ORGANIZED BY

UNIVERSITI MALAYA

PLANETARIUM NEGARA KUALA LUMPUR

NARIT

MINISTRY OF SCIENCE, TECHNOLOGY AND INNOVATION
MALAYSIAN SPACE AGENCY

16th Southeast Asia Astronomy Network Meeting

16 – 19 November 2026 | Kuala Lumpur, Malaysia

Planetarium Negara (National Planetarium)

Advancing Astronomy Through Regional Collaborations

SEAAN 2026
16TH MEETING · KUALA LUMPUR

Table of Content

Tentative Program **6**

Abstract **11**

Keynote Speaker **11**

Research on Eclipsing Binaries and Pulsating Variable Stars Based on Survey and Ground-based Telescope Data

Zhu Liying *11*

Invited Speaker **12**

Generating solutions in Einstein-Maxwell-scalar gravity

Y. K. Lim *12*

Discovery of a Dusty, Disintegrating Planet

M. H. Teng Yen *13*

Cosmic Dawn or Cosmic Daybreak?

J. Lim *14*

Abstract for Oral Contributors **15**

Stellar Physics & Exoplanets **15**

BIMA 3.0: Follow Up Observation of Short Period Eclipsing Binaries from TESS Data

H. Al Ikhsan *15*

Pulsation Studies and Detection of Heartbeat Stars

M. Li[1] *16*

Analysis of The Pulsation Period of The Variable Star CY Aquarii using The Lomb-Scargle Method Based on Ground-Based and Satellite Observation Data

W. Lestari *17*

TCP J18030904+1218140: A New AM CVn Binary Characterized from ZTF Archival Photometry and the 2026 Outburst Campaign

N. M. F. Fahrurozy *18*

Exploring Black Hole and Neutron Star X-ray Binary Classification with Large Language Models Using Compact Spectral Representations

F. I. Alfarizki *19*

Fractal and Multifractal Analysis of Light Curves of Blazars and Dwarf Novae

M. Tsuranova *20*

IMF-Integrated Alpha-element Yields from Very Massive Stars (VMS) Across Metallicity with Uncertainty Bands

A. F. Mohamed Mydin *21*

AI-Assisted Radio Frequency Interference (RFI) Mitigation for Stellar Astrophysics and Radio Astronomy

R. Masong *22*

Site Surveys, Design, and Firmware Verification of Phase-Preserving Radio Frequency Interference Mitigation for The ITB-Bosscha VGOS Station

F. A. Firmansyah *23*

Statistical Study Of Hot X-ray Onset Interval In Solar Flares During Solar Cycle 24

S. Selvam *24*

Differential Rotation for Sunspots with Simple Magnetic Morphology

M. Fauzi *25*

From Solar Radio Bursts to Ionospheric Perturbations: Quantifying the Coupling of CME Shock Dynamics with Regional Ionospheric Total Electron Content (TEC) Responses

A. H. Bely *26*

Mapping the Odd Ones Out: Finding Anomalous Exoplanet Transits with Self-Organising Maps

M. Sung *27*

AI Driven Investigation of TRAPPIST-1e Atmosphere Using Coupled 1-D Photochem and petitRADTRANS Codes

M. Waqas *28*

Probing Substellar Objects through Timing Variations in Close Binary Systems

E. Zhao *30*

Asteroseismic study of an exoplanetary-host star HD 95086

Y. Semenko *31*

AI-Enhanced Photonic Data Processing for Stellar Characterization: A Pilot Framework

R. Masong *32*

High-Precision Asteroid Characterization via Stellar Occultation: Results from the Indonesian Strenua Campaign and the CHORD Initiative

A. T. P. Jatmiko *33*

Investigating the Tidal Debris of an Open Star Cluster Complex

M. I. Arifyanto *34*

Theoretical Astrophysics & Cosmology 35

Constraining Extended Mass around Sagittarius A* through a Schwarzschild-like Spacetime and the Orbit of S2

M. N. Syarif 34

Beyond Exotic Matter: Rotating Wormholes in Randall-Sundrum Braneworld Scenarios

M. E. Paul 35

Braneworld Geometrodynamics: Its intriguing extra spatial dimension relation to a wormhole, gravitational waves and superluminality.

A. Alias *36*

Dark Energy Stars as Alternative Models of Compact Stars

M. A. Azman 37

The Photo-z Fallacy: Why Optimizing for Accuracy is Silently Sabotaging Precision Cosmology

K. R. Selvan 38

Galaxies and Active Galactic Nuclei (AGNs) **40**

The galaxy luminosity function from the present-day to z = 2, using over 1.1 million galaxies

S. Koonkor *40*

Characteristics and Evolution of Dust Attenuation in High-Redshift Star-Forming Galaxies (1 < z < 7) in the JADES Survey

K. Z. Hasnaningtyas *41*

Overmassive BHs in Little Red Dots

M. Abdul Latif *42*

The SAMI Galaxy Survey: On the importance of applying multiple selection criteria for finding Milky Way Analogues

S. Tuntipong *43*

A Census of Active Galactic Nuclei Identified by the Mid-infrared [Ne V] Line at z ≤ 0.025

A. M. Yassir Azlin *44*

The Evolving Origin of Star-forming Clumps at 2 < z < 9

I. K. Fitriana *45*

RR Lyrae in the Ultra-Faint Dwarf Galaxy Virgo III: From Lulin to Rubin and Beyond

C.-C. Ngeow *46*

Probing the X-ray Universe from the National University of Malaysia: Unveiling Faint Active Galactic Nuclei in the Nearby Galaxies

N. A. A. Annuar *47*

Tracing Subcluster Interactions in Abell 569 Through Neutral Hydrogen 21-cm Emission and Radio Galaxy Populations

U. F. S. Ungku Ibrahim *48*

Islamic Astronomy **49**

Evaluating Crescent Moon Visibility for Hijri Month Commencement in Thailand, 2021–2026

B. Maseng *49*

Parameters for an Independent Islamic Hijri Calendar: A Historical and Astronomical Approach

H. Setiyanto *50*

The Prominence of Tuan Haji Abdul Ghani in Digitalising Mathematical Calculations for Islamic Astronomy Applications

A. H. Kamarulzaman *51*

Promoting Islamic Astronomy in Thailand: Reconnecting Heritage, Science, and Society

N. Chehlaeh *52*

Astronomy Education, Outreach, Heritage and Astrotourism 53

Play Under the Dome: Gamified, Embodied Astronomy Education for Children in Sarawak, Malaysia

I. Ali 53

A Preliminary Evaluation of Mobile Planetarium Outreach on Psychological Well-Being in Underserved Philippine Communities

A. Terry 54

Exploring Astronomical Literacy Across Senior High School Academic Strands and Its Relationship with Student Engagement

S. L. Laurio 55

Assessing Planetarium-Based Learning: Students' Learning Experiences, Astronomical Understanding, and Engagement at Uin Walisongo Planetarium

T. A. Pratama 56

Laos' First Planetarium: Astronomy Education and Public Outreach at the Science and Botany Park

K. Sonboulom 57

Popular Educational Book on Near-Earth Supernovae throughout the Timespan of 1950-2026

N. A. Liando 58

Exploring the Astroarchaeological Heritage of Lenggong UNESCO Global Geopark through Geospatial Analysis

O. Zainon 59

Community-Based Astrotourism Development in Rinca Island, East Nusa Tenggara, Indonesia

Aprilia 60

Monitoring and Mapping Night Sky Brightness at Bosscha Observatory

D. G. Ramadhan 61

Observatories in Malaysia: Functionality and Growth

J. Y. H. Soo 62

High-Degree Nonradial Pulsations in Fast-Rotating, Eclipsing Binary and Exoplanet Host Stars

D. Mkrtichian 63

Abstract for Poster Contributors 64

Comparative Study of Sky Brightness Measurements using Sky Quality Meter (sqm) with Red and Visual Filters for Determining The 'Isha' Prayer Time in Selangor Observatory

A. A. Amaluddin Arip 64

Multi Wavelength Study of Radio Galaxies in the Merging Galaxy Cluster Abell 1367

N. F. A. Amran 65

Islamic Astronomy in Medieval Iberia: Exploring The Heritage of Al-Andalus

A. N. Mohd Ali 66

Can Slowly Rotating Population III Stars Produce Fast-Spinning Black Holes?
N. H. Ismail *67*
Dark Matter Mass Estimation in A569 Galaxy Cluster: Integrating Astrophysical and Qur'anic Insights of Unobservable Cosmic Structures
S. Abd Haris *68*
The effective strength of the Great Attractor: a numerical analysis of linear structure growth in ΛCDM
Muhammad Farhan H *69*
Outdoor Lighting Design to Minimize Light Pollution at the Timau National Observatory
K. A. Wiryanti *70*
Impact of Proximity Potential Models on The $^{12}c+^{12}c$ Fusion Reaction
Azni Abdul Aziz *71*
Making Sense of the Sky: A Hands-On Approach to Teaching Celestial Motion
J. A. Yang *72*
Bridging Sky and Society: Astronomy Education and Public Outreach at the Negeri Sembilan Observatory, Malaysia
S. S. Nordin *73*
Physics-Informed Artificial Intelligence for Dark Matter Halo Dynamics: a Preliminary Framework Based on Poisson's Equation
Matthew Laurence *74*

16TH SOUTHEAST ASIA ASTRONOMY NETWORK MEETING (SEAAN 2026)

Conference Programme
16 – 19 November 2026
National Planetarium, Kuala Lumpur, Malaysia

DAY 1 - Monday, 16 November 2026

Venue: Space Theatre	
8.00 - 9.00 am	Registration
9.00 - 9.20 am	Opening ceremony
9.20 - 9.50 am	***Keynote Speaker:*** *Pn Nik Mazlina binti Nik Mustapha (Deputy Director General (Technical Services & Operations), Malaysian Space Agency (MYSA))*
9.50 - 10.20 am	***Invited Speaker:*** *Dr. Songphon Munkongsujarit (NARIT)*
10.20 - 10.45 am	Photography Session + Tea break
Stellar Physics & Exoplanets	
Chair: Prof. Dr. Hasan Abu Kassim	
10.45 - 11.15 am	**Research on Eclipsing Binaries and Pulsating Variable Stars Based on Survey and Ground-based Telescope Data** ***Keynote Speaker:*** *Prof. Dr. Zhu Liying (Yunnan Observatories)*
11.15 - 11.35 am	**BIMA 3.0: Follow Up Observation of Short Period Eclipsing Binaries from TESS Data** *Hakim Al Ikhsan*
11.35 - 11.55 am	**Pulsation Studies and Detection of Heartbeat Stars** *Minyu Li*
11.55 am - 12.15 pm	**Analysis of the Pulsation Period of the Variable Star CY Aquarii using the Lomb-Scargle Method Based on Earth-Ground and Satellite Observation Data** *Windi Lestari*
12.15 - 2.00 pm	Lunch break

CONCURRENT SESSIONS

Venue: Space Theatre		**Venue: Ursa Major Meeting Room**
Stellar Physics & Exoplanets		
Chair: Dr. Mochamad Ikbal Arifyanto		
2.00 - 2.20 pm	**TCP J18030904+1218140: A New AM CVn Binary Characterized from ZTF Archival Photometry and the 2026 Outburst Campaign** *Naufal Muhammad Fauzan Fahrurozy*	**SEAAN BUSINESS MEETING** **2.00 - 6.00 pm**
2.20 - 2.40 pm	**Exploring Black Hole and Neutron Star X-ray Binary Classification with Large Language Models Using Compact Spectral Representations** *Fahmi Iman Alfarizki*	
2.40 - 3.00 pm	**Fractal and Multifractal Analysis of Light Curves of Blazars and Dwarf Novae** *Mariia Tsuranova*	
3.00 - 3.20 pm	**IMF-Integrated Alpha-element Yields from Very Massive Stars (VMS) Across Metallicity with Uncertainty Bands** *Amir Fauzan Bin Mohamed Mydin*	
3.20 - 3.35 pm	Tea break	
Chair: Dr. Aprilia		
3.35 - 3.55 pm	**AI-Assisted Radio Frequency Interference (RFI) Mitigation for Stellar Astrophysics and Radio Astronomy** *Rizchel Masong*	
3.55 - 4.15 pm	**Site Surveys, Design, and Firmware Verification of Phase-Preserving Radio Frequency Interference Mitigation for the ITB-Bosscha VGOS Station** *Fahmi Aziz Firmansyah*	
4.15 - 4.35 pm	**Statistical Study of Hot X-ray Onset Interval in Solar Flares During Solar Cycle 24** *Sanjivan A/L Selvam*	
4.35 - 4.55 pm	**Differential Rotation for Sunspots with Simple Magnetic Morphology** *Muhammad Fauzi*	
4.55 - 5.15 pm	**From Solar Radio Bursts to Ionospheric Perturbations: Quantifying the Coupling of CME Shock Dynamics with Regional Ionospheric Total Electron Content (TEC) Responses** *Ahmad Hariz bin Bely*	
6.00 pm	Departure for Conference Dinner	

DAY 2 - Tuesday, 17 November 2026	
Venue: Orion Room	
Theoretical Astrophysics & Cosmology	
Chair: Dr. Juan Carlos Algaba	
9.00 - 9.30 am	**Generating solutions in Einstein-Maxwell-scalar gravity** ***Invited Speaker:*** *Dr. Lim Yen Kheng (Xiamen University Malaysia)*
9.30 - 9.50 am	**Constraining Extended Mass around Sagittarius A* through a Schwarzschild-like Spacetime and the Orbit of S2** *Muchammad Najmi Syarif*
9.50 - 10.10 am	**Beyond Exotic Matter: Rotating Wormholes in Randall-Sundrum Braneworld Scenarios** *Matthew Ernest Paul*
10.10 - 10.30 am	**Braneworld Geometrodynamics: Its Intriguing Extra Spatial Dimension Relation to a Wormhole, Gravitational Waves and Superluminality** *Anuar Alias*
10.30 - 10.45 am	Tea break
10.45 - 11.05 am	**Dark Energy Stars as Alternative Models of Compact Stars** *Muhamad Ashraf bin Azman*
11.05 - 11.25 am	**The Photo-z Fallacy: Why Optimizing for Accuracy is Silently Sabotaging Precision Cosmology** *Karthik Raja A/L Selvan*
Galaxies and Active Galactic Nuclei (AGNs)	
11.25 - 11.45 am	**The galaxy luminosity function from the present-day to z = 2, using over 1.1 million galaxies** *Suttikoon Koonkor*
11.45 am - 12.05 pm	**Characteristics and Evolution of Dust Attenuation in High-Redshift Star-Forming Galaxies (1 < z < 7) in the JADES Survey** *Karina Zahra Hasnaningtyas*
12.05 - 12.25 pm	**Overmassive BHs in Little Red Dots** *Muhammad Abdul Latif*
12.25 - 2.00 pm	Lunch break
Stellar Physics & Exoplanets	
Chair: Dr. Yang Jiahui Abel	
2.00 - 2.30 pm	**Discovery of a Dusty, Disintegrating Planet** ***Invited Speaker:*** *Dr. Marc Hon Teng Yen (National University of Singapore)*
2.30 - 2.50 pm	**Mapping the Odd Ones Out: Finding Anomalous Exoplanet Transits with Self-Organising Maps** *Matthew Sung*
2.50 - 3.10 pm	**AI Driven Investigation of TRAPPIST-1e Atmosphere Using Coupled 1-D Photochem and petitRADTRANS Codes** *Muhammad Waqas*
3.10 - 3.30 pm	**Probing Substellar Objects through Timing Variations in Close Binary Systems** *Zhao Ergang*
3.30 - 3.45 pm	Tea break
Chair: Dr. Anuar Alias	
3.45 - 4.05 pm	**Asteroseismic study of an exoplanetary-host star HD 95086** *Yevhenii Semenko*
4.05 - 4.25 pm	**AI-Enhanced Photonic Data Processing for Stellar Characterization: A Pilot Framework** *Rizchel Masong*
4.25 - 4.45 pm	**High-Precision Asteroid Characterization via Stellar Occultation: Results from the Indonesian Strenua Campaign and the CHORD Initiative** *Agus Triono Puri Jatmiko*
4.45 - 5.05 pm	**Investigating the Tidal Debris of an Open Star Cluster Complex** *M.I. Arifyanto*
End of Day 2	

DAY 3 - Wednesday, 18 November 2026	
Venue: Orion Room	
Islamic Astronomy	
Chair: Dr. Raihana Ismail	
9.00 - 9.30 am	***Keynote Speaker:*** *Prof. Dr. Thomas Djamaluddin (National Research and Innovation Agency, Indonesia)*
9.30 - 10.00 am	**Surah Al-Kahfi and the Story of the Cave Sleepers from the Islamic Astronomical Perspectives** ***Invited Speaker:*** *Dato' LSr Dr. Azhari bin Mohamed (Advisor to Malaysian Islamic Astronomy Society)*
10.00 - 10.20 am	**Evaluating Crescent Moon Visibility for Hijri Month Commencement in Thailand, 2021–2026** *Basree Maseng*
10.20 - 10.35 am	Tea break
10.35 - 10.55 am	**Parameters for an Independent Islamic Hijri Calendar: A Historical and Astronomical Approach** *Hendro Setiyanto*
10.55 - 11.15 am	**The Prominence of Tuan Haji Abdul Ghani in Digitalising Mathematical Calculations for Islamic Astronomy Applications** *Amirul Hazim bin Kamarulzaman*
11.15 - 11.35 am	**Promoting Islamic Astronomy in Thailand: Reconnecting Heritage, Science, and Society** *Nareemas Chehlaeh*
11.35 am - 12.15 pm	**POSTER SESSION**
12.15 - 2.00 pm	Lunch break
Galaxies and Active Galactic Nuclei (AGNs)	
Chair: Dr. John Soo Yue Han	
2.00 - 2.30 pm	***Keynote Speaker:*** *Dr. Paul T. P. Ho (East Asian Observatory)*
2.30 - 3.00 pm	**Cosmic Dawn or Cosmic Daybreak?** ***Invited Speaker:*** *Prof. Dr. Jeremy Jin Leong Lim (The University of Hong Kong)*
3.00 - 3.20 pm	**The SAMI Galaxy Survey: On the importance of applying multiple selection criteria for finding Milky Way Analogues** *Sujeeporn Tuntipong*
3.20 - 3.35 pm	Tea break
Chair: Juan Carlos Algaba	
3.35 - 3.55 pm	**A Census of Active Galactic Nuclei Identified by the Mid-infrared [Ne v] Line at $z \leq 0.025$** *Anis Maisarah binti Yassir Azlin*
3.55 - 4.15 pm	**The Evolving Origin of Star-forming Clumps at $2 < z < 9$** *Itsna Khoirul Fitriana*
4.15 - 4.35 pm	**RR Lyrae in the Ultra-Faint Dwarf Galaxy Virgo III: From Lulin to Rubin and Beyond** *Chow-Choong Ngeow*
4.35 - 4.55 pm	**Probing the X-ray Universe from the National University of Malaysia: Unveiling Faint Active Galactic Nuclei in the Nearby Galaxies** *Nur Adlyka Ainul Annuar*
4.55 - 5.15 pm	**Tracing Subcluster Interactions in Abell 569 Through Neutral Hydrogen 21-Cm Emission and Radio Galaxy Populations** *Ungku Ferwani Salwa Binti Ungku Ibrahim*
End of Day 3	

DAY 4 - Thursday, 19 November 2026	
Venue: Orion Room	
Astronomy Education, Outreach, Heritage and Astrotourism	
Chair: Dr. Mohd Hafiz Saadon	
9.00 - 9.20 am	**Play Under the Dome: Gamified, Embodied Astronomy Education for Children in Sarawak, Malaysia** *Ismandy Ali*
9.20 - 9.40 am	**A Preliminary Evaluation of Mobile Planetarium Outreach on Psychological Well-Being in Underserved Philippine Communities** *Arwen Carina C. Terry*
9.40 - 10.00 am	**Exploring Astronomical Literacy Across Senior High School Academic Strands and Its Relationship with Student Engagement** *Shiela Lyn Laurio*
10.00 - 10.20 am	**Assessing Planetarium-Based Learning: Students' Learning Experiences, Astronomical Understanding, and Engagement at UIN Walisongo Planetarium** *Tengku Amanah Pratama*
10.20 - 10.35 am	Tea break
10.35 - 10.55 am	**Laos' First Planetarium: Astronomy Education and Public Outreach at the Science and Botany Park** *Kongsub Sonboulom*
10.55 - 11.15 am	**Popular Educational Book on Near-Earth Supernovae throughout the Timespan of 1950-2026** *Nathanael Aristo Liando*
11.15 - 11.35 am	**Exploring the Astroarchaeological Heritage of Lenggong UNESCO Global Geopark through Geospatial Analysis** *Othman Bin Zainon*
11.35 - 11.55 am	**Community-Based Astrotourism Development in Rinca Island, East Nusa Tenggara, Indonesia** *Aprilia*
11.55 - 12.15 pm	**Monitoring and Mapping Night Sky Brightness at Bosscha Observatory** *Dhimaz Gilang Ramadhan*
12.15 - 12.35 pm	**Observatories in Malaysia: Functionality and Growth** *John Soo Yue Han*
12.35 - 1.00 pm	Closing ceremony
End of Day 4	

Poster Session — Wednesday, 18 November 2026 Time: 11:35 am–12:15 pm	
Poster #ID	**POSTER TITLE** *Presenter Name*
P01	**Comparative Study of Sky Brightness Measurements using Sky Quality Meter (SQM) with Red and Visual Filters for Determining the 'Isha' Prayer Time in Selangor Observatory** *Asyrafuddin Arif bin Amaluddin Arip*
P02	**Multi Wavelength Study of Radio Galaxies in the Merging Galaxy Cluster Abell 1367** *Nur Fatin Aqilah binti Amran*
P03	**Islamic Astronomy in Medieval Iberia: Exploring the Heritage of Al-Andalus** *Aisyah Nazzirah*
P04	**Can Slowly Rotating Population III Stars Produce Fast-Spinning Black Holes?** *Nur Hidayah binti Ismail*
P05	**Dark Matter Mass Estimation in A569 Galaxy Cluster: Integrating Astrophysical and Qur'anic Insights of Unobservable Cosmic Structures** *Syafawati binti Abd Haris*
P06	**The effective strength of the Great Attractor: a numerical analysis of linear structure growth in ΛCDM** *Muhammad Farhan H*
P07	**Outdoor Lighting Design to Minimize Light Pollution at the Timau National Observatory** *Khairina Andhara Wiryanti*
P08	**Impact of Proximity Potential Models on the $^{12}C+^{12}C$ Fusion Reaction** *Azni Abdul Aziz*
P09	**Making Sense of the Sky: A Hands-On Approach to Teaching Celestial Motion** *Yang Jiahui Abel*
P10	**Bridging Sky and Society: Astronomy Education and Public Outreach at the Negeri Sembilan Observatory, Malaysia** *Siti Sarah binti Nordin*
P11	**Physics-Informed Artificial Intelligence for Dark Matter Halo Dynamics: A Preliminary Framework Based On Poisson's Equation** *Matthew Laurence*

Research on Eclipsing Binaries and Pulsating Variable Stars Based on Survey and Ground-based Telescope Data

Liying Zhu,[1,2]* Shengbang Qian,[3] Fangbing Meng,[1] Chao Xu,[1,2] Xiangdong Shi,[1] Wenxu Lin,[3] Ergang Zhao,[1] and Minyu Li[1]

[1] *Yunnan Observatories, Chinese Academy of Sciences (CAS), 650216, Kunming, People's Republic of China;*
[2] *University of Chinese Academy of Sciences, No.1 Yanqihu East Rd, Huairou District, 101408, Beijing, People's Republic of China*
[3] *Department of Astronomy, School of Physics and Astronomy, Yunnan University, Kunming 650091, People's Republic of China*
**Corresponding author: zhuly@ynao.ac.cn*

Eclipsing binaries and pulsating stars are two fundamental classes of variable objects that offer complementary constraints on stellar structure, evolution, and multiplicity. In the era of large-scale time-domain surveys, including OGLE, ZTF, LAMOST, SDSS, TESS, and Kepler, vast photometric and spectroscopic datasets have facilitated the systematic discovery, classification, and parameter estimation of these objects.

Based on precise sky survey data, we have detected a group of massive pulsating stars, heartbeat stars, and oEAs, significantly increasing the number of these special variables. We have also employed the properties of solar-like oscillating stars to characterize the exoplanet host systems, leading to the first discovery of exoplanets around B-type stars at intermediate orbital distances. Furthermore, integrated with ground-based follow-up observations, we have identified a group of stellar merger progenitors and explored their relationship with luminous red novae. In addition, we have detected various types of multiple star systems through a combined analysis involving the light-travel time effect (LTTE), radial velocity measurements, astrometric positional changes, and eclipse depth variation analysis.

In this talk, I will present these findings in detail and review how the synergy between survey data and dedicated telescope observations drives breakthroughs in our understanding of variable stars, stellar mergers, multiple star systems, and star–planet co-evolution.

Keywords: eclipsing binaries, pulsating variable stars, stellar mergers, multiple star systems, exoplanet system

Generating solutions in Einstein-Maxwell-scalar gravity

Y. K. Lim,*

Xiamen University Malaysia
**Corresponding author: yenkheng.lim@xmu.edu.my*

The Einstein equation of General Relativity is a notoriously complicated set of partial differential equations, and is often a challenging task to solve. Nevertheless, over the past century we have known many exact solutions obtained by various methods. Here, I will discuss solution-generation methods to obtain these exact solutions. More specifically, starting from a known exact solution known as the 'seed', a transformation can be applied to generate a new solution. This method is demonstrated by constructing some familiar solutions such as the Schwarzschild black hole, Melvin universe, and the planar AdS black hole. Subsequently, some new results such as the magnetised dark energy star, and a simple version of the AdS/Ricci-flat correspondence are discussed.
Keywords:Exact solutions in general relativity, higher-dimensional gravity, solution-generation methods

Discovery of a Dusty, Disintegrating Planet

Dr Marc Hon Teng Yen (NUS)

The planet BD+05 4868Ab is a world that is dying in a spectacular manner: by disintegration into dust that forms comet-like tails. In this talk, I will present its discovery, and how its dust tail offers the unprecedented opportunity to directly sample the geological composition of a rocky planet outside our Solar System.

Cosmic Dawn or Cosmic Daybreak?

J. Lim,[1,*] J. Zhang[2] and T. Broadhurst[3]
[1]*University of Hong Kong, Hong Kong SAR*
[2]*Donostia International Physics Center (DIPC), Spain*
[3]*Ikerbasque, Spain*
**Corresponding author: jjlim@hku.hk*

The seeds of cosmic structure were sown by the Inflation field (Big Bang), leaving small density inhomogeneities in Dark Matter (DM) that gave rise to tiny temperature fluctuations in the Cosmic Microwave Background (CMB). Thereafter, the collapse of over-dense regions into DM halos (self-gravitating structures) – their sizes and hence masses, as well as the epoch at which halos of a given size and mass first form – depends on the nature of the DM particle: whether these particles are cool (sub-relativistic), warm (mildly relativistic), or hot (relativistic), and whether these particles are ultra-massive (e.g., WIMPs) or ultra-light (e.g., Axions). DM halos provide potential wells for gas to condense and cool and therefore form stars, giving rise to visible galaxies. Between the epoch of recombination (visible as the CMB) and the formation of the first stars is the Dark Ages, during which there were no optical photons.
Before the launch of the JWST, it was predicted that the Universe gradually emerged from the Dark Ages in a Cosmic Dawn, as more galaxies formed over time and become brighter. This prediction is predicated on Dark Matter particles being both cold and ultra-massive, in which case smaller and hence lower-mass halos – hosting smaller and dimmer galaxies – formed earlier in the Universe. If, however, DM particles are cold and ultra-light, we show that the Universe would have suddenly emerged from the Dark Ages in a Cosmic Daybreak, for which the first visible galaxies were relatively bright – followed by the formation of both smaller and hence dimmer as well as larger and hence brighter galaxies. Both these predictions can now be tested through observations with the JWST: will these observations reveal a Cosmic Dawn or a Cosmic Daybreak, and therefore whether DM particles are ultra-massive or ultra-light? All will be revealed in this talk!

Keywords: Galaxy Assembly, Galaxy Evolution, Dark Matter, Early Universe

BIMA 3.0: Follow Up Observation of Short Period Eclipsing Binaries from TESS Data

H. Al Ikhsan[1,*]

[1]Institut Teknologi Bandung, Indonesia

*Corresponding author: hakimalikhsan@gmail.com

BIMA is a Eclipsing Binary Monitoring Project that began at Bosscha Observatory in 2012 with collaborators including the NARIT. BIMA 3.0 extends eclipse timing and orbital-period studies to photometric follow-up of short-period TESS binaries, including detached and semi-detached candidates and systems with distinctive light-curve morphologies. We present ongoing work to characterize selected systems, constrain their geometry and relative stellar properties, and investigate period variations potentially associated with mass transfer or third-body light-travel-time effects. BIMA 3.0 collaborates with Lulin Observatory, NARIT, and Langkawi National Observatory. At this stage, the ground-based dataset consists of multi-band photometry obtained with LATTE at Lulin Observatory, which we analyze alongside TESS data. PHOEBE 2 modeling estimates inclinations, fractional radii, and temperature ratios. Eclipse timings from both datasets are combined in observed-minus-calculated (O−C) diagrams to refine ephemerides and investigate secular and cyclic variations. Preliminary modeling of one of our target ,TIC 368452480, with a period of 0.5459 d, yields an inclination of 100.68°, a summed fractional radius of $(R_1 + R_2)/a = 0.5672$, and a temperature ratio of $T_2/T_1 = 0.9740$, indicating components with similar effective temperatures. Expanding the observing network can improve phase coverage, reduce weather-related gaps, and extend timing baselines. We invite Southeast Asian astronomers to contribute eclipse timings using small telescopes equipped with CCD or CMOS cameras, or radial velocities using spectroscopic facilities. Combined photometry and spectroscopy can determine absolute stellar masses and radii, while collaborative monitoring provides students with observational research experience.

Keywords:binaries: eclipsing – binaries: close – stars: fundamental parameters – techniques: photometric – methods: observational

Pulsation Studies and Detection of Heartbeat Stars

M. Li[1,*]

[1]Yunnan Observatories, Chinese Academy of Sciences, People's Republic of China;

*Corresponding author: liminyu@ynao.ac.cn

Heartbeat stars (HBSs) are a class of detached binary systems in highly eccentric orbits. During periastron passage, the strong tidal interaction due to the close distance causes ellipsoidal distortion of the components, and produces strong mutual irradiation effects, Doppler beaming, and other effects, which lead to sudden changes in the luminosity of the system. The shape of its light curve is similar to the "heartbeat" in an electrocardiogram; thus, their name derives from the presence of a heartbeat signature in their light curves. HBSs are ideal laboratories for studying the formation and evolution of binary stars in eccentric orbits and for exploring the internal structural changes of components under strong tidal action; they are also an important class of objects for studying the properties of tidally excited oscillations (TEOs) and for searching for special celestial bodies. Therefore, they are of great scientific value. Although theoretical work on HBSs is extensive, they are very hard to be detected by ground-based telescopes due to the small amplitude and short duration of the light variations. It was not until the release of long-period, high-precision photometric data from the Kepler space telescope that these tiny changes in the light curves were discovered and began to be studied. In this talk, I will present studies of HBSs using Kepler and TESS data, including investigations of their TEOs and their detection based on machine learning methods.

Keywords: Binary stars; Elliptical orbits; Stellar oscillations; Neural networks.

Analysis of The Pulsation Period of The Variable Star CY Aquarii using The Lomb-Scargle Method Based on Ground-Based and Satellite Observation Data

W. Lestari[1,*]

[1]Gadjah Mada University, Indonesia

*Corresponding author: windilestari@mail.ugm.ac.id

The variable star CY Aquarii is an intrinsic pulsating star of the SX Phoenicis type that belongs to the high-amplitude δ Scuti group. The star has a short pulsation period and relatively stable changes in brightness, making it an interesting object for periodicity analysis. This study aims to determine the pulsation period of CY Aquarii using the Lomb–Scargle method based on ground-based observation data from the American Association of Variable Star Observers and satellite data from the Transiting Exoplanet Survey Satellite, as well as compare the characteristics of the results obtained from the two data sources. This study uses an observational and comparative quantitative approach by utilizing photometric time series data in the form of magnitude and flux to observation time in the Barycentric Julian Date (BJD) system. The data were analyzed through pre-processing stages, light curve creation, Lomb–Scargle periodogram analysis to obtain dominant frequencies, and phase folding to visualize periodic patterns in one phase cycle. The Lomb–Scargle method was chosen because it is able to analyze unevenly distributed data, especially in ground-based observations. The expected result of this study is the accurate acquisition of the value of the CY Aquarii pulsation period from both data sources, as well as a comparison of the quality of the analysis results between the ground-based observation data and satellite data. The TESS data is expected to provide results with higher precision and lower noise than the AAVSO data because observations are made continuously without atmospheric disturbances. This research is expected to contribute to the study of variable stars, especially related to the analysis of periodicity, characteristics of light curves, and evaluation of the reliability of the Lomb–Scargle method in the analysis of astronomical data.

Keywords:CY Aquarii, variable star, Lomb–Scargle, light curve, pulsation period, TESS, AAVSO

TCP J18030904+1218140: A New AM CVn Binary Characterized from ZTF Archival Photometry and the 2026 Outburst Campaign

N. M. F. Fahrurozy[1,*]

[1]Insitut Teknologi Bandung, Indonesia

*Corresponding author: 10322051@mahasiswa.itb.ac.id

AM CVn-type stars are a class of ultra-compact binaries with orbital periods ranging from 5 to 65 minutes, in which a white dwarf primary accretes helium-rich material from a hydrogen-deficient donor. Their outbursts are driven by the same disc instability that operates in dwarf novae, but the long-period members of the class outburst only rarely and are correspondingly poorly characterised. TCP J18030904+1218140 was announced as a transient in 2026 August and confirmed as a new AM CVn star from the appearance of periodic brightness modulations during the active phase known as superhumps, and the absence of Balmer lines (Tampo et al. 2026), though the system had already appeared in Zwicky Transient Facility archival data as far back as 2018. We examine the 8.1-year ZTF archive for this system, using both catalogued detections and forced photometry. No outburst is recorded in the interval between the two events, establishing a superoutburst recurrence of more than eight years. The quiescent counterpart lies below the survey detection limit, so the observed amplitude of 4.33 magnitudes is a lower bound. The 2026 event comprises a primary outburst of about six days, a dip, and a rebrightening nine days after maximum, accompanied by a reversal in $g - r$ colour of 0.87 magnitudes that traces the thermal transition of the disc. We derive binary parameters and discuss the constraints these place on the donor.

Keywords:stars: dwarf novae; novae, cataclysmic variables; stars: AM CVn; stars: individual: TCP J18030904+1218140; accretion, accretion discs; binaries: close; white dwarfs

Exploring Black Hole and Neutron Star X-ray Binary Classification with Large Language Models Using Compact Spectral Representations

F. I. Alfarizki[1,*]

[1]Hacktiv8 Indonesia

*Corresponding author: fahmimn21@gmail.com

The classification of black holes and neutron stars in X-ray binary systems relies on their X-ray temporal and spectral properties. Previous studies have applied machine learning and deep learning methods to distinguish between the two classes using fluxes in spectral bins or parameters derived from spectral fitting. These approaches, however, generally rely on models trained specifically for the classification task. Here, we investigate whether large language models (LLMs) can distinguish between black holes and neutron star X-ray binaries from spectral fitting parameters using in-context learning. We use X-ray spectra from RXTE/PCA observations of well-established black hole and neutron star X-ray binaries. Each spectrum is represented by parameters obtained from spectral fitting, which are provided to the LLMs together with or without a set of labeled examples as contextual information for classification. We assess the ability of the LLMs to distinguish the two classes and to identify the spectral characteristics underlying their classification, and compare their interpretations with the physical information conveyed by the fitted parameters. Our preliminary results show that few-shot prompt improve classification accuracy from 68.43% in the zero-shot to approximately 78 - 79%, with comparable accuracy maintained when explicit astrophysical feature information is excluded from the input. We further investigate the role of parameter evolution by comparing chronologically ordered and randomized observations, with both configurations achieving correct classification of all evaluated sources. We further aim to assess the physical grounding of LLM-generated explanations by analyzing parameter attribution and evaluating the consistency of spectral evolution interpretations with observational evidence and established astrophysical knowledge. This work provides an initial assessment of the use of general-purpose LLMs for compact-object classification based on X-ray spectral information without task-specific model training.

Keywords:black holes, in-context learning, LLM, neutron stars, X-ray binaries

Fractal and Multifractal Analysis of Light Curves of Blazars and Dwarf Novae

M. Tsuranova[1,*]

[1]Far Eastern Federal University, Institute of Applied Astronomy of the RAS, Russia

*Corresponding author: ml.tsuranova2002@mail.ru

Blazars and dwarf novae are distinct classes of accretion-powered astrophysical systems whose light curves exhibit complex, non-stationary variability. Traditional photometric analysis may not fully reveal the underlying temporal structures and changes in variability regimes. This study applies fractal and multifractal methods to investigate the variability properties of these objects and explore the potential of nonlinear time-series analysis for characterizing accretion processes. The analysis includes light curves of six dwarf novae (U Gem, SU UMa, Z Cam, X Leo, YZ Cnc, and CN Ori) and two blazars (BL Lac and 3C 273), using observational data from the Transiting Exoplanet Survey Satellite (TESS) and the American Association of Variable Star Observers (AAVSO). The Higuchi method is used to estimate the fractal dimension of the light curves, while multifractal detrended fluctuation analysis (MFDFA), including its sliding-window implementation, is employed to characterize the distribution of fluctuations across different temporal scales and track changes in multifractal properties over time. The results reveal differences in fractal characteristics among dwarf novae subtypes and between dwarf novae and blazars. For dwarf novae, the estimated fractal dimension varies with the photometric state and can approach 2 during low-brightness phases. UGSU-type systems exhibit predominantly antipersistent behavior on large timescales, whereas UGSS-type systems generally show persistent characteristics. The blazar BL Lac displays a broad range of fractal dimensions, while 3C 273 exhibits values predominantly between 1.6 and 1.8. Multifractal analysis further reveals complex scaling properties in the light curves, with spectral asymmetry providing additional information about the distribution of local fluctuations. These findings demonstrate that fractal and multifractal methods can reveal temporal structures that are not readily apparent from visual inspection alone. In particular, sliding-window MFDFA offers a promising approach for investigating changes in variability patterns and searching for potential precursors of outbursts, superoutbursts, and standstills.

Keywords:dwarf novae; blazars; accretion processes; light curves; fractal dimension; multifractal analysis; Higuchi method; MFDFA; time-series analysis.

IMF-Integrated Alpha-element Yields from Very Massive Stars (VMS) Across Metallicity with Uncertainty Bands

A. F. Mohamed Mydin[1,*]

[1]Universiti Malaya, Malaysia

*Corresponding author: amirfauzan272@gmail.com

Very massive stars (VMS; $M \gtrsim 60\ M_\odot$) are rare yet potentially influential sources of Alpha-elements, especially at low metallicity (Z) where stellar winds are weaker and helium cores remain large. This project will use an existing homogeneous stellar grid to compute IMF-weighted yields of key elements (C, N, O, Ne) for three representative metallicities (e.g., $Z = 10^{-5}$, 10^{-3}, Z) with two rotation bins (non-rotating and $v/v_{crit} = 0.4$, where available). We will (i) interpolate yields across mass within each Z and rotation bin, (ii) integrate over a high-mass IMF between 60 and M_{max} = {60, 85, 120, 150, 200} $M_\odot$, and (iii) propagate uncertainties via Monte-Carlo over IMF slope, upper-mass cutoff, remnant/explosion recipe, and interpolation. Outputs include publication-ready tables of IMF-integrated yields with 16-84% intervals and concise figures showing where VMS materially affect population Alpha-element budgets as a function of Z. The work is computationally light and reproducible on a standard laptop.

Keywords:very massive stars, nucleosynthesis, alpha-elements, stellar yields, initial mass function, galactic chemical evolution.

AI-Assisted Radio Frequency Interference (RFI) Mitigation for Stellar Astrophysics and Radio Astronomy

R. Masong[1,*]

[1]De La Salle University, Philippines

*Corresponding author: rizchel_masong@dlsu.edu.ph

Proliferating anthropogenic Radio Frequency Interference (RFI) from satellite megaconstellations and terrestrial telecommunications increasingly degrades observational radio data, severely complicating the detection of faint stellar emission and transient astrophysical signals. Traditional threshold-based flagging techniques often fail to detect subtle, non-stationary interference or inadvertently discard genuine celestial signals through excessive data excision. This paper introduces an introductory, AI-assisted framework for RFI detection and mitigation in time-frequency dynamic spectra. By deploying deep learning architectures tailored to time-frequency representations, the pipeline aims to automate the differentiation between complex interference patterns and low-flux astrophysical phenomena. We present the foundational preprocessing pipeline, model selection considerations, and preliminary benchmarking protocols for comparison with standard radio observations. While exploratory, this approach demonstrates the viability of machine learning in identifying sensitive RFI, laying the foundation for scalable, automated data-reduction pipelines in stellar radio astronomy.

Keywords:radio frequency interference (RFI), radio astronomy, deep learning, stellar astrophysics, time-frequency analysis.

Site Surveys, Design, and Firmware Verification of Phase-Preserving Radio Frequency Interference Mitigation for The ITB-Bosscha VGOS Station

F. A. Firmansyah[1,*]

[1]Institut Teknologi Bandung (ITB), Indonesia

*Corresponding author: fahmiazizfirmansyah@gmail.com

The ITB-Bosscha VGOS station is Indonesia's first geodetic VLBI facility and one of few at low latitude, but stands only 15 km from a metropolitan area. Geodetic VLBI measures group delay, the slope of phase against frequency, and VGOS samples with two bits, so interference must be removed in real time, ahead of the quantizer, and without disturbing phase. We report two ambient site surveys and a mitigation system designed to meet this requirement. The first survey, in August 2026, found a 73 MHz feature near 5.45 GHz. A second survey two months later, about 30 dB more sensitive and covering all four VGOS bands, no longer saw it and instead found a bursty emitter at 5.75 GHz with 275 μs bursts and a duty cycle of 0.26%. The environment changes with time. The system subtracts interference adaptively using a reference antenna, in an overlap-save path that leaves the astronomical signal untouched by construction, and flags interference with a spectral kurtosis estimator. A bit-true model gives a group-delay error of at most 0.0017 ps against a 2 ps budget. Compared on identical scenes, excision, subtraction and blanking leave the group delay unbiased. They differ in cost, namely bandwidth, a little noise, or time. Subtraction works well for continuous emitters but cannot converge within one short burst, for which blanking is the better tool. Firmware blocks agree with the model and meet timing at 256 MHz. A reference antenna, continuous site monitoring, and tests on the target board remain before deployment.

Keywords:radio frequency interference, geodetic VLBI, VGOS, adaptive cancellation, spectral kurtosis, FPGA

Statistical Study Of Hot X-ray Onset Interval In Solar Flares During Solar Cycle 24

S. Selvam[1,*]

[1]Universiti Sains Malaysia

*Corresponding author: isaacgalileo98@gmail.com

Solar flare is an energetic event and understanding the physical processes triggering it will aid in forecasting them and protecting our technological infrastructures. The recently identified hot onset interval (HOI) may clear many unknowns of the elusive pre-flare phase, understudied compared to the impulsive phase. HOI is a pre-flare interval when elevated Geostationary Operational Environmental Satellites (GOES) soft X-ray (SXR) flux is detected before any elevated Reuven Ramaty High Energy Solar Spectroscopic Imager (RHESSI) hard X-ray (HXR) emission at the 10-15 MK isothermal plasma temperature (T_{iso}) range. Hitherto, the HOI was primarily detected visually which can be arbitrary. This study was conducted to detect the HOI mathematically and to study its properties using the latest GOES-15 SXR fluxes and the RHESSI HXR count rates data for 113 flares. The HOI was detected mathematically for each flare and verified with the previously published visually identified HOIs. The T_{iso} and isothermal plasma emission measure (EM_{iso}) during the HOIs were calculated. Most flares had the T_{iso} range of 8-15 MK regardless of their class. The EM_{iso} values for all the flares were mostly below 10^{48} cm^{-3} implying a low plasma amount. These values agree with the previously published values. They clearly show that small amounts of plasma were heated quickly to high temperatures in most flares before the impulsive phase. The HOI was successfully detected mathematically for most flares, implying it is common in solar flares. These results suggest that HOI may be helpful in automated solar flare prediction.

Keywords:X-ray, solar flares, GOES, RHESSI.

Differential Rotation for Sunspots with Simple Magnetic Morphology

M. Fauzi

[1]Bandung Institute of Technology, Indonesia

*Corresponding author: muhammad.fauzi9991@gmail.com

Solar differential rotation is the difference in the Sun's surface rotation rate with heliographic latitude; equatorial sunspots rotate faster than those at higher latitudes and can be studied through sunspot tracking. This study determines the characteristics of solar differential rotation based on sunspots with simple morphology (types α and β), tracking 16 Active Regions (AR) that produced 120 observational data points across heliographic latitudes of -32° to +22° during September 2021-November 2025, using SDO/HMI continuum images via JHelioviewer. The latitude-longitude position of each sunspot was manually recorded in the Carrington coordinate system at successive times, and the daily sidereal rotation rate was calculated from the change in longitude over time. Linear regression (LINEST, Excel) was applied following the form $\omega(\varphi)=A+B\sin^2\varphi$. The combined regression yielded $\omega(\lambda)=(14.242\pm0.046)-(0.078\pm0.363)\ \sin^2(\lambda)$ °/day, and the linear model $\omega=14.257-0.0013(\lambda)$°/day. Equatorial rotation rate of 14.242°/day corresponds to a sidereal period of approximately 25.28 days, consistent with sunspot tracer and magnetogram studies (14.25–14.55°/day). Coefficient B (-0.078°/day) indicates a decrease in rotation rate with latitude, smaller than in previous studies (-1.68 to-2.96°/day), due to limited data at low-to mid latitudes. Some sunspots showed rates exceeding the Carrington reference rate (14.844°/day), the highest reaching 16.61°/day for AR13149, associated with proper motion due to flux emergence. This method successfully identified the pattern of differential rotation empirically, although influenced by limited data and variations in sunspot proper motion.

Keywords: Differential Rotation, Sunspots, Simple Magnetic Morphology Sunspots, Solar Dynamics Observatory (SDO), Carrington Coordinates.

From Solar Radio Bursts to Ionospheric Perturbations: Quantifying the Coupling of CME Shock Dynamics with Regional Ionospheric Total Electron Content (TEC) Responses

A. H. Bely[1,*]

[1]Universiti Sultan Zainal Abidin, Malaysia

*Corresponding author: ahmadhariz007@gmail.com

Understanding the complete chain of energy transfer from solar eruptions to ionospheric disturbances remains a critical objective in space weather research. This study investigates the electrodynamic and physical coupling mechanisms during the extreme space weather event triggered by the X5.7 solar flare and halo Coronal Mass Ejection (CME) from NOAA Active Region 9077 on 14 July 2000 (Bastille Day event). Utilizing multi instrument diagnostics, the research analyze solar radio burst signatures, specifically tracking metric to decametric hectometric Type II radio bursts, whose drift rates using the Newkirk coronal density model place the CME shock speed at 1,275 km s^{-1}, alongside sky plane speeds reaching 1,674 km s^{-1} from CDAW and SOHO data, deprojected using the cone model. Pearson correlation and regression were applied to CME, SEP and Dst parameters, while VTEC at nine IGS stations (13–19 July 2000) was derived from dual frequency GNSS data obtained from CDDIS. This findings confirm that while CME kinematics effectively modulate Solar Energetic Particle (SEP) peak intensities (reaching up to 24,000 pfu for >10 MeV protons), the ultimate geomagnetic storm depth (Dst_{min} = −301 nT) is fundamentally dictated by the southward Interplanetary Magnetic Field component (B_z) and the associated southward electric field ($|VB_z|$), achieving a robust linear correlation (r_p = 0.718). Furthermore, by leveraging a global network of International GNSS Service (IGS) stations spanning Asian, African and American sectors, the research quantify the pronounced spatial and temporal variability of Vertical Total Electron Content (VTEC) responses. The results demonstrate that storm-time electrodynamic processes such as prompt penetration electric fields (PPEF), disturbance dynamo electric fields (DDEF) and equatorial fountain effect modulations induce significant regional anomalies, ranging from severe plasma depletions (dropping to 8–10 TECU at high latitude stations) to prominent positive storm enhancements exceeding 80–90 TECU in equatorial and southern latitude sectors. This comprehensive framework highlights that ionospheric TEC perturbations cannot be modeled by storm intensity alone, but require a coupled assessment of solar radio shock diagnostics, IMF orientation and local time electrodynamics. Ultimately, these insights provide crucial operational foundations for space agencies like MYSA and global satellite GNSS operators to safeguard spaceborne assets, mitigate positioning errors of plasma bubbles and enhance regional space weather forecasting resilience.

Keywords: Space weather, Coronal Mass Ejection (CME), Solar Radio Burst (SRB), Total Electron Content (TEC), Geomagnetic storm

Mapping the Odd Ones Out: Finding Anomalous Exoplanet Transits with Self-Organising Maps

M. Sung[1,*]

[1]National University of Singapore

*Corresponding author: matthewsung@u.nus.edu

Most exoplanets exhibit a simple signature, a clean symmetric dip as the planet crosses its star. A few do something stranger. Disintegrating planets create dusty tails, ringed planets stretch their ingress and egress, and moons and debris add distortions of their own. These rare shapes are one of the most interesting parts of exoplanet science, yet few have been found and studied, and so many have been missed in surveys like NASA's TESS. In this talk, I present an unsupervised learning approach to the problem, using a growing hierarchical self organising map (GHSOM). I organize phase-folded light curves and cluster transit morphologies to find the odd ones, and find signatures that are truly out of this world. I explain where the map excels, and where it currently falls short, and hint at some early interesting signals we have found.

Keywords:exoplanets, machine learning, unsupervised machine learning, transits, transiting exoplanets, light curves, transit morphology, disintegrating planets

AI Driven Investigation of TRAPPIST-1e Atmosphere Using Coupled 1-D Photochem and petitRADTRANS Codes

M. Waqas[1,*]

[1]Institut Teknologi Bandung, Indonesia.

*Corresponding author: mdwaqas767@gmail.com

With the James Webb Space Telescope (JWST), characterisation of temperate rocky exoplanet atmospheres has entered a new era. Given the 6,375 discovered exoplanets to date, TRAPPIST-1e is among the most favourable targets which is an Earth-sized planet orbiting within the inner edge of the habitable zone of its ultracool M8V host star at a distance of 12.4 pc. JWST/NIRSpec PRISM transmission spectroscopy has already ruled out hydrogen-dominated envelopes for this planet (Espinoza et al. 2025) but there still exists a broad range of high-mean-molecular-weight compositions. This motivates the theoretical modelling presented here to identify the most probable atmospheric compositions for TRAPPIST-1e. We present a self-consistent modelling framework coupling the 1-D photochemical-climate code Photochem (Wogan et al. 2025) with the line-by-line radiative-transfer code petitRADTRANS (used in c–k mode) (Mollière et al. 2019), including H_2O, CO_2, CH_4, CO and O_2 line opacities, N_2 and H_2 Rayleigh scattering, and N_2–N_2/N_2–H_2 collision-induced absorption. A Monte Carlo sweep of 2000 atmospheres across p(N_2) (0.2–20 bar), p(CO_2) (0.001–0.7 bar) and p(CH_4) (10^{-6}–10^{-2} bar) yields 1927 (96.4%) stable radiative-convective solutions, with equilibrium surface temperatures spanning 244–419 K and a dominant cooler primary peak at 285 K, in excellent agreement with the Earth-like scenario of Vecchio et al. (2020), and a warmer secondary peak at 380 K. Scatter-plot analysis shows CO_2 is the primary greenhouse driver, CH_4 contributes only weak warming under the M-dwarf spectrum (Turbet et al. 2018), and background N_2 acts mainly through pressure broadening. To make this parameter space tractable for routine exploration and to reduce the computational and time cost, in parallel we developed the TRAPPIST-1e Atmosphere Detection Lab, an open-source interactive tool (published on GitHub) built on random-forest machine-learning surrogates. This tool is trained directly on the Photochem–petitRADTRANS pipeline output. Where a single coupled climate-photochemistry-spectral solution requires on average 20–60 minutes of computation per model through developed pipeline, the trained surrogates return the surface temperature, χ^2, reduced χ^2, and the number of transits required for 5σ detection in few seconds, validated against held-out pipeline runs with $R^2 = 0.98$. This reduced the practical cost of scanning the full p(N_2)–p(CO_2)–p(CH_4) grid from months to seconds and is used here to guide and cross-check the spectral-fitting stage described below. For spectral synthesis we apply a two-stage selection criteria: first the ~180–200 atmospheres within the primary temperature peak (280–295 K, with matching CO_2/CH_4 ranges and the full range of p(N_2)), followed, if a good fit is not found, by ~15–25 atmospheres within the secondary peak (375–385 K). Synthetic transit spectra are generated at a reference pressure of 0.1 bar and a stellar radius of 0.117 R⊙ (Agol et al. 2021). Prior to instrument binning, synthetic spectra is convolved with a Gaussian line-spread function to the NIRSpec PRISM resolving power ($R \approx 100$ over 0.6–5.2 μm). Each model is compared against the Gaussian-Process-decontaminated, four-visit-combined transmission spectrum (Espinoza et al. 2025) through a weighted, offset-fitted χ^2 statistic, with the Bayesian Information Criterion (BIC) are used to rank the models and a per-bin signal-to-noise analysis is implied to estimate the number of additional transits required to detect the strongest predicted spectral features at 5σ. The ten best-fitting atmospheres from the converged Monte Carlo sweep are ranked by χ^2 which are summarised in Appendix A. All ten cluster tightly around the cooler primary (Earth-like) temperature peak that favour low CO_2 pressures (~0.001–0.002 bar) with a wide spread in CH_4, and require ~86–97 additional transits for 5σ detection of their strongest spectral features. This work aims to: (1) identify the most probable atmospheric composition for TRAPPIST-1e; (2) determine whether the cooler primary or warmer secondary temperature peak provides a better fit to the observed JWST transmission spectrum; (3) place possible constraints on the habitability of this temperate rocky world; and (4) inform future observational strategy for JWST, including the 15 additional JWST transits currently being observed. For interpreting the transmission spectra of M-

dwarf planets, the resulting pipeline, together with its machine-learning surrogate, provides a robust and computationally accessible framework. This work also provides the broader implications for biosignature searches and for understanding atmospheric evolution in the ultracool-dwarf domain.

Keywords: Keywords: exoplanets, TRAPPIST-1e, atmospheric modelling, photochemistry, radiative transfer, JWST, habitable zone, M-dwarf stars, machine learning

Probing Substellar Objects through Timing Variations in Close Binary Systems

E. Zhao[1,*]

[1]Yunnan Observatories, Chinese Academy of Sciences, China

*Corresponding author: zergang@ynao.ac.cn

Substellar objects—brown dwarfs and exoplanets—are a key frontier in modern astrophysics. Brown dwarfs, as "failed stars" with masses intermediate between those of stars and planets, bridge the gap between the two classes and provide critical constraints on formation theories for both stars and planets. Exoplanets, likewise, remain a persistent focus of active exploration and discovery. Close binaries are ideal testbeds for studying orbital stability and planetary system evolution under extreme dynamical conditions. In this talk, I will present our ongoing search for substellar companions—which have been rarely detected until now—in eclipsing binaries using the timing variation method. By combining Kepler and TESS photometry with ground-based follow-up, we aim to uncover a hidden population of circumbinary brown dwarfs and exoplanets.

Keywords: Substellar object, close binary system, Timing Variation method

Asteroseismic study of an exoplanetary-host star HD 95086

Y. Semenko[1,*]

[1]NARIT, Thailand

*Corresponding author: eugene@narit.or.th

A handful of early-type stars hosting exoplanets are also δ Scuti variables, with WASP-33 probably the best-known example. Non-radial pulsations enable asteroseismology to accurately determine the physical parameters and evolutionary status of these stars. Seismic modelling also probes stellar interiors with precision inaccessible to other methods. Accurate host-star parameters are crucial for exoplanetary studies. HD 95086 is an A-type star with two gas/dust discs and an exoplanet, resolved optically at ~50 au from the host star. Despite the general interest in this planetary system, its δ Scuti pulsation has remained poorly addressed. We used an extensive set of archival spectroscopic and photometric data and asteroseismic analysis to reassess the stellar fundamental parameters and evolutionary status. We confirmed that HD 95086 is a genuinely pre-main-sequence object with an age of 13-16 Myr and may potentially host more than one planet. The presented materials are part of a paper by Mkrtichian & Semenko (2026) submitted to ApJ.

Keywords:stars: atmospheres — stars: early-type — stars: variables: delta Scuti — stars: individual: HD 95086 — general: asteroseismology

AI-Enhanced Photonic Data Processing for Stellar Characterization: A Pilot Framework

R. Masong[1,*]

[1]De La Salle University, Philippines

*Corresponding author: rizchel_masong@dlsu.edu.ph

Modern observational stellar physics increasingly relies on advanced photonic instrumentation, which generates vast, high-dimensional optical datasets that are often compromised by instrumental noise, atmospheric turbulence, and wavefront distortions. Conventional reduction pipelines struggle to process these data volumes efficiently without substantial manual intervention. This paper introduces a pilot framework that integrates deep learning architectures into the photonic data processing pipeline to automate error correction and streamline stellar characterization. We outline an end-to-end workflow starting with raw optical signal acquisition, followed by preprocessing to mitigate telluric absorption, instrumental artifacts, and cosmic rays, producing standardized inputs suitable for neural networks. We explore baseline model topologies tailored to optical data structures and establish proof-of-concept pipelines for automated spectral classification and parameter regression. Preliminary benchmarking against canonical astronomical catalogs and standard error metrics demonstrates the feasibility of this learning-based approach for rapid stellar analysis. While exploratory, this pilot methodology lays the groundwork for real-time photonic data processing and future hardware-in-the-loop telescope integrations.

Keywords:stellar characterization, astronomical photonics

High-Precision Asteroid Characterization via Stellar Occultation: Results from the Indonesian Strenua Campaign and the CHORD Initiative

A. T. P. Jatmiko[1,*]

[1]Bosscha Observatory, FMIPA ITB, Indonesia

*Corresponding author: agustriono.pj@gmail.com

Stellar occultations provide sub-milliarcsecond resolution of minor planet profiles, offering critical ground-truth constraints for asteroid shape modeling and precision astrometry. We present results from a recent multi-chord occultation campaign of the main-belt asteroid (1201) Strenua, conducted across Indonesia at 26 April 2026. The coordinated deployment yielded a high-resolution cross-sectional profile, significantly refining the body's physical dimensions and orbital ephemerides (Jatmiko et al 2026, in prep). While the Strenua campaign demonstrates the efficacy of distributed regional observation, Southeast Asia remains critically underrepresented in global occultation networks. To address this geographic data gap, we propose the Collaborative Hub for Occultation Research and Discovery (CHORD). Operating as a structured professional-amateur (Pro-Am) network, CHORD aims to standardize timing protocols, optimize regional resource allocation, and mobilize rapid-response deployments. By formalizing this infrastructure, CHORD will integrate Southeast Asia into the global observational grid, maximizing the region's contribution to minor planet characterization, solar system evolution studies, and planetary defense initiatives.

Keywords: Stellar occultations, Minor planets: (1201) Strenua, Pro-Am collaboration, Observational astronomy

Investigating the Tidal Debris of an Open Star Cluster Complex

M. I. Arifyanto[1,*]

[1]Astronomy Research Division, Faculty of Mathematics and Natural Sciences, ITB, Indonesia

*Corresponding author: mochamad.ikbal@itb.ac.id

We present an investigation into the extended structure and tidal debris of a newly identified septuple open cluster system using Gaia DR3 data. This complex consists of seven proximate members (ASCC 19, ASCC 20, ASCC 21, Briceno 1, OC 0339, OCSN 61, and UBC 17a) that exhibit shared photometric ages and kinematic properties, suggesting a common origin. However, fully understanding the dynamical evolution of this complex requires mapping its extended tidal tails—a challenge due to extreme density variations and the difficulty of identifying members in low-density peripheral regions. To address this, we applied the ENTRAP (ENtropy-based Topological Rescue of Ambiguous Points) method to recover potential cluster members in the outskirts. By capturing these extended structures, we present a map of the complex's suspected tidal tails. The analysis of this debris offers further insights into the dynamical interactions and evolutionary processes that may be shaping the current morphology of this septuple cluster system.

Constraining Extended Mass around Sagittarius A* through a Schwarzschild-like Spacetime and the Orbit of S2

M. N. Syarif[1,*]

[1]Institut Teknologi Bandung, Indonesia

*Corresponding author: mnajmisyarif@gmail.com

Tests of Einstein's theory of General Relativity (GR) have achieved remarkable success across a wide range of gravitational regimes. The environment surrounding the supermassive black hole Sagittarius A* (Sgr A*) at the center of the Milky Way provides a natural laboratory for testing the validity of this theory. The successful detection of Schwarzschild precession in the orbit of the S2 star by the GRAVITY Collaboration not only confirmed one of the key relativistic predictions of GR, but also strengthened the evidence for the dominance of a central point mass at the Galactic Center. However, the current level of observational precision still allows for the possible influence of an extended mass distribution surrounding the black hole. Theoretically, the presence of extended mass is expected to induce a retrograde precession component that acts in the opposite direction to the relativistic effect produced by the central point mass. In contrast to commonly adopted Post-Newtonian approaches, this work analyzes the orbital dynamics of the S2 star by directly formulating a non-vacuum spacetime metric within a General Relativistic framework. Using the available compilation of astrometric data for S2, the parameters of the extended mass distribution and its characteristic spatial scale are estimated through statistical fitting using the Markov Chain Monte Carlo (MCMC). This framework is used to constrain the amount and spatial distribution of extended mass around Sgr A* and to assess the extent to which its influence on the orbit of S2 can be distinguished from the predictions of Schwarzschild spacetime.

Keywords: Sagittarius A*, S2 star, extended mass, general relativity, Schwarzschild-like metric, MCMC

Beyond Exotic Matter: Rotating Wormholes in Randall-Sundrum Braneworld Scenarios

M. E. Paul[1,*]

[1]Universiti Kebangsaan Malaysia

*Corresponding author: matthewepaul99@gmail.com

Traversable wormholes in standard general relativity literature often require violations of the null energy condition (NEC) in order to be a viable model. Via Randall-Sundrum (RS) braneworld gravity frameworks, higher-dimensional gravitational effects from the bulk Weyl tensor that are projected on the brane could modify the effective stress-energy needed to sustain the wormhole. This work focuses on the roles of rotation and bulk-induced tidal effects on the effective exoticity of traversable wormholes. This is done by formulating the wormhole geometry within RS frameworks and characterizing the parameters for rotation and tidal charge. The Einstein tensor is then derived and utilized within the 4-dimensional field equations in order to obtain the effective energy density, radial and angular pressures. The projected Weyl tensor contributions from the bulk are analyzed to distinguish gravitational effects from higher-dimensional geometry from brane-localized matter. The NEC is then evaluated at the wormhole throat by varying the parameter combinations to quantify the relationship between NEC violation and rotational and tidal effects. The results are expected to showcase the effects of rotation and tidal charge on enhancing or reducing the reliance on exotic matter to support wormhole geometry. This study also further paves the way for extended works on wormhole stability and brane entanglement within the RS framework.

Keywords:braneworld, wormholes, general relativity

Braneworld Geometrodynamics: Its intriguing extra spatial dimension relation to a wormhole, gravitational waves and superluminality.

A. Alias[1,*]

[1]Universiti Kebangsaan Malaysia

*Corresponding author: aliasanuar37@gmail.com

Geometrodynamics of spacetime are evolving subjects underly our understanding in a bigger picture in cosmology. In these studies, we review the effects of braneworld bulk space on three different aspects which are on a wormhole, gravitational waves and possible construction of spacetime warped bubble that could superluminally propelled in hyperspace by brane-bulk space interaction. For the braneworld wormhole, we study the spatial dynamics in terms of spacetime expansion and contraction affecting the changes at the throat of the wormhole by either decreasing or increasing the stress energy tensor respectively. For gravitational waves where most studies on the source of the waves were derived from the dynamic character of two binary compacted massive objects such as black holes and neutron stars, gravitational waves that originate from a single source of event would be of interest. Thus, this study not only suggests a single source of gravitational waves but is also a form of proving the existence of higher dimensional space by providing the formulation of stress energy tensors at the wormhole throat affected by the bulk induced gravitational waves. For the superluminality, by embedding the extra-dimensional terms that represent bulk space of braneworld, the travelling object's hypersurface may "fly-through" the bulk hyperspace of braneworld. All these studies have not only signified braneworld geometrodynamics and its application such as the superluminal travel but also the existence of extra-dimension as conjectured in braneworld cosmology.

Keywords: General Relativity, Braneworld, Gravitational Waves, Wormhole, Superluminality.

Dark Energy Stars as Alternative Models of Compact Stars

M. A. Azman[1,*]

[1]Department of Applied Physics, Faculty of Science and Technology, Universiti Kebangsaan Malaysia

*Corresponding author: asaz@ukm.edu.my

Dark energy stars are proposed as an alternative theoretical framework for understanding compact stars. This study explores the structure and physical properties of dark energy stars within the framework of general relativity. The effects of dark energy on the internal structure, pressure profiles and stability of compact configurations are investigated. The results provide insights into how dark energy may influence the structure of highly compact stars and demonstrate its potential role in alternative models of compact stars.

Keywords: Dark energy stars; compact stars; dark energy; general relativity; stellar structure

The Photo-z Fallacy: Why Optimizing for Accuracy is Silently Sabotaging Precision Cosmology

K. R. Selvan[1,*]

[1]Universiti Sains Malaysia

*Corresponding author: karthikraja@student.usm.my

Thanks to the new generation of large-scale dark energy sky surveys, there has been a huge demand in recent decades for accurate photometric redshifts (photo-z). However, most of the current studies focus almost entirely on optimizing their models only towards point estimates, often overlooking the effects of the improvement it can have on probability distribution functions (PDFs) and the N(z) distribution, making it one of the most underexplored questions in precision cosmology. In this work, we investigate the statistical interdependence between point estimates, PDFs and N(z) distributions as additional parameters are introduced. Using galaxies from the Sloan Digital Sky Survey (SDSS) DR19, we trained a simple Random Forest Regressor with different combinations of photometric bands and morphological parameters, and evaluated their performance using an exhaustive list of evaluation metrics. After a thorough analysis, we found that point estimates, PDFs and N(z) distributions are indeed interconnected, but interestingly, improvements in one do not always translate into improvements in the others. Individually, additional photometric bands primarily improve PDF precision as well as point estimate accuracy, reducing RMSE and NMAD by 41.2% and 47.3%, respectively, while morphological parameters provide complementary informations that significantly improve individual PDF calibration and the overall agreement of the reconstructed N(z) distribution with actual redshift distribution, especially when fewer photometric bands are available. The correlation analysis further supports the complex relationship between these outputs, showing that PDF precision is associated with point estimate accuracy, while both point estimate and PDF calibration play important roles in reconstructing N(z) by correctly assigning galaxies to their tomographic bins and minimizing probability leakage between adjacent bins, respectively. These findings strongly emphasise that it is important to understand not only how each output improves, but also which aspects of one output can cause the improvement in the others. Finally, we propose a set of complementary evaluation metrics from each photo-z output to provide a comprehensive summary on individual photo-z performance and the relationship between them.

Keywords:methods: statistical; galaxy surveys; Machine learning; galaxies: distances and redshifts; galaxies: structure; Astrophysics - Astrophysics of Galaxies; Astrophysics - Cosmology and Nongalactic Astrophysics; Astrophysics - Instrumentation and Methods for Astrophysics

The galaxy luminosity function from the present-day to z = 2, using over 1.1 million galaxies

S. Koonkor[1,*]

[1]National Astronomical Research Institute of Thailand

*Corresponding author: suttikoon@narit.or.th

In this talk, I will present a measurement of the galaxy luminosity function (LF) in the optical bands from the present-day to z = 2, using over 1.1 million galaxies from the Physics of the Accelerating Universe Survey (PAUS). PAUS combines broad-band imaging from the Canada-France-Hawaii Telescope Lensing Survey with narrow-band photometry from PAUCam, enabling high-precision photometric redshifts with an accuracy of σ_{68} = 0.019 down to i_{AB} = 23. A synthetic lightcone mock catalogue built using the GALFORM semi-analytic model is used to simulate PAUS selection effects and photometric uncertainties, and to derive a machine-learning based estimate of the k-correction. We recover rest-frame luminosities using a random forest regressor trained on simulated ugriz photometry and redshifts. LFs are estimated using the $1/V_{max}$ method, accounting for photometric redshift and magnitude errors, and validated against mock data. We find good agreement between observations and models at z < 1, with increasing discrepancies at higher redshifts due to photometric redshift outliers. The bright-end of the LF becomes flatter at high redshift, primarily driven by redshift errors. We show that the faint-end of the LF becomes more incomplete with increasing redshift, but is still useful for constraining models. We analyze the red and blue galaxy populations separately, observing distinct evolutionary trends. The model overpredicts the number of both faint red and blue galaxies. Our study highlights the importance of accurate redshift estimation and selection modelling for robust LF recovery, and demonstrates that PAUS can characterise the galaxy population with photometric redshifts across a wide redshift baseline.

Keywords: Simulations, Distances and redshift, Galaxy luminosity function, Galaxy stellar mass function, Machine Learning

Characteristics and Evolution of Dust Attenuation in High-Redshift Star-Forming Galaxies (1 < z < 7) in the JADES Survey

K. Z. Hasnaningtyas[1,*]

[1]Bandung Institute of Technology, Indonesia

*Corresponding author: karinazahrahasnaningtyas@gmail.com

Whether the dust obscuring young ionized gas in galaxies behaves differently from the dust attenuating their older stellar populations is a long-standing question in galaxy evolution, one usually tested only in the low-redshift universe. This study was conducted using 314 star-forming galaxies at 1 < z < 7, selected from the JADES NIRSpec spectroscopic and photometric catalogs, and compared nebular reddening measured from the Balmer decrement with stellar continuum reddening derived from SED fitting. Redshift-dependent theoretical Balmer decrement values were used instead of a fixed local-universe ratio, reflecting expected differences in gas conditions between the early and late universe. Nebular and stellar reddening track each other closely at low stellar mass but diverge sharply above a transition mass near 10^9 M$\odot$, a pattern that holds steady across the full redshift range rather than changing with cosmic time. Both reddening measures increase with star formation rate, and the ratio between them increases with absolute star formation rate but shows little dependence on specific star formation rate. At the same time, the overall link between nebular and stellar reddening grows weaker toward higher redshift. Stellar mass and star formation rate together, rather than either alone, appear necessary to explain these trends.

Keywords:dust attenuation, Balmer decrement, JADES, high redshift, stellar mass, star formation rate

Overmassive BHs in Little Red Dots

M. Abdul Latif[1,*]

[1]United Arab Emirates University

*Corresponding author: malatif@uaeu.ac.ae

The unprecedented sensitivity of the James Webb Space Telescope has revolutionized our understanding of the early universe. It has unveiled a large population of active galactic nuclei (AGN) that challenge our theoretical models. These newly observed massive black hole (BHs) powering AGN are overmassive compared to the host galaxies and and have an unexpectedly high abundance. I will present results from the cosmological simulation which is the first to follow the coevolution of a DCBH and its host halo for severalhundred Myr. I will show that our simulation reproduce the properties of BHs, their host galaxies and their spectra, consistent with those of three OBGs: UHZ1, GHZ9 and GN-z11. I will discuss that overmassive black hole galaxies at redshifts $z \sim 10$ are the natural result of DCBH birth in primordial halos at early times.

Keywords: Little Red dots High redshift galaxies AGN Massive Black Holes

The SAMI Galaxy Survey: On the importance of applying multiple selection criteria for finding Milky Way Analogues

S. Tuntipong[1,*]

[1]National Astronomical Research Institute of Thailand

*Corresponding author: sujeeporn@narit.or.th

Milky Way Analogues (MWAs) provide an alternative insight into the various pathways that lead to the formation of disc galaxies with similar properties to the Milky Way. In this study, we explore different selection techniques for identifying MWAs in the SAMI Galaxy Survey. We utilise a nearest neighbours method to define MWAs using four selection parameters including stellar mass, star formation rate (SFR), bulge-to-total ratio (B/T) and disc effective radius. Based on 15 different selection combinations, we find that including stellar mass and SFR is essential for minimising biases in the average MWA properties as compared to the Milky Way. Furthermore, given the Milky Way's smaller-than-average size, selection combinations without disc effective radius result in MWAs being too large. Lastly, we find that B/T is the least important parameter out of the four tested parameters. Using all four selection criteria, we define the top-10 most Milky Way-like galaxies in the GAMA and Cluster regions of the SAMI survey. These most Milky-Way-like galaxies are typically barred spirals, with kinematically cold rotating discs and reside in a wide range of environments. Surprisingly, we find no significant differences between the MWAs selected from the GAMA and Cluster regions. Our work highlights the importance of using multiple selection criteria for finding MWAs and also demonstrates potential biases in previous MWA studies.

Keywords:galaxy, galaxy surveys, galaxy kinematics

A Census of Active Galactic Nuclei Identified by the Mid-infrared [Ne V] Line at z ≤ 0.025

A. M. Yassir Azlin[1,*]

[1]Universiti Kebangsaan Malaysia

*Corresponding author: sarahyassir@gmail.com

We present a census of local active galactic nuclei (AGN) at a redshift of z ≤ 0.025 selected using the high-ionization [Ne V] 14.32 μm emission line from the Infrared Database of Extragalactic Observables from Spitzer. We identify 103 sources with detected [Ne V] emission, which we regard as AGN within the volume. This sample represents ∼18% of the galaxy population within this redshift range, consistent with AGN fractions derived using other selection techniques. We investigate the biases and properties of this [Ne V]-selected AGN sample by comparing it with traditional AGN selection methods based on hard X-ray, optical, and mid-infrared colors. We find that our selection significantly misses AGN with underdeveloped narrow-line regions (NLRs), which account for approximately half of the AGN identified by NLR-independent methods. However, ~10% of our sample is undetected in optical diagnostics, while ~40% is missed by hard X-rays and ~70% by infrared continuum. Notably, ~15% of our AGN are missed by all classical methods, constituting a population of previously unidentified AGN revealed solely by the [Ne V] emission line. Based on our analysis, we show that this line can efficiently select heavily Compton-thick and host-dominated AGN systems. Our analysis also yields mean bolometric luminosities of $\log(L_{bol}/(\mathrm{erg\ s^{-1}})) = 44.5 \pm 0.7$, black hole masses of $\log(M_{BH}/M_\odot) = 7.3 \pm 0.6$, and an Eddington ratio of $\lambda_{Edd} = 0.15 \pm 0.11$. Our sample harbors AGN with comparable luminosities but systematically lower-mass black holes accreting at higher Eddington ratios than those in the hard X-ray-selected sample. This suggests that our AGN may represent local analogs of the rapidly growing SMBH population prevalent at cosmic noon.

Keywords: Infrared spectroscopy; Active galactic nuclei; High energy astrophysics

The Evolving Origin of Star-forming Clumps at 2 < z < 9

I. K. Fitriana[1,*]

[1]Institut Teknologi Bandung, Indonesia

*Corresponding author: itsna.khoirul@itb.ac.id

We investigate the demographics, physical properties, and dominant formation mechanisms of clumpy galaxies across 2 < z < 9 to understand the evolutionary role of clumps across cosmic time. Utilizing JWST/NIRCam imaging across ∼ 800 arcmin^2 from five legacy fields (CEERS, GOODS-N, GOODS-S, PRIMER-UDS, and PRIMER-COSMOS), we systematically identify UV sub-kiloparsec clumps, yielding 2741 clumpy galaxies from a parent sample of 7988 galaxies. We find that the clumpy fraction peaks at ∼ 50% during cosmic noon (z ≈ 2–3) and declines gradually toward earlier epochs, maintaining a ∼ 20% prevalence even at z ≈ 7–9. Clumpy galaxies are found to be more massive and more actively star-forming, with broader dust attenuation distributions compared to their non-clumpy counterparts, while showing no significant difference in specific star formation rate or mass-weighted stellar age. By evaluating radial clump age gradients, implied merger rates, and local galaxy overdensities, we identify a redshift-dependent transition in the dominant clump formation channel: at z ≳ 4.5, clump formation is consistent with being driven primarily by major and minor mergers, whereas at z ≲ 4.5, merger rates alone are insufficient to account for the clumpy population, requiring a substantial contribution from in-situ violent disk instability (VDI). This in-situ mechanism drives the inward migration of clumps, contributing to the assembly of central galactic bulges near cosmic noon. The number of clumps per galaxy further reflects this duality: two-clump systems show systematically weaker VDI migration signatures, suggesting a larger ex-situ contribution relative to higher-clump-number systems.

Keywords: Galaxies — Galaxy evolution — Galaxy structure — High-redshift galaxies

RR Lyrae in the Ultra-Faint Dwarf Galaxy Virgo III: From Lulin to Rubin and Beyond

C.-C. Ngeow[1,*]

[1]Graduate Institute of Astronomy, National Central University, Taiwan

*Corresponding author: cngeow@astro.ncu.edu.tw

Virgo III is a recently discovered ultra-faint dwarf (UFD) galaxy -- a type of old, faint, and dark-matter dominated galaxy. If the low-mass population II RR Lyrae pulsating stars can be identified in a UFD, then the distance measurement from using RR Lyrae to the UFD can be constraint or improved. Using the Lulin One-meter Telescope (LOT), we have searched and identified three RR Lyrae candidates to be associated with Virgo III. However, the single-filter long-exposure LOT observations cannot be used to confirm the RR Lyrae nature of them. Later, they are being confirmed by Pai et al (2026) based on the Rubin Observatory data. This demonstrates the on-going Rubin Observatory Legacy Survey of Space and Time (LSST) is ideal to perform the search of RR Lyrae in newly discovered UFDs. Nevertheless, for those UFDs located in the northern sky (i.e. out of the reach of LSST), we plan to perform a similar search using the Trans-Pacific 2-meter Telescope (TP2M, located in San Pedro Martier, Mexico), as well as other 2-4 meter class telescopes such as the TNO 2.4-meter Telescope and the 3.8-meter Telecope located at the Timau National Observatory.

Keywords: Ultra-faint dwarf, RR Lyrae, optical telescopes

Probing the X-ray Universe from the National University of Malaysia: Unveiling Faint Active Galactic Nuclei in the Nearby Galaxies

N. A. A. Annuar[1,*]

[1]Universiti Kebangsaan Malaysia

*Corresponding author: adlyka.ukm@gmail.com

X-ray astronomy provides a window into some of the most energetic phenomena in the Universe. In this talk, I will present an overview of X-ray astronomy research conducted at the National University of Malaysia (Universiti Kebangsaan Malaysia, UKM), with a particular focus on accreting supermassive black holes, better known as active galactic nuclei (AGN). In AGN, X-ray emission originates close to the central supermassive black hole, providing a key probe of black hole accretion and the intrinsic power of the AGN. Our research combines observations from major X-ray observatories, including Chandra, XMM-Newton, Swift, and NuSTAR, with complementary multiwavelength observations to investigate AGN across a broad range of luminosities and environments. I will highlight our studies of heavily obscured and low-luminosity AGN, including the identification and characterisation of some of the lowest-luminosity heavily obscured AGN known. These studies illustrate the importance of distinguishing AGN that appear faint due to heavy obscuration from those that are intrinsically low luminosity, which is essential for obtaining a more complete picture of the AGN population. Through these studies, I will also highlight the importance of multiwavelength approaches in advancing our understanding of accreting supermassive black holes, and some of the observational challenges that remain in uncovering the faint and hidden black hole population.

Keywords:X-ray, Active Galactic Nuclei, black hole

Tracing Subcluster Interactions in Abell 569 Through Neutral Hydrogen 21-cm Emission and Radio Galaxy Populations

U. F. S. Ungku Ibrahim[1,*] , Z . Zainal Abidin[2]

[1,2] Universiti Malaya, Malaysia

*Corresponding author: [1]uferwanis@um.edu.my

Galaxy clusters grow through the accretion of galaxies and the merging of smaller structures. Neutral hydrogen (H I) provides a useful tracer of gas dynamics and galaxy interactions, offering insights into the evolutionary state of galaxy clusters. This study investigates the dynamical structure of Abell 569 (A569) using the H I 21-cm spectral line observed with a 6.4-m single-dish radio telescope through the Jodrell Bank Internet Observatory at the University of Manchester. The integrated H I spectrum was analysed and compared with the optical galaxy distribution and radio galaxy population using data from the NASA/IPAC Extragalactic Database (NED), HyperLEDA and the NRAO VLA Sky Survey (NVSS). The integrated H I spectrum exhibits a double-peaked profile, with components centred at approximately 5837 and 6377 km s^{-1}. These features suggest the presence of two distinct galaxy systems within the observed field. A comparison with the optical galaxy distribution identifies a main component, A569a, and a secondary component, A569b. The two systems exhibit substantial spiral galaxy populations, comprising approximately 33% and 53% of their respective galaxy samples, consistent with a cluster environment that has not yet reached a fully evolved state. A total of 13 radio galaxies were identified across the two components, including the prominent wide-angle-tail radio galaxy NGC 2329. In the secondary component, an offset between the H I spectral peak and the optical galaxy distribution may indicate disturbed gas associated with interactions between the systems. These findings demonstrate the potential of single-dish H I observations, combined with optical and radio galaxy catalogues, to investigate substructure and possible merger activity in galaxy clusters. Further spatially resolved H I observations are needed to confirm the distribution and physical origin of the detected gas.

Keywords: Abell 569, neutral hydrogen (H I), galaxy clusters, substructure, radio galaxies.

Evaluating Crescent Moon Visibility for Hijri Month Commencement in Thailand, 2021–2026

B. Maseng[1,*]

[1]CHANGE Academy classroom, Thailand

*Corresponding author: basreemaseng@gmail.com

In Islamic tradition, the beginning of a new month is determined by observing the Hilal (crescent moon) on the 29th day of each month in the Hijri calendar. This practice guides Muslims worldwide in fulfilling their religious obligations; for instance, the month of Ramadan is dedicated to fasting, while the month of Dhu al-Hijjah is associated with the Hajj pilgrimage to Mecca, Saudi Arabia. In Thailand, a recurring issue is that the Sheikhul Islam Office's announcement of a new month sometimes fails to align with the actual sighting of the crescent moon. This study examined the visibility of the crescent moon by calculating its potential appearance using the Accurate Times software, alongside actual observations conducted at the moon-sighting observatory in Yaha District, Yala Province. Data collected over 53 months revealed 31 instances where the crescent was successfully sighted. The average altitude at the time of sighting was 11.55 ± 4.29 degrees, with an average elongation of 13.69 ± 4.25 degrees. The findings suggest that when the moon's altitude and elongation exceed the established visibility criteria—specifically an altitude greater than 9 degrees and an elongation greater than 10 degrees—the likelihood of sighting increases. However, three instances in the dataset did not conform to these parameters, highlighting a margin of error in moon-sighting predictions. Future efforts should focus on improving moon-sighting tools, incorporating meteorological data, and identifying more suitable locations for observation.

Keywords: Crescent Moon Visibility, Hilal Sighting, Hijri Calendar, Sheikhul Islam Office, Accurate Times

Parameters for an Independent Islamic Hijri Calendar: A Historical and Astronomical Approach

H. Setiyanto[1,*]

[1]IMAHNOONG Observatory & Mushollatorium, Indonesia

*Corresponding author: hsetyanto@imahnoong.com

A calendar should function not only to track time but also as a framework for astronomical calculations. Ideally, an independent calendar enables the computation of celestial positions—such as those of the Sun, Moon, and stars—directly from its own chronology. In contrast, the current methodology for the Islamic Hijri calendar relies on external astronomical data to determine dates. This paper explores the essential parameters required to develop an independent Islamic Hijri calendar that is both scientifically robust and religiously authentic. By synthesizing historical practices, astronomical principles, and modern advancements in calendar science, this research proposes a set of foundational criteria for a self-sufficient Islamic calendar system

Keywords: Independent Islamic Hijri Calendar, Wada Date, Arafah Mean Time, Nasii' prohibition, Farewell Pilgram

The Prominence of Tuan Haji Abdul Ghani in Digitalising Mathematical Calculations for Islamic Astronomy Applications

A. H. Kamarulzaman[1,*]

[1]Universiti Sultan Zainal Abidin, Malaysia

*Corresponding author: hazimkamarulzaman@unisza.edu.my

Islamic astronomy historically relied on complex manual mathematical calculations such as spherical trigonometry and traditional astronomical tables to determine prayer times, azimuth for qibla direction and developing hijri calendars. The modern transition toward digital tools marked a significant shift in ensuring high-precision timing for the commencement of ibadah for the muslim community. This study examines the intellectual contributions and pioneering role of Tuan Haji Abdul Ghani bin Salleh (1929–2009) in bridging traditional islamic astronomy mathematics with modern computational methods. Utilizing a qualitative historical approach involving textual analysis of primary manuscripts, interviewing his students and family members, this paper traces how his methodologies transformed raw astronomical algorithms into digitised computing models using calculators. The findings reveal that his work streamlined spherical trigonometry for automated calculation, reduced human error and the need to acquire a high-accuracy of calculations. He has restructured and developed more than a dozen mathematical calculations and formulas for the application in Islamic astronomy. Beyond technical modernization, Tuan Haji Abdul Ghani's andragogical efforts facilitated knowledge transfer across regional borders including Malaysia, Brunei and Singapore. His legacy demonstrates the synthesis of classical Islamic scholarship and contemporary technology, serving as a critical foundation for modern digital islamic applications used today.

Keywords: Mathematical astronomy, digitalisation, islamic astronomy, falak calculations

Promoting Islamic Astronomy in Thailand: Reconnecting Heritage, Science, and Society

N. Chehlaeh[1,*]

[1]Faculty of Science and Technology, Prince of Songkla University, Pattani Campus, Thailand

*Corresponding author: nareemas.c@psu.ac.th

Astronomy is a crucial field of knowledge in all civilizations, especially in Islamic civilization. Muslims all around the world have long used astronomical knowledge in their religious practices and daily lives. Thailand is the home country of several Muslims. In the past, religious scholars have continually developed Islamic astronomy in the region, but today many problems arise from a lack of full understanding of astronomical and Islamic religious principles. This causes conflicts in Muslim society in Thailand, for instance, the issue of determining prayer times, the crescent moon sighting, determining the Islamic months, and the qibla direction. For this reason, the Prince of Songkla University (PSU), in collaboration with Fatoni University, the National Astronomical Research Institute of Thailand (NARIT), and the Ministry of Higher Education, Science, Research and Innovation (MHESI), funded by the National Research Council of Thailand, jointly developed a project called Development and Application of Technology and Innovation in Islamic Astronomy in Thailand. The project aims to develop a curriculum in accordance with the context in Thailand, collect Islamic astronomy wisdom and heritage for research and conservation, develop the Islamic astronomy website, and transfer Islamic astronomical knowledge based on scientific and religious principles to students, educational personnel, religious leaders, community leaders, and interested citizens. The project's impact indicators consist of 11 high schools in five southernmost provinces that attended the fundamental Islamic astronomy training program. 54 higher education students and 30 educational personnel, community leaders, and religious leaders attended and completed the advanced Islamic astronomy training program. In addition, more than 500 people participated in the Islamic astronomy symposium and the Islamic astronomy exhibition events. This project is the first important step in the systematic development and promotion of Islamic astronomy within the country. Cooperation between relevant organizations can support, sustain, and advance the project. Therefore, international collaboration is essential for the development of Islamic astronomy in Thailand.

Keywords: Islamic Astronomy, Astronomical Heritage, Scientific Knowledge Transfer, Thailand

Play Under the Dome: Gamified, Embodied Astronomy Education for Children in Sarawak, Malaysia

I. Ali[1,*]

[1]Ministry of Education, Innovation and Talent Development, Malaysia

*Corresponding author: ismandya@sarawak.gov.my

Abstract. At Planetarium Sultan Iskandar in Kuching, every astronomy activity for children has been built as a game since 2006, and since 2021 the programme has toured Sarawak in a five-metre portable dome. This paper describes three families of low-cost, physical, bilingual (Bahasa Malaysia and English) games designed for 12-year-olds: sequencing games that order ten objects by size and by distance, everyday playground games rewritten with astronomy content, and Launch to Orbit, a floor-mat rocket race powered by mission-role question cards. In each game the science is built into the rules. All-or-nothing scoring makes a lucky guess at a ten-item sequence almost impossible (1 in 10!); the rocket's staging rule follows Tsiolkovsky's rocket equation; and the expected number of turns to orbit, 9/p, lets knowledge rather than luck decide the race. We relate the design to gamification research, where a meta-analysis reports a cognitive effect of g = 0.49, and to embodied learning. Because the programme has descriptive but not yet controlled evidence, we propose a cluster-randomised study aligned with the Year 6 science syllabus. We argue that such games suit the region's many settings where planetarium and digital infrastructure cannot be relied on

Keywords:astronomy education; gamification; embodied learning; planetarium; outreach; Malaysia

A Preliminary Evaluation of Mobile Planetarium Outreach on Psychological Well-Being in Underserved Philippine Communities

A. Terry[1,*]

[1]Laniakea Ventures Opc, Philippines

*Corresponding author: onelaniakea@gmail.com

Philippines, being a geographically challenged country, creates an opportunity gap in accessing mental health resources, and specialized science education remains critically uneven in the Philippines. Especially across Geographically Isolated and Disadvantaged Areas (GIDAs) and public school systems. Mobile planetariums are widely used to stimulate interest in astronomy and space science. Students' affective/psycological co-benefits are poorly evaluated. This preliminary study explores the psychosocial impact of mobile planetarium outreach among youth and community members in underserved Philippine localities. Grounded in Attention Restoration Theory and the psychological constructs of awe, we implemented a mixed-methods pilot intervention incorporating immersive projection shows, guided celestial storytelling, and facilitated post-show debriefs. Pre- and post-intervention evaluations, complemented by focus group discussions, assessed participants' acute stress levels, sense of connectedness, positive affect, and perceptions of personal problems relative to the cosmic scale (the "overview effect"). Preliminary qualitative and quantitative findings indicate significant self-reported reductions in everyday anxiety and cognitive fatigue, alongside heightened feelings of shared awe, communal belonging, and curiosity. These initial observations suggest that mobile planetarium domes do not merely serve as tools for STEM literacy, but operate as low-cost, mobile restorative environments that offer non-clinical mental health benefits to under-resourced communities. We conclude by outlining recommendations for integrating mental well-being metrics and culturally grounded storytelling into nationwide mobile science outreach programs.

Keywords:mobile planetarium, informal astronomy education, mental well-being, psychological restoration, underserved communities, Philippines, science outreach.

Exploring Astronomical Literacy Across Senior High School Academic Strands and Its Relationship with Student Engagement

S. L. Laurio[1,*]

[1]Dela Salle Araneta University, Philippines

*Corresponding author: shielalyn.laurio12@gmail.com

The Philippine astronomy curriculum spans elementary (grades 3-6) through secondary (both junior and senior high schools); underlying issues and mastery vary by academic track. This study evaluates astronomical literacy across Senior High School strands (STEM, HUMSS, ABM, and TVL) and examines its relationship with multidimensional student engagement (cognitive, affective, and behavioral). Using a comparative-correlational design, data were collected from senior high school students via an adapted Astronomy Diagnostic Test and a standardized engagement scale. Results revealed significant disparities in astronomical literacy across strands, with fundamental misconceptions persisting even in science-oriented tracks. Notably, while affective engagement (interest and curiosity) was consistently high across all cohorts, cognitive engagement was the only significant predictor of conceptual mastery. These findings demonstrate that enthusiasm alone is insufficient for scientific literacy, underscoring the need for targeted, strand-responsive instructional strategies that bridge the gap between general fascination and deep conceptual understanding.

Keywords:astronomical literacy, senior high school strands, student engagement, STEM education, conceptual understanding.

Assessing Planetarium-Based Learning: Students' Learning Experiences, Astronomical Understanding, and Engagement at Uin Walisongo Planetarium

T. A. Pratama[1,*]

[1]Universitas Islam Negeri Walisongo, Indonesia

*Corresponding author: t.amanah.pratama@gmail.com

Planetariums offer immersive informal science learning environments that can support students' understanding of astronomical concepts through dome theater presentations, visual simulations, and observational activities. This study explores the learning experiences, perceived astronomical understanding, and engagement of elementary and junior high school students visiting UIN Walisongo Planetarium, Indonesia, with particular emphasis on educational content related to the Universe and the Solar System. A qualitative-dominant approach is employed, supported by descriptive survey findings, to examine students' responses to age-appropriate planetarium shows aligned with school science learning topics. Data are drawn from students' verbal and written responses, observations of their engagement, and feedback following the shows. The findings indicate that more than 95% of surveyed students reported that planetarium experiences helped them understand astronomical material more easily, particularly concepts related to the Universe and the Solar System. These topics can be challenging for children because the relative sizes of celestial bodies, vast astronomical distances, and planetary motions are difficult to conceptualize through abstract explanations and textbook representations alone. Students' responses suggest that immersive dome theater presentations and visual simulations help them visualize the relative sizes of planets and the Sun, as well as Earth's rotation and the apparent motion of the Sun. Furthermore, more than 98% of surveyed students agreed that educational planetarium shows tailored to their learning needs increased their interest in astronomy. Direct solar observation through a telescope was also reported as an engaging experience that stimulated curiosity about space technology and encouraged interest in exploring astronomy and science further. The qualitative findings indicate that planetarium visits provide contextual, inspiring, and meaningful learning experiences that complement conventional classroom instruction. These experiences offer opportunities for students to move beyond memorization toward visual exploration, observation, and reflection on astronomical phenomena. However, students' reported understanding and interest should be distinguished from objectively measured learning gains or sustained changes in learning behavior. Overall, the findings highlight the educational potential of planetarium-based learning as a complementary resource for elementary and junior high school science education. The study underscores the importance of developing age-appropriate, curriculum-aligned planetarium programs that integrate immersive visualization and observational activities to support students' astronomical understanding and engagement with science.

Keywords: Planetarium-based learning, learning experiences, astronomical understanding, student engagement, informal science education, Solar System.

Laos' First Planetarium: Astronomy Education and Public Outreach at the Science and Botany Park

K. Sonboulom[1,*]

[1]Science and Botany Learning Promotion Foundation, Laos

*Corresponding author: bankshiroyasha@gmail.com

The Science and Botany Park in Vientiane Province is home to the first planetarium established in Lao PDR. The facility was developed to support astronomy education and public engagement by providing immersive learning experiences for students, families, and other visitors. The planetarium features a 14-metre dome, 104 seats, an eight-projector Fulldome.pro system with 4K fulldome projection, and Stellarium as the primary software for live night-sky simulation. Educational sessions are commonly based on the current night sky rather than a fixed programme. Depending on seasonal visibility, sessions may introduce the Moon, visible planets, constellations, the Milky Way, and other astronomical phenomena. Cultural interpretations of the night sky, such as traditional stories associated with the Moon, may also be incorporated. These activities are complemented by telescope observations using Sky-Watcher FlexTube 300P and 200P telescopes. The planetarium serves members of the general public, including students, families, and other visitors. Informal participant feedback and staff observations indicate generally positive engagement with the astronomy activities. As Laos' first planetarium, the facility represents an important development in astronomy education and public outreach in Lao PDR, combining simulated night-sky learning, hands-on activities, and direct astronomical observation.

Keywords: Planetarium; Astronomy Education; Public Outreach; Night-Sky Simulation; Lao PDR

Popular Educational Book on Near-Earth Supernovae throughout the Timespan of 1950-2026

N. A. Liando[1,*]

[1]Bandung Institute of Technology, Indonesia

*Corresponding author: nathanaelliando63@gmail.com

Near Earth Supernovae (NES) are estimated to once happen during the End Ordovician-End Pleistocene era (~440 Myr–22 kyr), where emitted cosmic particles and gamma rays then consequently result in mass extinction for organisms of that time period. Discovered sediments known to contain crude oil and live iron-60 radioisotopes are the signs of such phenomenon happening, along with the abundance of iron deposits on Earth as well as the Solar System that has known to harbor them in asteroid belts. Increase of atmospheric radiocarbon by diffusive shock acceleration post-SN explosion is now used to detect anomaly for Earth's ecosystem changes. Therefore, climate alteration is influenced through unobservable events considering the length of period since it happened, resulting in only the effects that can be observed. This educational book discusses the cross-century history of NES research from a historical perspective, within 1950-2026's timespan, its effects on Earth, along with how this field could develop in the upcoming years.

Keywords: Near-Earth Supernovae, 60Fe Radioisotope, Astronomy Education, Cosmic and Gamma Rays, History of Astronomy, Science Communication, Stellar Evolution.

Exploring the Astroarchaeological Heritage of Lenggong UNESCO Global Geopark through Geospatial Analysis

O. Zainon[1,*]

[1]Department of Geoinformation, Faculty of Built Environment and Surveying, Universiti Teknologi Malaysia 81310 Johor Bahru. Johor.

*Corresponding author: othmanz.kl@utm.my

Lenggong UNESCO Global Geopark offers a distinctive setting for investigating relationships among archaeological landscapes, celestial visibility, and geological processes associated with cosmic events. Its archaeological record includes cave occupations and open-air lithic workshops, while Bukit Bunuh is interpreted in official heritage accounts as an approximately 1.83-million-year-old meteorite impact locality. This paper develops a geospatial framework with two objectives: to characterize the spatial relationships between archaeological sites, terrain, and observable celestial markers; and to establish an evidence-based approach for integrating impact-related geoheritage and potential astronomical associations into heritage management. The framework combines Geographic Information Systems, digital elevation models, field orientation surveys, viewshed analysis, horizon modeling, chronological assessment, and terrain-conditioned statistical comparisons. An illustrative solar calculation demonstrates how local horizon altitude affects candidate alignment directions. The methodological synthesis identifies three essential requirements: distinguishing natural cave geometry from human selection, testing astronomical associations against environmental alternatives, and separating present-day terrain from reconstructed prehistoric landscapes. No original site measurements or statistical alignment results are reported. Consequently, claims of deliberate astronomical orientation or impact-driven settlement change remain hypotheses requiring independent evidence. The principal contribution is a reproducible analytical and interpretive framework that supports archaeological research, site conservation, and scientifically responsible geotourism in Lenggong.

Keywords: Astroarchaeology; geospatial analysis; prehistoric settlement; geoheritage; horizon modeling

Community-Based Astrotourism Development in Rinca Island, East Nusa Tenggara, Indonesia

Aprilia[1,*]

[1]Institut Teknologi Bandung (ITB), Indonesia

*Corresponding author: aprilia@itb.ac.id

Astrotourism has the potential to support sustainable tourism, improve science literacy, and create new economic opportunities for local communities. To introduce this concept in the Komodo National Park region, a community-based astrotourism program was conducted in Pasir Panjang Village, Rinca Island, East Nusa Tenggara. Participants included tour guides, fishers, and local vendors. The one-day training covered the basic concepts of astrotourism, including starbathing and starfishing, followed by practical training on the installation and use of the Stellarium application. A nighttime stargazing session was then conducted to familiarize participants with celestial objects and night-sky navigation using Stellarium. In addition, surveys of several islands around Rinca Island were carried out to assess their potential for astrotourism activities, while a starfishing demonstration was conducted by the instructors. The program highlighted the potential of integrating astronomy outreach with marine and island tourism, while encouraging community participation in developing innovative and sustainable tourism activities in the Komodo region.

Keywords:astrotourism, starfishing, starbathing, astronomy outreach, community engagement, Rinca Island

Monitoring and Mapping Night Sky Brightness at Bosscha Observatory

D. G. Ramadhan[1,*]

[1]Bosscha Observatory/Institut Teknologi Bandung, Indonesia
*Corresponding author: dhimaz.gilang@gmail.com

We report on the night sky brightness monitoring campaign at Bosscha Observatory conducted from 2024 to 2026. Our primary data collection utilizes an automated, zenith-pointing Sky Quality Meter (SQM) with a ~70° field of view, which records sky brightness at one-minute intervals. To complement the sky brightness measurements, the SQM is co-located with an Automatic Weather System (AWS), which simultaneously records meteorological parameters. This automated system enables continuous, long-term monitoring and facilitates the investigation of seasonal variations in night sky brightness in relation to local atmospheric conditions. In addition to the SQM measurements, we developed a complementary method for constructing a V-band sky brightness map using photometric observations obtained with a ~36-cm telescope, targeting a well-distributed grid of celestial coordinates. We performed forced photometry on detected stars in each frame to obtain background light flux. The sequence and number of target positions are optimized to capture temporal variations in sky brightness over the course of a single night. This approach extends sky brightness characterization to lower altitudes that are strongly affected by urban light pollution but lie outside the SQM coverage. Constructing these sky brightness maps allowing us to investigate the spatial and temporal characteristics of light pollution as well as the influence of natural factors such as varying moonlight conditions on the observed night sky brightness.

Keywords:sky brightness; light pollution; Sky Quality Meter (SQM); photometry; astronomical site monitoring

Observatories in Malaysia: Functionality and Growth

J. Y. H. Soo[1,*]

[1]Universiti Sains Malaysia

*Corresponding author: johnsooyh@usm.my

How many astronomical observatories are there in Malaysia, and how did they come about? In a recent work, we conducted an in-depth analysis on the functionality and growth of 29 astronomical observatories across 12 states in Malaysia through interviews, document analysis and site visits. These observatories were divided according to their categories, functions and accessibility, and the factors which drive their growth and development are also analysed. In this talk, we will share the full results of this work, showing a complete timeline of Malaysian observatories, their current roles, challenges and contributions to the nation, and how Malaysia could move forward to improve the infrastructure and collaborative power in observational astronomy. This research contributes to the limited literature on Southeast Asian observatory development, particularly in Malaysia, and provides a foundation for future coordination in strengthening the role of astronomical observatories in education, research and public engagement.

Keywords: Astronomical Observatories, Optical Astronomy, Malaysian Astronomy, Astronomy Education, Astronomical Heritage

High-Degree Nonradial Pulsations in Fast-Rotating, Eclipsing Binary and Exoplanet Host Stars

D. Mkrtichian[1,*]

[1]National Astronomical Research Institute of Thailand (NARIT)

*Corresponding author: davidmkrt@gmail.com

Over the past four years, we have undertaken the first large scale spectroscopic survey of pulsations in rapidly rotating A-F type stars, encompassing single stars, eclipsing binaries, and exoplanet host systems. To date, we have identified 67 new bright (V<7 mag) non-radially pulsating stars and performed detailed pulsation mode identifications. Single, rapidly rotating stars predominantly exhibit excited sectoral and tesseral modes that are symmetric about the rotation axis, whereas close binaries display tidally locked pulsations with the pulsation axis oriented toward the gravitationally bound companion.

Keywords: Asteroseismology: pulsations: non-radial

Comparative Study of Sky Brightness Measurements using Sky Quality Meter (sqm) with Red and Visual Filters for Determining The 'Isha' Prayer Time in Selangor Observatory

A. A. Amaluddin Arip[1,*]

[1]Universiti Malaya, Malaysia

*Corresponding author: aaasyrafuddin@gmail.com

The beginning of 'Isha' prayer time is determined by the disappearance of red twilight (Shafaq Ahmar). In contemporary practice, the Solar Depression Angle (SDA) is widely used to estimate this disappearance, with criteria ranging from 15° to 19.5° globally. In Malaysia, the Department of Islamic Development Malaysia (JAKIM) adopts an SDA of 18° below the horizon. This study examines changes in twilight sky brightness in the red and visual bands to identify stabilisation of sky brightness and its relationship with Shafaq Ahmar and official 'Isha' prayer times. Observations were conducted at the Selangor Observatory (Bortle Class 4) using two Sky Quality Meters (SQM-LU-DL), one equipped with a standard HOYA CM-500 visual filter and the other with a HOYA R-60 red filter combined with an Optolong UV/IR Cut Filter. Both instruments were directed towards the western horizon, recording sky brightness at 10-second intervals from sunset until 9:00 p.m. Data were analysed using Python, while the corresponding solar depression angles were determined using solar position data from the Department of Survey and Mapping Malaysia (JUPEM). Preliminary observations from 31 December 2025 to 8 January 2026 showed differences of 0° to 1.38° between the two filters in the solar depression angles at which sky brightness stabilised. Both instruments showed stabilisation between −10.91° and −14.55°, earlier than JAKIM's −18° criterion. These findings may be influenced by local background sky brightness and atmospheric conditions. The results demonstrate the potential of sky brightness measurements using different spectral filters to investigate the disappearance of Shafaq Ahmar and further evaluate the astronomical criteria used to determine 'Isha' prayer times.

Keywords: Isha; Shafaq Ahmar; Sky Quality Meter (SQM); Sky Brightness; Solar Depression Angle

Multi Wavelength Study of Radio Galaxies in the Merging Galaxy Cluster Abell 1367

N. F. A. Amran[1,*]

[1]Universiti Malaya, Malaysia

*Corresponding author: 22003295@siswa.um.edu.my

Abell 1367 (z = 0.0216) is a nearby merging galaxy cluster characterized by a dynamically disturbed intracluster medium (ICM). Interactions between radio galaxies and the surrounding ICM can generate ram pressure that deflects radio jets, producing narrow-angle-tail (NAT) and wide-angle-tail (WAT) morphologies. This study investigates the relationship between radio-jet bending and local projected ICM thermodynamic structure. Radio galaxies were selected using optical membership information and FIRST/NVSS radio observations. An automated two-lobe method identified host-associated radio lobes and measured jet-bending angles from radio-intensity peaks and World Coordinate System coordinates. Local temperature-gradient and pseudo-pressure diagnostics were extracted from XMM-Newton maps at galaxy positions. Spearman rank analysis was performed alongside exploratory of Machine Learning. For example, Random Forest modelling and SHAP interpretation as supporting multivariate consistency checks. Jet-bending measurements were obtained for 24 radio galaxies, comprising 9 NAT and 15 WAT sources. Six galaxies had usable local XMM-Newton coverage. Positive trends were observed between jet bending and temperature-gradient magnitude (Spearman $\rho = +0.429$, $p = 0.397$, $N = 6$) and pseudo-pressure ($\rho = +0.600$, $p = 0.400$, $N = 4$). In exploratory Random Forest modelling, the temperature-gradient proxy showed the highest feature importance, followed by 1.4 GHz radio flux density. SHAP analysis suggested that higher temperature-gradient values tended to contribute positively to predicted bending angles. Although the small local sample limits statistical interpretation, these findings suggest that merger-related ICM thermodynamic variations may contribute to radio-jet bending. Further comparisons across larger samples of merging and relaxed galaxy clusters are needed to evaluate these relationships.

Keywords: Abell 1367, radio galaxies, jet bending, intracluster medium, galaxy-cluster mergers.

ISLAMIC ASTRONOMY IN MEDIEVAL IBERIA: EXPLORING THE HERITAGE OF AL-ANDALUS

A. N. Mohd Ali[1,*]

[1]Universiti Malaya, Malaysia

*Corresponding author: u2100077@siswa.um.edu.my

Throughout the history that took place over the past 1,300 years in relation to the evolution of the Iberian Peninsula, with a primary focus on Al-Andalusian Civilisation. Going beyond the conventional narrative that focuses on the political upheavals that dominated the history of the Iberian Peninsula, this research focuses on the synergy that was cultivated in a multi-religious society. Therefore, the coexistence of Muslim, Christian and Jewish populations fostered an environment in which scholarship and scientific research flourished, especially in several key regions. Therefore, this research closely follows the development of the path of knowledge from the Al-Andalusian period to the modern era and identifies the importance of Al-Andalus as a conduit for intellectual continuity that led to the development of European states. In addition, this research also analyses the advances that exist in the fields of computational mathematics and astronomy. Not only that, but it also identifies how the innovations of the Al-Andalusian period, highlighted by instruments with precision that exceeded the intellectual limits of the time and the needs of religion, succeeded in becoming the basis for wider technological advances. Therefore, the research identifies this Al-Andalusian legacy as one of the fundamental pillars that became the focus of the global scientific revolution to prove that ancient knowledge and modern knowledge complement each other.

Keywords: Al-Andalus, Islamic Golden Age, Iberian History, Development of knowledge, Bridging

Can Slowly Rotating Population III Stars Produce Fast-Spinning Black Holes?

N. H. Ismail[1,*]

[1]Jabatan Fizik/Universiti Malaya, Malaysia

*Corresponding author: hidayahismail14@gmail.com

The origin of massive, rapidly spinning black holes remains an important challenge in stellar evolution, particularly in light of gravitational-wave events such as GW231123. We investigate whether slowly rotating Population III stars can form such remnants through single-star evolution. Using the GENEC stellar evolution code, we compute zero-metallicity models with initial masses of 80, 85, and 90 $M_\odot$, including rotational mixing and magnetic angular-momentum transport. We assess their proximity to pair instability using carbon–oxygen core masses and the volume-averaged adiabatic index, and estimate black-hole masses and spins assuming direct collapse. Our 80 and 85 $M_\odot$ models develop CO cores of approximately 31–36 $M_\odot$ and remain globally stable against pair instability. Their extremely weak mass loss allows them to retain most of their stellar mass and angular momentum, producing black holes of up to approximately 80–85 $M_\odot$ with dimensionless spins reaching $a_{BH} \simeq 0.7$. In contrast, the 90 $M_\odot$ models lie near the transitional pulsational pair-instability regime. These results show that massive, rapidly spinning black holes do not necessarily require rapidly rotating progenitors. Slowly rotating Pop III stars evolving just below the pair-instability boundary provide a plausible single-star channel for producing heavy, high-spin black holes relevant to gravitational-wave observations.

Keywords:stars: evolution – stars: massive – stars: mass-loss – stars: Population III

Dark Matter Mass Estimation in A569 Galaxy Cluster: Integrating Astrophysical and Qur'anic Insights of Unobservable Cosmic Structures

S. Abd Haris[1,*]

[1]Universiti Malaya, Malaysia

*Corresponding author: syfaharis03@gmail.com

Despite being discovered nearly a century ago, the nature and composition of dark matter remain as an unsolved enigma at the frontier of research landscape. The quest to understand these unseen components of the universe has emerged as a shared point of inquiry between modern cosmology and Qur'anic interpretation. Therefore, this study aims to explore the scientific and Qur'anic perspectives on the existence of dark matter in galaxy clusters. To achieve this, this work has adopted an interdisciplinary investigation into dark matter within the A569 galaxy cluster, integrating the quantitative astrophysical mass estimation via the virial theorem with qualitative Qur'anic exegesis (tafsīr 'ilmī). The findings suggest that there is no fundamental dichotomy between modern astrophysical discoveries concerning dark matter and the Qur'anic description of the universe. We hoped that this work provided a new contribution in developing an integrated framework for astrophysics and Islamic Astronomy exploration, especially in the search of dark matter, which is arguably the most fundamental and exciting challenges of contemporary science.

Keywords: Cosmology, galaxy clusters, tafsīr 'ilmī: merger, dark matter, cosmic web, Qur'anic exegesis

The effective strength of the Great Attractor: a numerical analysis of linear structure growth in ΛCDM

Muhammad Farhan H[1,*]

[1]Man Insan Cendekia Gorontalo High School, Indonesia

*Corresponding author: farhan.herman441@gmail.com

Context. The Great Attractor governs the motion of galaxies across the local supercluster, the Milky Way among them. Aims. This study asks when structure growth in that region was strongest, and how far it has declined since. Methods. The linear growth equation is solved numerically in a ΛCDM background, following the growth rate f and the growth factor D. Results. The product f·D peaked about 4.5 Gyr ago. It has fallen roughly 10% since. Conclusions. Growth in the Great Attractor basin is past its maximum. The Milky Way sits in a basin that still deepens, but ever more slowly: what is slowing is the accretion of new material, not the Great Attractors gravity itself.

Keywords: Key words : Great Attractor; structure growth rate; growth factor; ΛCDM model; gravitational basin

Outdoor Lighting Design to Minimize Light Pollution at the Timau National Observatory

K. A. Wiryanti[1,*]

[1]Bandung Institute of Technology, Indonesia

*Corresponding author: khairinaandhara@gmail.com

The Timau National Observatory area requires an outdoor lighting system that meets circulation needs without disrupting dark-sky conditions. This study aims to design such a system and evaluate its compliance with road lighting standards and light pollution mitigation parameters, using DIALux Evo 13.2 numerical simulations with the Street Lighting approach applied to the entire area via Outdoor Planning, in accordance with CIE 150:2017, EN 13201:2015, Ministry of Transportation Regulation No. 27 of 2018, and SNI 6197:2020. Evaluation parameters include road illuminance and uniformity, luminaire photometry, and building surface luminance. The both sides offset configuration (light point height 1.40 m, spacing between luminaires 3.65 m) yields an average illuminance of 2.81 lx (roadway) and 2.78 lx (sidewalk), meeting Class P6 requirements, with full cut-off luminaires, ULR 0%, intensity class G*6, and TI 0%. Building surface luminance requirements were met at 100% for the Telescope 380 Building (Zone E0), while supporting buildings in Zone E1 only achieved 57.1–100% due to light exposure from the existing system. The resulting street lighting design meets the functional requirements and specified photometric parameters, while the existing lighting on the E1 support buildings needs to be reevaluated and replaced with directional-distribution luminaires, ULR 0%, and appropriate light output and color temperature. This design can serve as a technical reference for system development.

Keywords: Outdoor lighting; Light pollution; Timau National Observatory

IMPACT OF PROXIMITY POTENTIAL MODELS ON THE $^{12}C+^{12}C$ FUSION REACTION

Azni Abdul Aziz [1,*] and Norhasliza Yusof [2,3]

[1] *Department of Physics, Kulliyyah of Science, International Islamic University Malaysia, 25200, Kuantan, Pahang, Malaysia;*

[2] *Department of Physics, Faculty of Science, University of Malaya, 50603 Kuala Lumpur, Malaysia*

[3] *Center of Astronomy and Astrophysics, Faculty of Science,*

University of Malaya, 50603 Kuala Lumpur, Malaysia

**Corresponding author: azniabdulaziz@iium.edu.my*

The $^{12}C+^{12}C$ fusion reaction plays a crucial role in stellar carbon burning and the evolution of massive stars. However, significant uncertainties remain in the fusion cross sections and reaction rates at astrophysical energies. In this work, we systematically investigate the performance of various versions of the proximity potential formalism in describing the $^{12}C+^{12}C$ fusion process. Fusion cross sections are calculated using the one-dimensional barrier penetration model and compared with available experimental data. The corresponding astrophysical S-factors and thermonuclear reaction rates are also evaluated. Statistical analyses are performed to identify the potential models that best reproduce the experimental measurements. The results provide improved constraints on the $^{12}C+^{12}C$ reaction and help reduce nuclear physics uncertainties in stellar evolution calculations.

Keywords: Nuclear astrophysics, $^{12}C+^{12}C$ fusion, carbon burning, proximity potential, reaction rates.

Making Sense of the Sky: A Hands-On Approach to Teaching Celestial Motion

J. A. Yang[1,*]

[1]National University of Singapore

*Corresponding author: phyyja@nus.edu.sg

Understanding celestial motion requires students to visualise three-dimensional spatial relationships and distinguish between the physical motion of celestial bodies and their apparent movement across the sky. These concepts can be difficult to grasp through lectures and diagrams alone as students have to coordinate multiple simultaneous motions and reference frames. We developed a hands-on classroom activity using a simple physical model of the Solar System to reinforce concepts introduced in an undergraduate astronomy course. Working in groups, students manipulate models of the Sun, Earth, Moon, and planets on interchangeable bases representing the zodiac, solar calendar, and lunar stations. These models provide a 3-dimensional view of the solar system and allow students to visualise relative motion across different reference frames. Students explore seasons, axial precession, celestial visibility, lunar phases, sidereal and synodic periods, planetary elongation, and retrograde motion in exercises based on guided inquiry. By tracing lines of sight and switching between heliocentric and geocentric perspectives, students investigate how observable astronomical phenomena arise from relative motion, and how these phenomena relate to historical and traditional skywatching practices. This reinforces how ancient observers determined celestial positions and developed calendars based on recurring astronomical cycles and provide a backdrop to explore how different cultural traditions interpret and organise observations of the same sky.

Keywords: Astronomy Education, Physical Models

Bridging Sky and Society: Astronomy Education and Public Outreach at the Negeri Sembilan Observatory, Malaysia

S. S. Nordin

Public observatories play a crucial role in connecting astronomy with the communities around them.This paper shares the experience of the Negeri Sembilan Observatory in making astronomy accessible to students, families and the general public through structured education and outreach programmes. Following a major upgrade of its exhibition facilities in 2025, the observatory welcomed approximately 12,164 visitors between September 2025 and September 2026, reflecting strong public interest in astronomy, and public Google reviews of the observatory are overwhelmingly positive. We describe the main activities, including guided telescope observing sessions, public viewing of celestial events, interactive exhibitions and hands-on workshops. We also highlight how growing visitor numbers are opening opportunities for astrotourism in the state. We reflect on what has worked well and on the challenges encountered, and conclude with practical recommendations for small and medium-sized observatories in the region.
Keywords: astronomy education, public outreach, astrotourism, interactive exhibition, public observatory, Negeri Sembilan

Physics-Informed Artificial Intelligence for Dark Matter Halo Dynamics: a Preliminary Framework Based on Poisson's Equation

Matthew Laurence[1] and Ungku Ferwani Salwa Ungku Ibrahim[2,*]

[1]*Department of Mathematics and Science Education, Faculty of Education, Universiti Malaya, Malaysia*
[2]*Centre for Astronomy and Astrophysics, Department of Physics, Faculty of Science, Universiti Malaya, Malaysia*
**Corresponding author: uferwanis@um.edu.my*

Dark matter plays a fundamental role in the formation and dynamical evolution of galaxies, including Milky Way-like systems. However, understanding the three-dimensional distribution and gravitational influence of dark matter remains challenging because its properties cannot be observed directly and must be inferred from its gravitational effects on visible matter. This study introduces a preliminary conceptual framework for incorporating artificial intelligence (AI) into the physical modelling of dark matter halos, with particular emphasis on enforcing gravitational consistency through Poisson's equation. The proposed approach explores the use of physics-informed neural networks (PINNs) to combine data-driven learning with the governing equations of gravity. As an illustrative example, simulated dark matter halo distributions representative of Milky Way-like galaxies could be used to investigate whether an AI model can reconstruct halo density profiles and gravitational potential while satisfying Poisson's equation. The framework could also be extended to examine halo dynamics by relating the gravitational potential to the acceleration of matter and, with appropriate dynamical information, to the evolution of the halo. Simulated density fields and gravitational solutions would provide a basis for comparing AI predictions with conventional numerical calculations. As a preliminary investigation, this work outlines the potential of physics-informed AI to connect computational learning with physically meaningful solutions in galactic dynamics. Rather than treating AI predictions as purely statistical outputs, the proposed framework seeks to incorporate fundamental gravitational constraints into the learning process. This concept may provide a foundation for future studies of dark matter halo structure and dynamics, with possible applications to numerical simulations and observationally informed models of Milky Way-like galaxies.

Keywords: dark matter halos, Milky Way-like galaxies, physics-informed neural networks (PINNs), galactic dynamics, artificial intelligence.

SEAAN 2026
16TH MEETING · KUALA LUMPUR

16TH SOUTHEAST ASIA ASTRONOMY NETWORK MEETING

Special Thanks

To our sponsors

The organizing committee gratefully acknowledges the generous support of our sponsors, whose contributions have helped make this meeting possible.

MAIWP

MAINS
MAJLIS AGAMA ISLAM NEGERI SEMBILAN

PERSATUAN FALAK SYAR'I MALAYSIA
جمعية الفلك الشرعي بماليزيا
MALAYSIAN ISLAMIC ASTRONOMY SOCIETY

INSTITUT FIZIK MALAYSIA
MALAYSIAN INSTITUTE OF PHYSICS

OPTICAL UNIVERSE
SCIENTIFIC INSTRUMENT

ORGANIZED BY

UNIVERSITI MALAYA

PLANETARIUM NEGARA KUALA LUMPUR

NARIT

MINISTRY OF SCIENCE, TECHNOLOGY AND INNOVATION
MALAYSIAN SPACE AGENCY

16TH SOUTHEAST ASIA ASTRONOMY NETWORK MEETING

Advancing Astronomy Through Regional Collaborations

Scan for more information

contact information

Email: seaan2026kl@gmail.com

Website: https://umevent.um.edu.my/SEAAN2026

SEAAN 2026
16TH MEETING · KUALA LUMPUR