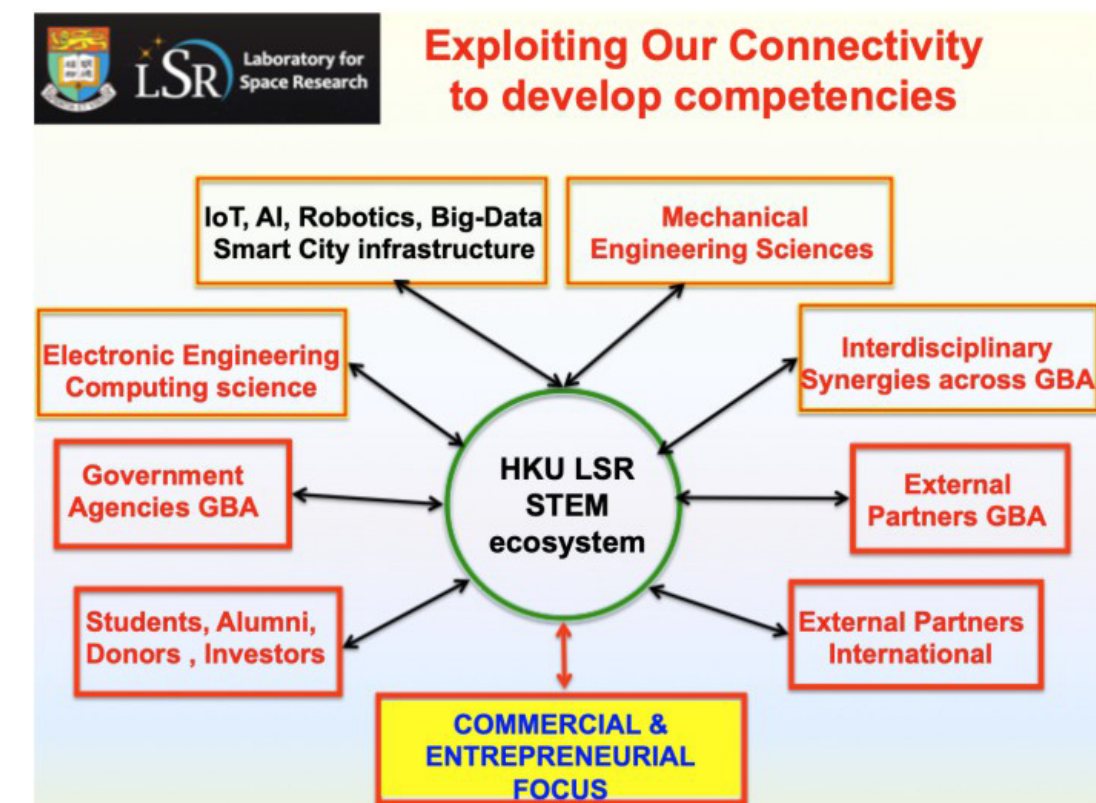
11. Future Plans and Opportunities



It is important that future plans for the LSR are aligned and in the same direction as the plans for HKU as a whole. Our future depends on the level of support from HKU senior management and the Faculty of Science under Dean Professor Qiang Zhou. Now we are directly under the FoS we remain adept at securing funding, undertaking impactful projects, maintaining good relations with our partners and continuing to raise our profile via regular news items, initiatives and press releases. A few key future LSR plans, evolved from last year's report, are listed below:

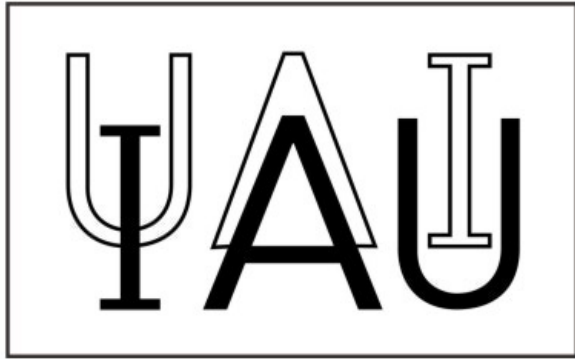
- ◆ Secure meaningful long-term funding
 - this is essential if our future is to be secured
 - have appointed a new "non remunerated" Beijing based LSR deputy director for Mainland affairs to assist with this
- ◆ Leverage our increased autonomy within the Faculty of Science
 - Given the current improved operational parameters that have very positively impacted our operations, this is a new aim
- ◆ Set up the "INSPIRE" laboratory in the GBA funding permitted
 - this will depend on HKU proceeding with the agreement with the Shenzhen government of a Shenzhen campus
- ◆ Establish CAS-HKU joint INSPIRE 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 INSPIRE at HKU
 - perhaps via conversion to a proper HKU centre or AoE institute
- ◆ Consolidate projects and develop our space & planetary science program:
 - The partially funded 6U CubeSat MeV Gamma-ray mission (as a pathfinder to the hoped for RMB 1 billion PANGU mission) is proceeding while we await news of our bid for a science payload on the Chinese Space Station
 - Continue to develop a World class spectroscopy lab for Planetary science under deputy LSR director Dr. Joe Michalski
 - 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. Zhingua Yao into DES in August 2023 under the HKU 100 talents scheme is a key, positive development but we need more. As an example, despite up to 4 joint posts with the LSR and DES/Physics being funded in the first BRC round 3 years ago with the new 6 year cycle, none of these posts were advertised to be filled by the respective departments. At the same time astrophysicists in the Physics department have dropped from 6 in number in 2020 to 3 today while general Physics staff have increased from 16 to 27. While there is an on-going recruitment for one Astro position in Physics this in no way accounts for the calamitous decline over the last 3 years in particular, especially while other areas have benefitted. We urge the FoS and HKU SMT to address this issue.



Schematic diagram reproduced from the last annual report due to its strong on-going relevance of how we believe the LSR fits into the bigger STEM picture and how we can exploit such synergies and connectivity to build valuable competencies across various areas and jurisdictions.

➤ Opportunities for the LSR



It is amazing how lucky you become the harder you work and how many opportunities there are once you recognize them. The issue for many is fear of failure and so reluctance to seize opportunities when they arise. The LSR is not afraid on both counts and this ethos and modus operandi has been successful so far. We are not afraid to try and believe this is a key to the future success and survival of 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
- There is one very tangible opportunity that has come to us August 2023 in HKU-LSR being chosen to host the very prestigious IAU Pacific regional meeting in 2026. This meeting, held only every 3-4 years will gather ~500 astronomer from typically 40+ countries for a week of science meetings. It is a wonderful opportunity to showcase HK SAR astrophysics and our city.

12. Glossary of Terms

- BEST – Business Economy for Space Technology LSR led STEM initiative
- BISME – Beijing Institute of Space Mechanics and Electricityth
- 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.
- 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
- INSPIRE - International Space & Planetary Institute for Research Excellence
- JV – Joint Venture Company
- KE – Knowledge Exchange
- LSR – Laboratory for Space Research
- MoU – Memorandum of Understanding
- OASA – Orion Astropreneur Space Academy
- PANGU – Pair production N Gamma-ray Unit (a gamma-ray space telescope)
- PDF – Postdoctoral Research Fellow
- PSHK – Physical Society of Hong Kong
- RAP – Research Assistant Professor
- RGC – Research Grants Council
- RMGS – Research Matching Grant Scheme
- RPG – Research Postgraduate
- SALT – South African Large Telescope
- SCMP – South China Morning Post
- SMT – Senior Management Team, HKU
- STB – Science & Technology Bureau, Dongguan
- 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 new LSR laboratory manager for her great 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, GRF and CRF funds and HKU for UDF and BRC support that has enabled the LSR to flourish so far.

We thank the Provost Prof. Richard Wong for our strategic move to the FoS and DVC (Research) Prof. Max Shen for his strong support of the LSR. We also thank the new Dean of Science, Prof. Qiang Zhou for his support of the LSR since he took over and 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 paper in top journals in chronological order

I.1. LSR Led paper


nature astronomy

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[nature](#) > [nature astronomy](#) > [review articles](#) > [article](#)

Review Article | [Published: 15 September 2022](#)

Geological diversity and microbiological potential of lakes on Mars

[Joseph R. Michalski](#) , [Timothy A. Goudge](#), [Sean A. Crowe](#), [Javier Cuadros](#), [John F. Mustard](#) & [Sarah Stewart Johnson](#)

[Nature Astronomy](#) **6**, 1133–1141 (2022) | [Cite this article](#)

1814 Accesses | **5** Citations | **284** Altmetric | [Metrics](#)

Abstract

Hundreds of ancient lake basins detected on Mars via orbital remote sensing represent rare oases of hydrosphere–atmosphere–lithosphere interactions with great astrobiological potential. These palaeolake basins, and associated lacustrine deposits, could preserve evidence of biogenesis on Mars, and their geology, mineralogy and geochemistry place strong constraints on past climate. Most Martian palaeolakes date to the Noachian (>3.7 Gyr ago (Ga)) and probably lasted $\sim 10^2$ – 10^6 years, representing only a small fraction of the ~ 400 Myr of Noachian time. However, some palaeolakes occurred during the Hesperian (3–3.7 Ga), and it is likely that many shallow thermokarst lakes occurred in the Amazonian (<3 Ga) but left few traces. Noachian lacustrine deposits contain detrital Fe/Mg-rich clay minerals as well as authigenic Fe/Mg carbonates, sulfates, silica, chlorides and clay minerals that potentially preserve the characteristics of the ancient atmosphere and climate. While Martian palaeolakes are undeniably among the top targets for future surface exploration and sample return, many questions surrounding prospects for biogenesis and biological productivity in short-lived lakes and transient warm climates on an otherwise cold planet remain. Martian lakes also provide tremendous comparative value for reconstructing the geology and geobiology of inland waters on the Archaean Earth.

I.2. LSR Led paper

communications earth & environment

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[nature](#) > [communications earth & environment](#) > [articles](#) > [article](#)

Article | [Open Access](#) | Published: 04 November 2022

Chemical weathering over hundreds of millions of years of greenhouse conditions on Mars

[Binlong Ye](#) & [Joseph R. Michalski](#) 

[Communications Earth & Environment](#) **3**, Article number: 266 (2022) | [Cite this article](#)

2154 Accesses | 1 Citations | 5 Altmetric | [Metrics](#)

Abstract

Chemical weathering profiles on Mars which consist of an upper Al clay-rich, Fe-poor layer and lower Fe/Mg clay-rich layer are believed to have formed due to precipitation-driven top down leaching process in an ancient, reducing greenhouse climate. Here we use remote sensing imagery and spectroscopy coupled with topographic data and crater chronology to explore the geological characteristics, stratigraphy and relative age of >200 weathering profiles across the southern highlands of Mars. We find that nearly all exposures show a similar, single stratigraphic relationship of Al/Si materials over Fe/Mg clays rather than multiple, interbedded mineralogical transitions. This suggests either one single climate warming event or, perhaps more likely, chemical resetting of weathering horizons during multiple events. While the time required to form a typical martian weathering profile may have been only $\sim 10^6$ – 10^7 years, the profiles occur in deposits dating from the Early Noachian into the Hesperian and suggest that chemical weathering may have occurred over a large range of geologic time, with a peak around 3.7–3.8 billion years ago.

I.3. LSR co-authored paper


nature astronomy

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Article | Published: 08 December 2022

The messy death of a multiple star system and the resulting planetary nebula as observed by JWST

[Orsola De Marco](#) , [Muhammad Akashi](#), [Stavros Akras](#), [Javier Alcolea](#), [Isabel Aleman](#), [Philippe Amram](#), [Bruce Balick](#), [Elvire De Beck](#), [Eric G. Blackman](#), [Henri M. J. Boffin](#), [Panos Boumis](#), [Jesse Bublitz](#), [Beatrice Bucciarelli](#), [Valentin Bujarrabal](#), [Jan Cami](#), [Nicholas Chornay](#), [You-Hua Chu](#), [Romano L. M. Corradi](#), [Adam Frank](#), [D. A. García-Hernández](#), [Jorge García-Rojas](#), [Guillermo García-Segura](#), [Veronica Gómez-Llanos](#), [Denise R. Gonçalves](#), ... [Albert A. Zijlstra](#) [+ Show authors](#)

[Nature Astronomy](#) **6**, 1421–1432 (2022) | [Cite this article](#)

2175 Accesses | 5 Citations | 724 Altmetric | [Metrics](#)

 An [Author Correction](#) to this article was published on 03 January 2023

 This article has been [updated](#)

Abstract

Planetary nebulae—the ejected envelopes of red giant stars—provide us with a history of the last, mass-losing phases of 90% of stars initially more massive than the Sun. Here we analyse images of the planetary nebula NGC 3132 from the James Webb Space Telescope (JWST) Early Release Observations. A structured, extended hydrogen halo surrounding an ionized central bubble is imprinted with spiral structures, probably shaped by a low-mass companion orbiting the central star at about 40–60 au. The images also reveal a mid-infrared excess at the central star, interpreted as a dusty disk, which is indicative of an interaction with another closer companion. Including the previously known A-type visual companion, the progenitor of the NGC 3132 planetary nebula must have been at least a stellar quartet. The JWST images allow us to generate a model of the illumination, ionization and hydrodynamics of the molecular halo, demonstrating the power of JWST to investigate complex stellar outflows. Furthermore, new measurements of the A-type visual companion allow us to derive the value for the mass of the progenitor of a central star with excellent precision: $2.86 \pm 0.06 M_{\odot}$. These results serve as pathfinders for future JWST observations of planetary nebulae, providing unique insight into fundamental astrophysical processes including colliding winds and binary star interactions, with implications for supernovae and gravitational-wave systems.

I.4. LSR led paper

nature astronomy

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Article | [Published: 12 January 2023](#)

Mineralogy and chronology of the young mare volcanism in the Procellarum-KREEP-Terrane

[Yuqi Qian](#), [Zhenbing She](#), [Qi He](#), [Long Xiao](#) , [Zaicong Wang](#) , [James W. Head](#), [Lingzhi Sun](#), [Yiran Wang](#), [Bo Wu](#), [Xiang Wu](#), [Biji Luo](#), [Kenan Cao](#), [Yiheng Li](#), [Mingtian Dong](#), [Wenlei Song](#), [Fabin Pan](#), [Joseph Michalski](#), [Binlong Ye](#), [Jiawei Zhao](#), [Siyuan Zhao](#), [Jun Huang](#), [Jiannan Zhao](#), [Jiang Wang](#), [Keping Zong](#) & [Zhaochu Hu](#)

[Nature Astronomy](#) **7**, 287–297 (2023) | [Cite this article](#)

1015 Accesses | 5 Citations | 13 Altmetric | [Metrics](#)

Abstract

Young lunar mare basalts are recent volcanic products distributed mainly in the Procellarum-KREEP-Terrane. However, these young basalts were never investigated in situ until 2013 by Chang'e-3, and then sampled by Chang'e-5 in 2020. Using the returned Chang'e-5 samples as ground truth, and examining Moon Mineralogy Mapper data globally, we found the young basalts containing less abundant olivine (<10%) than previously suggested. The Chang'e-3 and Chang'e-5 basalts belong to a type of underrepresented basalt. We reassessed the model ages of the young basalts using the new chronology function calibrated by the Chang'e-5 samples and found the young basalts have a trend of increasing TiO₂ abundance with time. The young basalts with an age of around 2.0 Ga (billion years ago) are widespread in the Procellarum-KREEP-Terrane, including the Chang'e-5 unit. This indicates mare volcanism was still active at that time and an additional heat source or mechanism may be needed compared to older basalts. Young mare samples from Chang'e-5 and other potential sites are needed to constrain the late lunar thermal and volcanic history.

I.5. LSR led paper

nature astronomy

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Article | [Published: 20 April 2023](#)

Einstein rings modulated by wavelike dark matter from anomalies in gravitationally lensed images

[Alfred Amruth](#) , [Tom Broadhurst](#), [Jeremy Lim](#), [Masamune Oguri](#), [George F. Smoot](#), [Jose M. Diego](#), [Enoch Leung](#), [Razieh Emami](#), [Juno Li](#), [Tzihong Chiueh](#), [Hsi-Yu Schive](#), [Michael C. H. Yeung](#) & [Sung Kei Li](#)

[Nature Astronomy](#) **7**, 736–747 (2023) | [Cite this article](#)

2652 Accesses | 2 Citations | 456 Altmetric | [Metrics](#)

Abstract

Unveiling the true nature of dark matter, which manifests itself only through gravity, is one of the principal quests in physics. Leading candidates for dark matter are weakly interacting massive particles or ultralight bosons (axions), at opposite extremes in mass scales, that have been postulated by competing theories to solve deficiencies in the Standard Model of particle physics. Whereas dark matter weakly interacting massive particles behave like discrete particles (ρ DM), quantum interference between dark matter axions is manifested as waves (ψ DM). Here, we show that gravitational lensing leaves signatures in multiply lensed images of background galaxies that reveal whether the foreground lensing galaxy inhabits a ρ DM or ψ DM halo. Whereas ρ DM lens models leave well documented anomalies between the predicted and observed brightnesses and positions of multiply lensed images, ψ DM lens models correctly predict the level of anomalies remaining with ρ DM lens models. More challengingly, when subjected to a battery of tests for reproducing the quadruply lensed triplet images in the system HS 0810+2554, ψ DM is able to reproduce all aspects of this system whereas ρ DM often fails. The ability of ψ DM to resolve lensing anomalies even in demanding cases such as HS 0810+2554, together with its success in reproducing other astrophysical observations, tilt the balance toward new physics invoking axions.

I.6. LSR led paper

THE ASTROPHYSICAL JOURNAL LETTERS

OPEN ACCESS

When the Stars Align: A 5σ Concordance of Planetary Nebulae Major Axes in the Center of Our Galaxy

Shuyu Tan¹ , Quentin A. Parker¹ , Albert A. Zijlstra² , Andreas Ritter¹ , and Bryan Rees²

Published 2023 July 13 • © 2023. The Author(s). Published by the American Astronomical Society.

[The Astrophysical Journal Letters](#), Volume 951, Number 2

Citation Shuyu Tan et al 2023 *ApJL* 951 L44

DOI 10.3847/2041-8213/acdbcd

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Figures ▾ Tables ▾ References ▾ Article data ▾

[+ Article and author information](#)

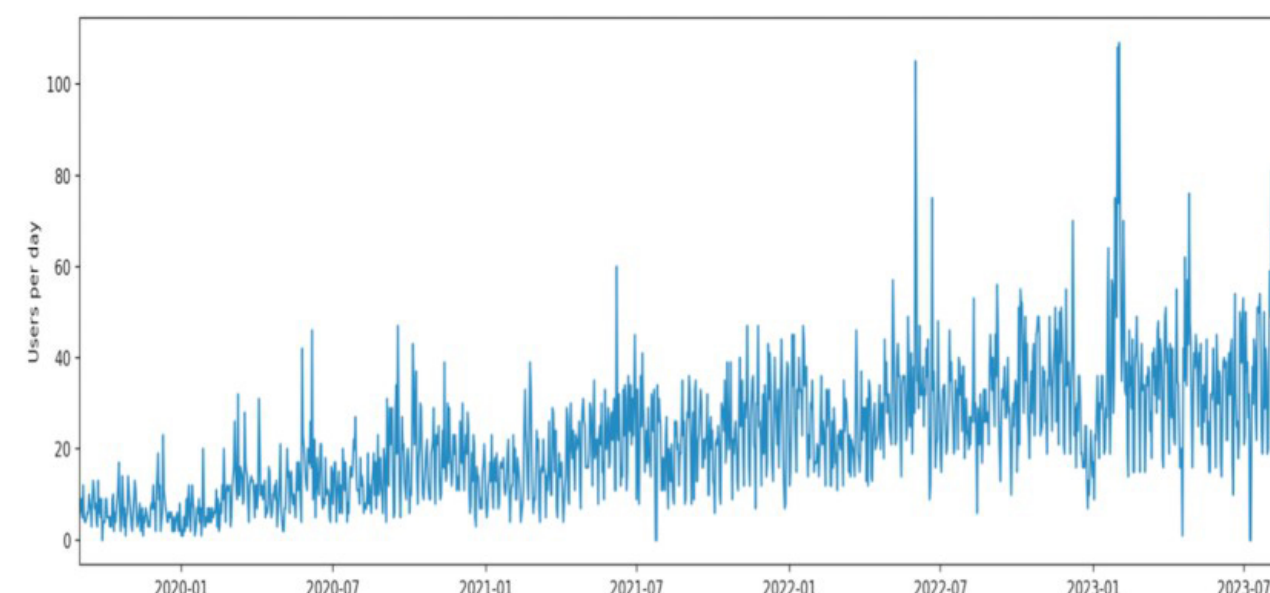
Abstract

We report observations of a remarkable major axes alignment nearly parallel to the Galactic plane of 5σ significance for a subset of bulge "planetary nebulae" (PNe) that host, or are inferred to host, short-period binaries. Nearly all are bipolar. It is solely this specific PN population that accounts for the much weaker statistical alignments previously reported for the more general bulge PNe. It is clear evidence of a persistent, organized process acting on a measurable parameter at the heart of our galaxy over perhaps cosmologically significant periods of time for this very particular PN sample. Stable magnetic fields are currently the only plausible mechanism that could affect multiple binary star orbits as revealed by the observed major axes orientations of their eventual PNe. Examples are fed into the current bulge PN population at a rate determined by their formation history and mass range of their binary stellar progenitors.

APPENDIX II

APPENDIX IIA. Four years of LSR Website traffic Sept. 2019-August 2023

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 three 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 with the number of access sessions almost doubling. 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.



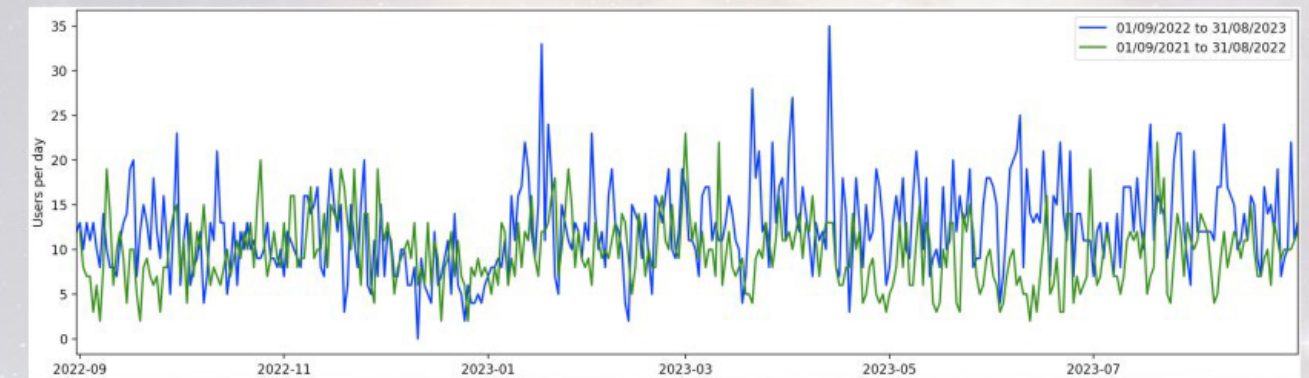
LSR website access sessions by users over the last 4 years showing a strong secular increase in interest in our website and our activities

Country	Users	Sessions
Hong Kong	4384	6974
China	2520	2800
United States	900	948
Japan	320	314
United Kingdom	294	323
India	168	178
Australia	145	153
Singapore	140	145
Canada	127	141
Taiwan	120	125
Macao	116	148
Germany	105	107
France	98	96
Italy	95	97
Netherlands	91	118
South Korea	69	73
Malaysia	48	48
Philippines	44	48
Spain	39	42
Pakistan	38	39

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

APPENDIX IIB: HASH Website traffic September 2020-August 2023

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
China	336	370
United States	312	1284
Hong Kong	215	1381
France	183	1073
Germany	177	756
United Kingdom	91	362
Trkiye	76	848
India	66	72
Spain	50	314
Mexico	47	196
Japan	39	47
Belgium	30	370
Italy	29	92
Australia	25	37
Netherlands	22	25
Brazil	21	24
Malaysia	21	15
Austria	20	26
Switzerland	18	75
Taiwan	18	71

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

APPENDIX III

Current complete list of all LSR Mainland and International MoUs and agreements October 2017-August 2023

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 now have 27. 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 Utilization – May 2020
12. East Asian Observatory (EAO) – October 2020
13. Three way MoU with LSR, OASA & HKU Academy for the talented – May 2021
14. Genius Corporation Ltd. August 2023

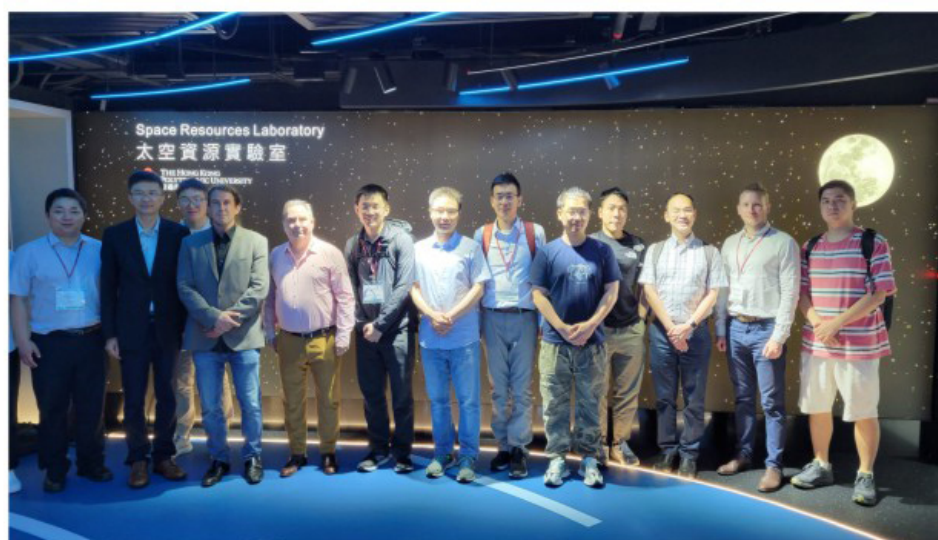
LSR Agreements of Letters of Intent signed

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

APPENDIX IV

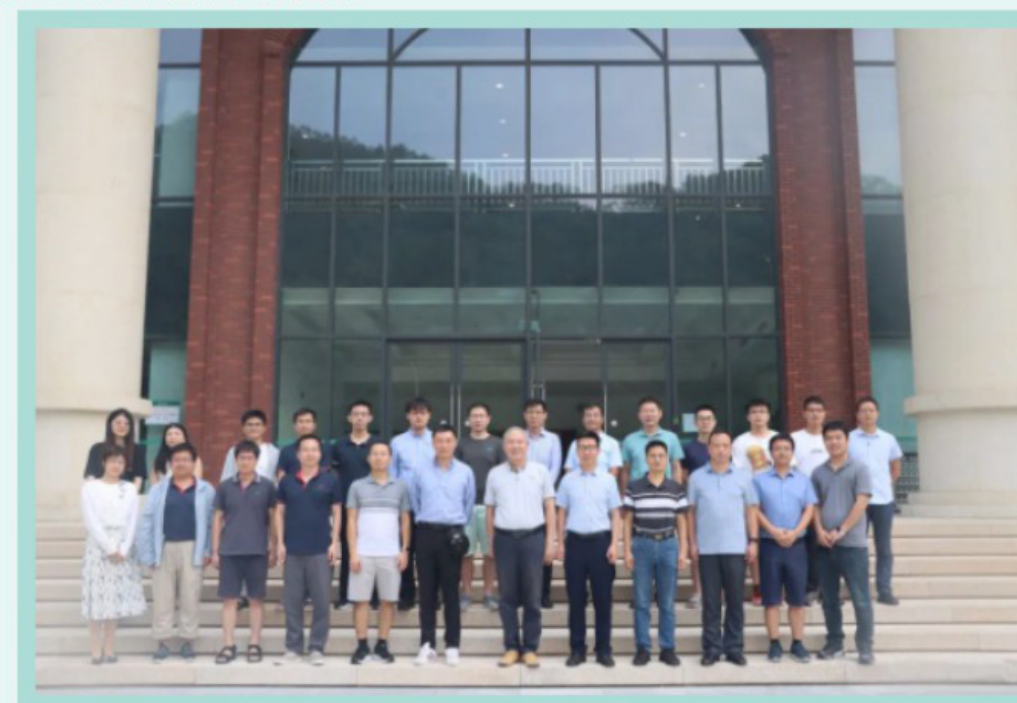
Miscellany of additional materials

IV B: Some recent LSR activities and initiatives



PolyU "PAIR" conference on Deep Space 20th May 2023 where Dr. Joe Michalski gave a keynote Speech including visit to their Deep Space Exploration Centre.

2023年7月15日，2023年粤港澳空间科学与技术联盟学术研讨会暨粤港澳高校联盟青年学者论坛分论坛在中山大学珠海校区天琴中心顺利召开。来自中山大学、澳门科技大学、香港大学、香港浸会大学、深圳大学、华南师范大学、广东工业大学、广州大学等单位的专家代表参加了本次会议。





与会专家代表合影

会议中，来自粤港澳空间科学与技术联盟的7位专家分别就卫星项目、空间探测技术、太空实验和空间技术应用等方面的最新进展、研究成果以及研究热点进行了报告。

Dr. Zhonghua Yao and Mr. Andy Kong represented the LSR at this important Mainland event at SYSU in Zhuhai on 15th July 2023

IV C: Miscellaneous LSR Knowledge Exchange Events (chronological order)

I&T Committee Meeting: A discussion on Hong Kong's ventures into space

with Perry Lam and Prof. Quentin Parker (HKU)

[Register](#)

Oct 26, 2022
8:00 AM - 9:00 AM (GMT+8)

[Contact Organizer](#)

Details

Please join our online I&T Committee Meeting on October 26th from 8-9AM HKT.

Come out and be a part of AmCham's Innovation and Technology community!

Location: Zoom

Who should join

1. I&T Committee members
2. Members who are interested in learning about Hong Kong's ventures into space and who would like to become part of the I&T community at AmCham HK.

What to expect

- Discussion on the Orion Astropreneur Space Academy, HKU Laboratory for Space Research, and the China Manned Space Agency.
- Inspiration sharing from committee members.
- Networking opportunity with decision-makers in the innovation and technology industry.

Remarks

- Open to AmCham Members only. All AmCham Members are welcome to join.
- The event will be online.

We look forward to your continued participation and engagement!

Agenda

For this week's I&T committee meeting, we have brought in a long time member Perry Lam, who is the CEO of LAM Institute and Co-Founder of the Orion Astropreneur Space Academy (OASA) and Prof. Quentin Parker, who is a Professor at the Department of Physics at the University of Hong Kong and also directs HKU's Laboratory for Space Research (LSR).

Perry and Quentin will be leading the discussion on the partnership in the new space economy with OASA and LSR, following the news that the China Manned Space Agency has been putting in efforts to recruit Hongkongers to serve as payload specialists to carry out space missions.

Webinar with the American Chamber of Commerce, October 26th 2022 on HK SAR's ventures into Space.

New episode of Q&A in Science

- What is Astronomy?
Here's what Astrophysicist says!
天體物理學家話你知——
星座論命有原因!



LSR FoS member Dr. David Yu is an expert STEM educator

ASK ME ANYTHING ABOUT ASTROPRENEURSHIP

OASA

SPACE DEBRIS

Date: 23 Feb 2023 18:30 (HKT)
Venue: Zoom

What is space debris and how does it affect the environment?

Moderator:



Perry Lam
Chairman
OASA

Guest Speakers:



Prof. Quentin Parker
Director
LSR HKU



Ivan Lee
Research Analyst
OASA

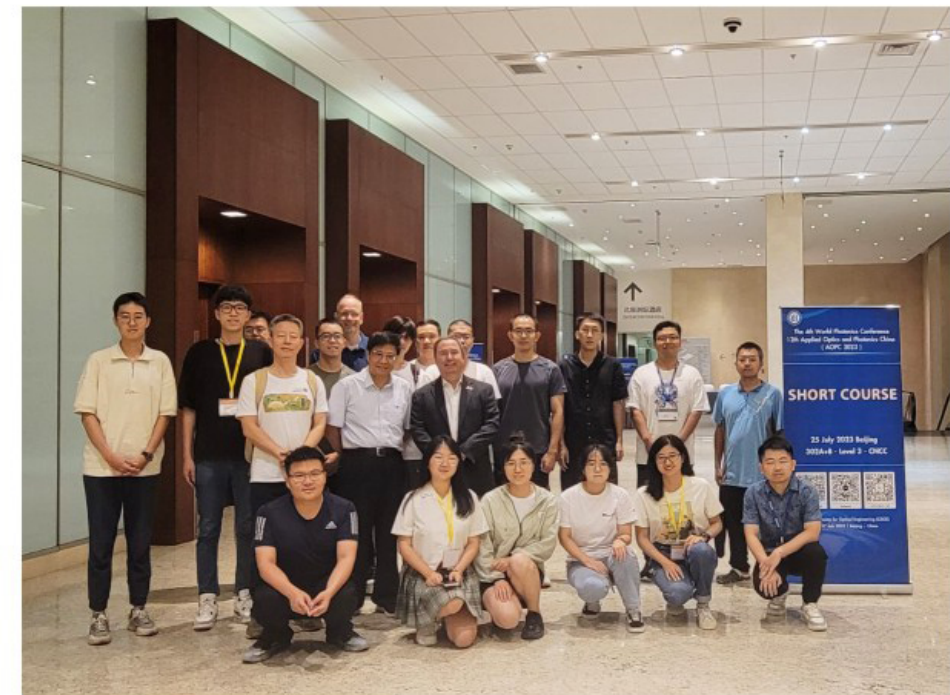
OASA SpaceBiz Webinar on Space Debris with LSR's Quentin Parker as keynote speaker – 23rd February 2023



Talk on the importance of STEM education to ~200 students at the Chinese International School, HK SAR by Prof. Quentin Parker, February 28th 2023



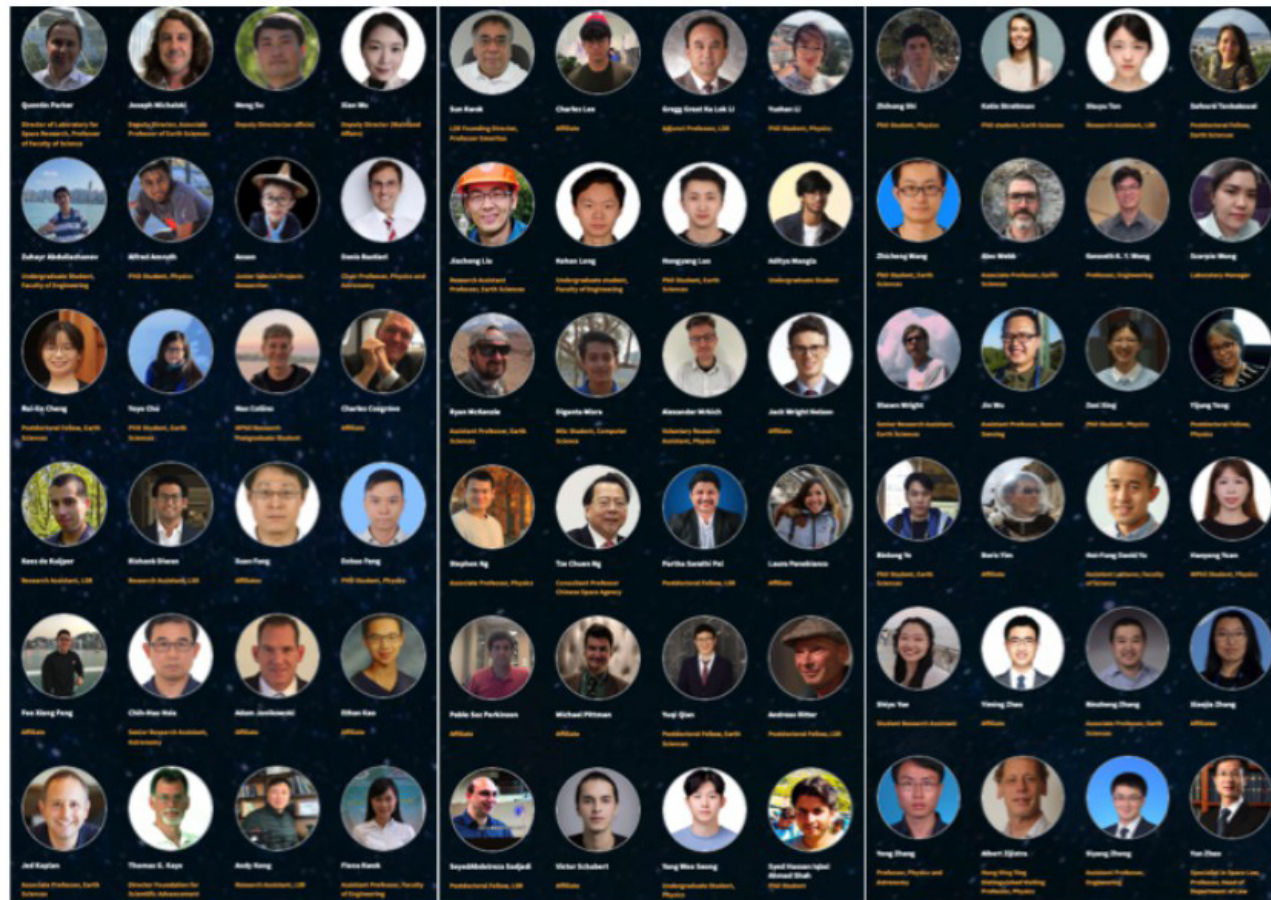
HK productivity council exhibition with LSR-OASA-HKU Academy for the talented booth celebrating the winners of our “BEST” CubeSat program – April 2023



STEM lecture “short course” by Prof. Quentin Parker, Beijing National Exhibition Centre, July 25th 2023 on “Does China have the right stuff?”

APPENDIX V

Putting a face to our LSR membership.



A montage of all current 72 LSR members as at End August 2023

LSR Current Membership List (72 members as of 21st Sep 2023)

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
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	HKU	Science	Earth Sciences
Rishank Diwan	Postgraduate Student	HKU	Science	LSR
Kees de Kuijper	Research Assistant	HKU	Science	LSR
Xuan Fang	Research Assistant	HKU	Science	Physics
Enhao Feng	Affiliate	HKU	Science	Physics
Foo Xiang Feng	PhD Student	HKU	Science	Physics
Chih-Hao Hsia	Senior Research Assistant	HKU	Science	Physics
Adam Janikowski	Affiliate	Colorado School of Mines	N/A	Space Resources
Ethan Kao	Affiliate	University of College London	Science	Physics & Astronomy
Jed Kaplan	Associate Professor	HKU	Science	Earth Sciences

Name	Title	University/ Institute	Faculty	Department
Thomas G. Kaye	Director, Foundation for Scientific Advancement	Arizona, USA	Science	Astrophysics
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
Aditya Mangla	Undergraduate student	HKUST	Science	Physics
Ryan McKenzie	Assistant Professor	HKU	Science	Earth Sciences
Diganta Misra	Msc Student	Montreal Institute of Learning Algorithms	Engineering	Computer Science
Alexander Mrkich	Voluntary Research Assistant	HKU	Science	Physics
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
Partha Pal	Postdoctoral Fellow	HKU	Science	LSR
Laura Panebianco	Affiliate	HKU	Science	Physics
Pablo Saz Parkinson	Affiliate	HKU	Science	Physics
Michael Pittman	Research Assistant Professor	HKU	Science	Earth Sciences
Yuqi Qian	Postdoctoral Fellow	HKU	Science	Earth Science

Name	Title	University/ Institute	Faculty	Department
Andreas Ritter	Postdoctoral Fellow	HKU	Science	LSR
SeyedAbdolreza 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
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
Binlong Ye	PhD Student	HKU	Science	Earth Sciences
Boris Yim	Affiliate	HKU	Science	Physics
David Hoi-Fung Yu	Assistant Lecturer	HKU	Science	Faculty of Science
Hao Yang Yuan	Mphil Student	HKU	Science	Physics
Shiyu Yue	Student Research Assistant	HKU	Science	LSR
Yiming Zhao	Affiliate	HKU	Science	Physics

Name	Title	University/ Institute	Faculty	Department
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
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

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 (51 c.f. 52 last year and 44 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 hundreds of press items emerging from our 5 press releases such as the 50+ stories from the Amruth et al., 2023 Nature Astronomy paper and the 40+ stories from the Tan et al 2023 ApJ Letter and especially the 310 media links from the Yuqi Qian HKU moon rock scoop.

Series of SCMP and China Daily articles

Between Sept 2022 and August 2023 Prof. Quentin Parker has been active this reporting period with a series of 10 SCMP and 15 China daily articles largely but not exclusively associated with the Chinese Space program and STEM education issues and other science related stories. See: <https://www.lsr.hku.hk/series-of-south-china-morning-post-interview-related-prof-quentin-parker/> for details of a few of the most relevant.

List of all 49 major press, TV, video and radio stories and interviews with LSR members during the reporting period (does not include a further general 207 media links and a further 310 from the Chang'E 5 HKU moonrock story.

➤ 1. September 2022

-(21 Sept) Prof. Quentin Parker, LSR director, shared his insights on CGTN Live, World Today: How China “turned the table” on manned space over the past 30 years. The podcast can be listened on <https://radio.cgtn.com/podcast/news/1/Cross-Strait-integration-picks-up-over-past-decade-despite-external-interference-and-disruption/372778> (starting from 34:32)

-(27 Sept) Prof. Quentin Parker, LSR director, shared his insights on CGTN Live, World Today: NASA successfully crashes a spacecraft into an asteroid in planetary defense test. Is it a game-changing achievement?

The podcast can be listened on <https://radio.cgtn.com/podcast/news/1/Are-we-paying-enough-attention-to-long-Covid/373882> (starting from 40:50)

- (28 Sept) Prof. Quentin Parker, LSR director, explained about NASA's DART mission on Backchat, RTHK Radio 3's current affairs programme. It was broadcasted on 28 September, 2022 and the playback is available on <https://www.rthk.hk/radio/radio3/programme/backchat/episode/840638> (starting from 45:29)

2. October 2022

- (3 Oct) Prof. Quentin Parker, LSR director, shared his optimistic view on the effect of launch of recruitment campaign by Chinese space agency in Hong Kong on young people's development in scientific research. https://www.scmp.com/news/china/science/article/3194598/wanted-aspiring-chinese-astronauts-hong-kong-and-macau?module=perpetual_scroll_0&pgtype=article&campaign=3194598
- (3 Oct) Prof. Quentin Parker, LSR director, was interviewed by ViuTV on China's recruitment of payload specialist in Hong Kong. https://news.now.com/home/local/player?newsId=492494&refer=Share&utm_source=nowNewsAppShare&utm_medium=referral (starting from 00:37)
- (5 Oct) Prof. Quentin Parker, LSR director, shared his views on China's recruitment of payload specialist in HK on Backchat, RTHK Radio 3's current affairs programme. It was broadcasted on 5 October, 2022 and the playback is available on <https://www.rthk.hk/radio/radio3/programme/backchat/episode/841938> (starting from 08:50)
- (6 Oct) Prof. Quentin Parker, LSR director published an article on SCMP to share his views on implications of China's recruitment of payload specialist in Hong Kong for local aerospace development on 6 Oct, 2022. The article can be read on <https://www.scmp.com/comment/opinion/article/3194715/chinas-space-recruitment-drive-one-small-step-hong-kong-one-giant>
- (6 Oct) Prof. Quentin Parker, LSR director was interviewed by TVB on the impact of China's recruitment of payload specialist in HK on local aerospace research. The interview was broadcasted on 'A Closer look' (時事多面睇) on 6 Oct, 2022 on TVB News Channel (83). <https://news.tvb.com/tc/programme/closerlook> (starting from 05:41); <https://news.tvb.com/tc/programme/newsroundup> (starting from 21:07)
- (7 Oct) Prof. Quentin Parker, LSR director, and Andy Kong, research assistant, interviewed by XinHua News Agency on China's recruitment of payload specialist in Hong Kong. The article was published on 7 October, and can be read on (Chinese) http://www.news.cn/2022-10/07/c_1129053575.htm; (English) <https://english.news.cn/20221007/8ccb37a51dfb49c49a4c41cfea5f7d8/c.html>

- (18 Oct) Prof. Quentin Parker, LSR director, was interviewed by HKIBC English News on the space recruitment drive and aerospace economy in the city. The interview was broadcasted on 18 October, and can be viewed on https://youtu.be/gcHkh-wW__4

- (26 Oct) Prof. Quentin Parker, LSR director, shared his view on the prospect of Hong Kong-born taikonaut and New Space economy of Hong Kong in the future. The article was published on 26 October, on China Daily, <https://www.chinadailyhk.com/article/296865#Taikonauts-from-HK-may-not-be-a-mere-dream>

3. November 2022

- (1 Nov) Prof. Quentin Parker, LSR director, shared his insights of Mengtian lab module docks with core module of China's space station on CGTN Live, World Today: China's space station takes shape. How will scientists use it? on 1 Nov, 2022. The podcast can be listened on <https://radio.cgtn.com/podcast/news/1/Chinas-space-station-takes-shape-How-will-scientists-use-it/380325> (starting from 24:24)
- (2 Nov) Prof. Quentin Parker, LSR director, shared his views on the crucial role of science and technology in realizing the green initiatives for the Belt and Road Initiative. The article was published on 2 November, on China Daily, <https://www.chinadailyhk.com/article/297986>
- (13 Nov) Prof. Quentin Parker, LSR director, shared his views on future of "NewSpace" economy, and development of science and education in China. The article was published on 13 November, on China Daily, <https://www.chinadailyasia.com/article/299713#SAR's-strengths-aid-facilitation-of-nation's-sci-tech-endeavors>
- (29 Nov) Prof. Quentin Parker, LSR director, shared his insights on China's Shenzhou-15 manned space mission on CGTN Live, World Today: What will be the tasks of the Shenzhou-15 manned space mission? on 29 Nov, 2022. The podcast can be listened on <https://radio.cgtn.com/podcast/news/1/What-will-be-the-tasks-of-the-Shenzhou-15-manned-space-mission/385477> (starting from 00:50)
- (30 Nov) Prof. Quentin Parker, LSR director, shared his views on China's success on sending a new team of astronauts to its Tiangong space station. The article was published on 30 November on the japantimes, <https://www.japantimes.co.jp/news/2022/11/30/asia-pacific/china-space-us-military-pla/>

4. December 2022

- (22 Dec) Prof. Quentin Parker, LSR director, and Dr. Andreas Ritter, Postdoctoral Fellow at LSR, interviewed on their identification of SN1181 and advice for young people in pursuit of dreams. The article was published on 22 December on Wenweipo, <https://dw-media.tkww.hk/epaper/wwp/20221222/a08-1222.pdf>
- (29 Dec) Prof. Quentin Parker, LSR director, shared his view on the future of Space and Earth advancement and possible establishment of international EAO HQ in Guangdong-Hong Kong-Macao Greater Bay Area. The article was published on 29 December, on China Daily, <https://www.chinadailyhk.com/article/a/307428>
- (31 Dec) Prof. Quentin Parker, Director of Laboratory for Space Research (LSR) at The University of Hong Kong, was featured on RTHK TV Programme 'Our Scientists' on the work of his team at LSR on Lobster-eye X-ray Satellite & CubeSat project. He also talked about our Business & Economy in Space Technology (BEST) programme and shared his insights on STEM education in Hong Kong. The episode was broadcasted on 31 December, on RTHK 31, and can be viewed on <https://www.rthk.hk/tv/dtt31/programme/ourscientists2022/episode/853740>

5. Jan 2023

- (26 Jan) The research work of Prof. Quentin Parker, Director of LSR, and Dr. Andreas Ritter, Postdoctoral fellow at LSR, on Pa30 is featured on nature news article, titled 'Weird supernova remnant blows scientists' minds', published on 26 Jan 2023. The article can be read on <https://www.nature.com/articles/d41586-023-00202-1>

6. May 2023

- (17 May) The article published on South China Morning Post, written by Prof. Quentin Parker, Director of LSR, "Amid harmful media noise on Taiwan and Ukraine, the scientific method could offer clarity" published on 17 May. The article can be read on <https://www.scmp.com/comment/opinion/article/3220620/amid-harmful-media-noise-taiwan-and-ukraine-scientific-method-could-offer-clarity>
- (24 May) The article published on China Daily, written by Prof. Quentin Parker, Director of LSR, "US trade restrictions may eclipse UAE's moon plans" published on 24 May. The article can be read on <https://www.chinadailyhk.com/article/332507>

- (29 May) Prof. Quentin Parker, Director of LSR, shared his views on China's ambitious plans for space exploration, including a manned lunar landing by 2030. This podcast was published on 29 May on CGTN, from 00:46 to 13:50: <https://radio.cgtn.com/podcast/news/1/China-plans-to-realize-manned-lunar-landing-by-2030/418812>
- (30 May) Prof. Quentin Parker, Director of LSR, shared his views on the significance of Gui Haichao's role as a scientist on the mission in China's space program. This podcast was published on 30 May on USA national public radio: <https://www.npr.org/2023/05/30/1178773460/china-launches-a-new-3-person-crew-for-its-orbiting-space-station>
- (30 May) The article published on China Daily, written by Prof. Quentin Parker, Director of LSR, "Cooperation, not race, in space" published on 30 May. The article can be read on <https://www.chinadailyhk.com/article/333437?showpdf=true#Cooperation-not-race-in-space>
- (30 May) Prof. Quentin Parker, Director of LSR, shared his views on Hong Kong's role in the development of a burgeoning new space economy. This article was published on 30 May on RTHK: <https://news.rthk.hk/rthk/en/component/k2/1702686-20230530.htm>
- (30 May) The Al Jazeera's interview of Prof. Quentin Parker, Director of LSR, discussed China's recent launch of the Shenzhou rocket to the Tiangong space station, and mentioned China's plans to send humans to the moon by 2030 and open a space tourism program. This interview was published on 30 May on Al Jazeera: <https://mediaview.aljazeera.com/video/6UeWQACaoQ>
- (31 May) Prof. Quentin Parker, Director of LSR, shared his views on the screening process for Chinese payload specialists. This article was published on 31 May on SCMP: <https://www.scmp.com/news/hong-kong/society/article/3222345/hong-kongs-astronaut-hopefuls-prepare-another-round-screening-beijing-chinese-spacecraft-launches>
- (31st May) Prof. Quentin Parker, Director of LSR, shared his opinions on the first civilian Taikonaut in an interview on RTHK https://news.rthk.hk/rthk/en/news-programmes/this-episode.htm?cmsid=77&episode_id=885261&livetime=20230531000000&segment_id=14&share=twitter

7. Jun 2023

- (1 Jun) The article published on South China Morning Post, written by Prof. Quentin Parker, Director of LSR, “Shenzhou 16 launch is a tribute to China’s surging space prowess” published on 1 Jun 2023. The article can be read on <https://www.scmp.com/comment/opinion/article/3222396/shenzhou-16-launch-tribute-chinas-surging-space-prowess>
- (1 Jun) Prof. Quentin Parker, Director of LSR, shared his views on China’s big space dreams to the Moon. This article was published on 1 Jun on The China Project: <https://thechinaproject.com/2023/06/01/chinas-first-civilian-in-space-and-maybe-a-man-on-the-moon/>
- (2 Jun) Prof. Quentin Parker, Director of LSR, as one of 3 panel members, shared his views on the future objectives of China’s space program. This podcast was published on 2 Jun on CGTN: <https://radio.cgtn.com/podcast/news/1/Panel-Unlocking-the-cosmos-Chinas-Shenzhou-16-and-beyond/419548>
- (4 Jun) Prof. Quentin Parker, Director of LSR, his views were quoted on the article “China sends first civilian into orbit as Xi Jinping pursues ‘eternal dream’” on UK’s Financial Times: <https://www.ft.com/content/59743621-d461-4787-956f-80f1b4f8ce5f>
- (15 Jun) Prof. Quentin Parker, Director of LSR, shared his views on the Shenzhou-16 launch. This interview was published on 15 Jun on Science and Technology Daily: http://digitalpaper.stdaily.com/http_www.kjrb.com/ywtk/html/2023-06/15/content_555035.htm?div=-1
- (28 Jun) Dr. Yuqi QIAN, member of LSR, has successfully applied to borrow a total of 822.6 milligrams of lunar soil samples from Beijing for his team’s research. The related news were published on the A1 page on Ta Kung Po on 28 Jun: <https://www.wenweipo.com/epaper/tpk/section/20230628/1673759868286406656.html>
- (28 Jun) Dr. Yuqi QIAN, member of LSR, and his team passed the review of the China National Space Administration’s Lunar Exploration and Aerospace Engineering Center. They obtained four moon soil samples and planned to transport them to Hong Kong in July. The related news were published on the A11 page on Wen Wei Po on 28 Jun: <https://www.wenweipo.com/epaper/wwp/section/20230628/1673748031310401536.html>

- (Jun) Alfred Amruth, member of LSR, has the front cover of Volume 7 Issue 6 of Nature Astronomy on June 2023. It could be found online: <https://www.nature.com/natastron/volumes/7/issues/6>

8. Jul 2023

- (6 Jul) Prof. Quentin Parker, Director of LSR, was interviewed by Hong Kong International Business Channel (HKIBC) in “Talk The Walk on Saturday”. He shared his view on China’s space program, the space economy development and LSR. This interview was uploaded on 6 Jul on the social media platform Youtube: <https://youtu.be/IY6sci9LJcA> and Facebook: <https://fb.watch/1CbK9ubI8v/>
- (13 Jul) HKU and Manchester University Astronomers come closer to finding answers about mysterious alignment of ghost stars. The details could be viewed on the Faculty of Science website since 13 Jul: <https://www.scifac.hku.hk/news/astronomers-find-answers-to-mysterious-action-of-ghost-stars-in-our-galaxy>
- (17 Jul) Dr. Joseph Ryan MICHALSKI has been awarded the XPLOER Prize 2023. He is the first non-Chinese awardee for the past five years. The details are published on the WenWeiPo on 17 Jul: <https://www.wenweipo.com/a/202307/17/AP64b4dfd3e4b043f3863d10ee.html> and the page of the Dr. Joseph Ryan MICHALSKI on the XPLOER Prize can be found here: <https://xploreprize.org/#/awardeeDetails?id=730>
- (21 Jul) The article published on China Daily, written by Prof. Quentin Parker, Director of LSR, “Ghostly action across time and space” published on 21 Jul. The article can be read on: <https://www.chinadailyhk.com/article/342046#Ghostly-action-across-time-and-space>
- (23 Jul) LSR’s research paper “When the Stars Align: A 5 σ Concordance of Planetary Nebulae Major Axes in the Center of Our Galaxy.” was featured in a specific story on Youtube by a science influencer with 1.16 million subscribers on 23 Jul. It could be viewed on Youtube: <https://www.youtube.com/watch?v=r8WlvrnU624> and the DOI of the paper: 10.3847/2041-8213/acdbcd

9. Aug 2023

- (8 Aug) Dr. Yuqi QIAN, member of LSR, has brought back the moon soil sample collected by Chang'e 5 to HKU for further study. The related news were published on the A5 page on Tai Kung Po (<http://www.takungpao.com.hk/news/232109/2023/0808/879731.html>) and the A1 Page on Wen Wei Po (<https://www.wenweipo.com/a/202308/08/AP64d18a57e4b043f38642de79.html>) on 8 Aug.
- (9 Aug) Prof Quentin Parker's Article "Fight for our planet" was posted on South China Morning Post on 9 Aug. The full article can be viewed on: <https://scmp.epaper.pressreader.com/article/281874417927814>
- (16 Aug) Prof Quentin Parker's Article "World would benefit if the West were open to greater scientific collaboration" was posted on China Daily on 16 Aug. The full article can be viewed on: <https://www.chinadailyhk.com/article/345979>
- (17 Aug) Prof Quentin Parker has been interviewed by RTHK backchat on Geosynchronous radar on 17 Aug. Prof Parker's interview started at 44:25. And it can be listened on: <https://open.spotify.com/episode/5QTiTyLnQirNBCspZwJoll>
- (23 Aug) Prof Quentin Parker's Article "To win over global talent, Hong Kong must show its freedoms aren't lost" was posted on South China Morning Post on 23 Aug. The full article can be viewed on: <https://www.scmp.com/comment/opinion/article/3231786/win-over-global-talent-hong-kong-must-show-its-freedoms-arent-lost>
- (31 Aug) Prof Quentin Parker's Article "Is there room for Space in the CE's upcoming policy address?" was posted on China Daily on 31 Aug. The full article can be viewed on: <https://www.chinadailyhk.com/article/348609#Is-there-room-for-Space-in-the-CE's-upcoming-policy-address>

APPENDIX VII

The LSR family and a very special visit from a special little guy

The LSR subscribes to an ethos of tolerance, equal recognition and treatment regardless of race, religion, gender or LGBTQ status. Currently 20% (15) of our members are female, which, though lower than we would prefer, still bears favorable comparison with most departments in the Faculty of Science. Our international representation is also high with members from more than a dozen different countries other than the Chinese Mainland and the HK SAR of the PRC. We are strong supporters of diversity in the workforce.

On 24th February 2023 the LSR hosted a special visit from an inspirational young man Anson. This was under the auspices of HSBC's share your dream initiative. Anson is suffering from an incurable illness but had a dream of space and astronomy and so we hosted him at the LSR to try to give him some wonderful memories and insights into a working space research lab. We have made him a special member of the LSR in charge of special projects.



Left: Anson; Right Anson, his parents, members of the HSBC "Share your dream" Team and members of the LSR, 24th Feb. 2023

APPENDIX VIII

Member focus: Dr. Alfred Amruth in his own words



"My journey through astrophysics at HKU has lasted a decade now. Throughout this journey, I came to the realization that one of the most important things in doing research is to have a friendly environment where you can discuss anything freely with experts from different fields. Apart from my colleagues within my own research group, I found this at, and only at, the LSR! The vast range of experts at the LSR - spanning multiple fields from Earth Science to Computer Science to Astronomy - make being a member a truly rich experience. However, the key is that with their expertise also comes humility - an

important ingredient in any scientist hoping to break barriers and reach for the stars.

The multiple activities and immense outreach programs carried out at the LSR have given countless opportunities to everyone, ranging from high school students to senior academic staff. My favourite is the regular social events, like the LSR Research Jamboree (last conducted in December 2022), where researchers from all fields can mingle and learn about everyone's research in a friendly, festive atmosphere. With upcoming activities planned (like the Asia Pacific Rim IAU meeting in 2026), and collaborations that are being forged all around the world, the LSR has taken the stage to be the leading light for the future generation of astronomers in HK!"

Alfred Amruth

* Dr. Amruth is also the recipient of a Dissertation Year Fellowship (a new award by the university for final year PhD students who have their thesis rated as top 5% out of all theses submitted - it lets you continue an additional year of research) so we look forward to more exciting science from this exceptional young scientists.

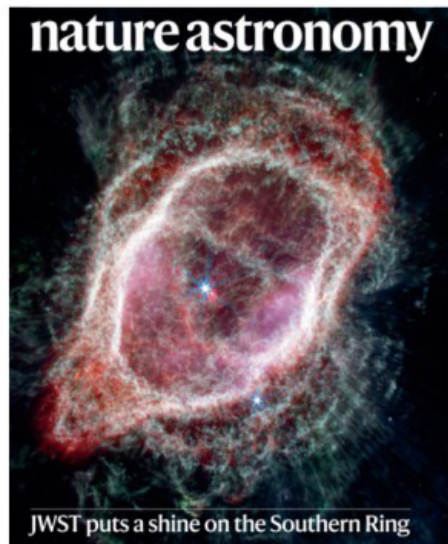
Member focus: Mr. Benjamin Lau (RA) in his own words

I am an undergraduate student studying Astrophysics. The past 4 months working at the LSR as a Student RA has been absolutely wonderful. Here are some of the reasons why, as well as some of the obstacles I faced. The excellent learning environment and great guidance from Prof. Quentin Parker. I remember when I first met with Quentin to talk about possible positions for me he said "it's like a family here", and I agree, although it did take me some time to feel "fit in". Here at the LSR what surprises me is not only the diversity of nationality but also the diversity of personality — everyone has very special qualities. They chat about science things a lot, even in casual chats, or in a joke when they mentioned Newton's laws of motion but somehow still sounded scientifically plausible but funny at the same time. The reason I didn't immediately feel "fit it" is because I wasn't used to being in such a diverse environment, but then I slowly figured I could just join in the conversations even if I don't understand what they are talking about, I could ask any of them about the science that I was learning and they would be very happy to explain and teach me. They are all genuinely passionate about science so I learn a lot everyday simply being here. Also, Quentin is an amazing teacher and LSR director. Having such diversity, Quentin knows how to help and guide each of us in a way that gives us space yet offers firm and solid support.

I was mainly researching planetary nebulae and their central stars. This was my first experience in actual scientific research and dealing with raw scientific data, which requires some computer skills and a very good understanding of the data structure. So I did a lot of reading and practicing, at times I would get very stuck at one specific code that couldn't work the way I wanted it to, or some ideas that I didn't know how to achieve, but one of the things Quentin suggested me to do was to take notes of my goals and what I've learned as I go, which I found helpful to keep track of what I'm doing and why I'm doing it. During my time at the LSR I learned a lot. From astrophysical knowledge to computer programming to learning skills. Also, hearing about what other colleges are researching makes working at the LSR even more valuable. My knowledge of Python was limited before I came to the LSR but my colleagues helped explain some of the ideas to me and showed me some of the codes they have written before, which was very helpful. The bigger takeaway, however, was learning skills. I did a lot of self-learning by googling around and reading articles, many times I wouldn't know how to ask for help when I didn't know how to do certain things, but eventually, I figured it's a very valuable skill to have being able to articulate what I don't understand and ask a good question that actually helps others to understand what I need, which helps me to learn. LSR is a place filled with smart, highly educated, friendly, and fun people. This has been a great pleasure working with and getting to know each one of them.

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. This is the first time the LSR has been associated with two nature astronomy papers that have also been selected to as the front cover.



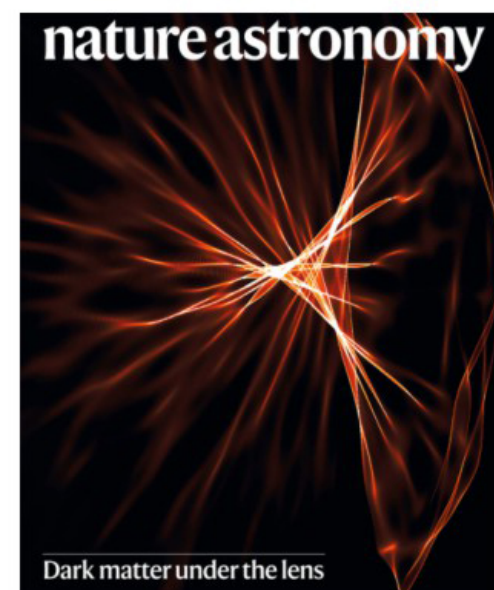
1.Top left: Front cover of the Nature Astronomy 6, 1421-1432, December 2022. In one of the first research papers based on observations with the James Webb Space Telescope LSR astronomers were involved in the mid-infrared observations of the Southern Ring Nebula. See: <https://astronomycommunity.nature.com/posts/a-firmament-of-astronomers-crowd-over-ngc3132>



3.Bottom Left in montage: Sample of Moon rock provided to HKU from the Chang'E 5 mission. LSR members Dr Yuqi QIAN and Dr Joe Michalksi in DES at the University of Hong Kong (HKU) have achieved a historic feat by obtaining lunar soil samples collected by the Chinese lunar probe Chang'e-5 in 2020. This is 1st time a Hong Kong research team has secured such samples.

See:<https://www.hku.hk/press/press-releases/detail/26437.html>

2.Top Right in montage: Front cover of Nature Astronomy 7, 736-747, April 2023. In work led by LSR member Alfred AMRUTH, a PhD student in Dr Jeremy LIM's HKU team, astrophysicists have for the 1st time computed how gravitationally-lensed images generated by galaxies incorporating ultralight Dark Matter particles differ from those with ultra massive Dark Matter particles. See: https://hku.hk/press/news_detail_26056.html



4.Bottom right in montage: Image from the Astrophysical Journal letters paper led by LSR member Shuyu Tan: ApJ Letters, 951, L44 concerning the alignment of Planetary nebulae in the Galactic bulge as revealed by central stars that are found in short period binaries. See:<https://www.manchester.ac.uk/discover/news/when-the-stars-align-astronomers-find-answers-to-mysterious-action-of-ghost-stars-in-our-galaxy/>

