General Information

會議資訊

1. 年會會場 / Meeting Venue

a. 國立成功大學光復校區國際會議廳

National Cheng Kung University (NCKU), International Conference Room

◎主會場（Session S1-S5）：第一演講室(1st Lecture Room) [地下一樓(B1)]

◎天文教育及業餘天文活動報告（Session E1-E3）：

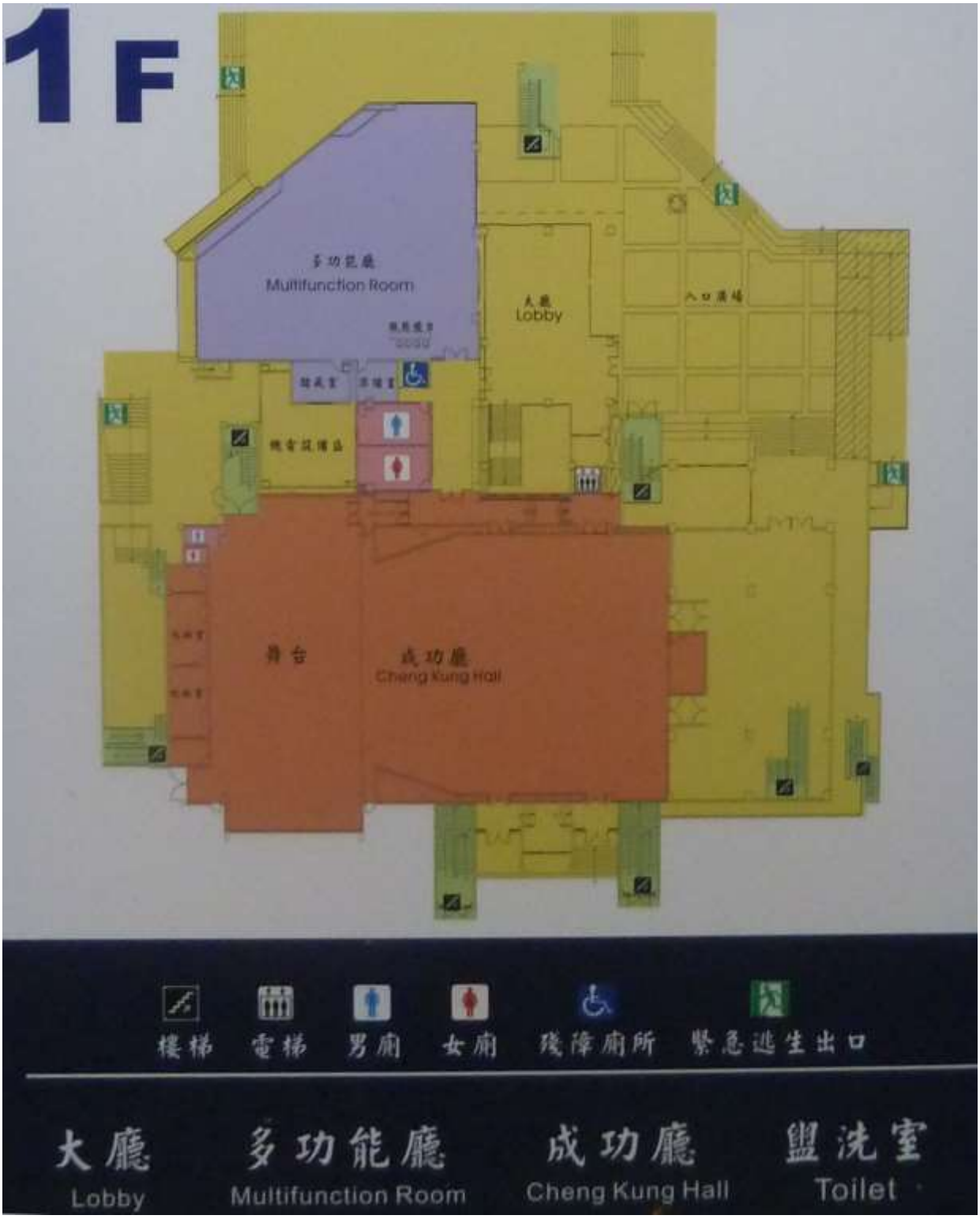
第三演講室(3rd Lecture Room)/第二演講室(2nd Lecture Room) [地下一樓(B1)]

◎午餐區（Lunch Area）:多功能廳(Multifunction Room)[一樓(1F)]

◎海報展（Poster Sessions）:多功能廳(Multifunction Room)[一樓(1F)]

◎參展廠商（Vendor Exhibits）:多功能廳(Multifunction Room) [一樓(1F)]


B1F
現在位置
行動不便升降平台
電梯
男廁
女廁
緊急逃生出口
國際會議廳
International Conference Room
貴賓休息室
VIP Room
盥洗室
Toilet
第一演講室
1st Lecture Room
第二演講室
2nd Lecture Room
第三演講室
3rd Lecture Room



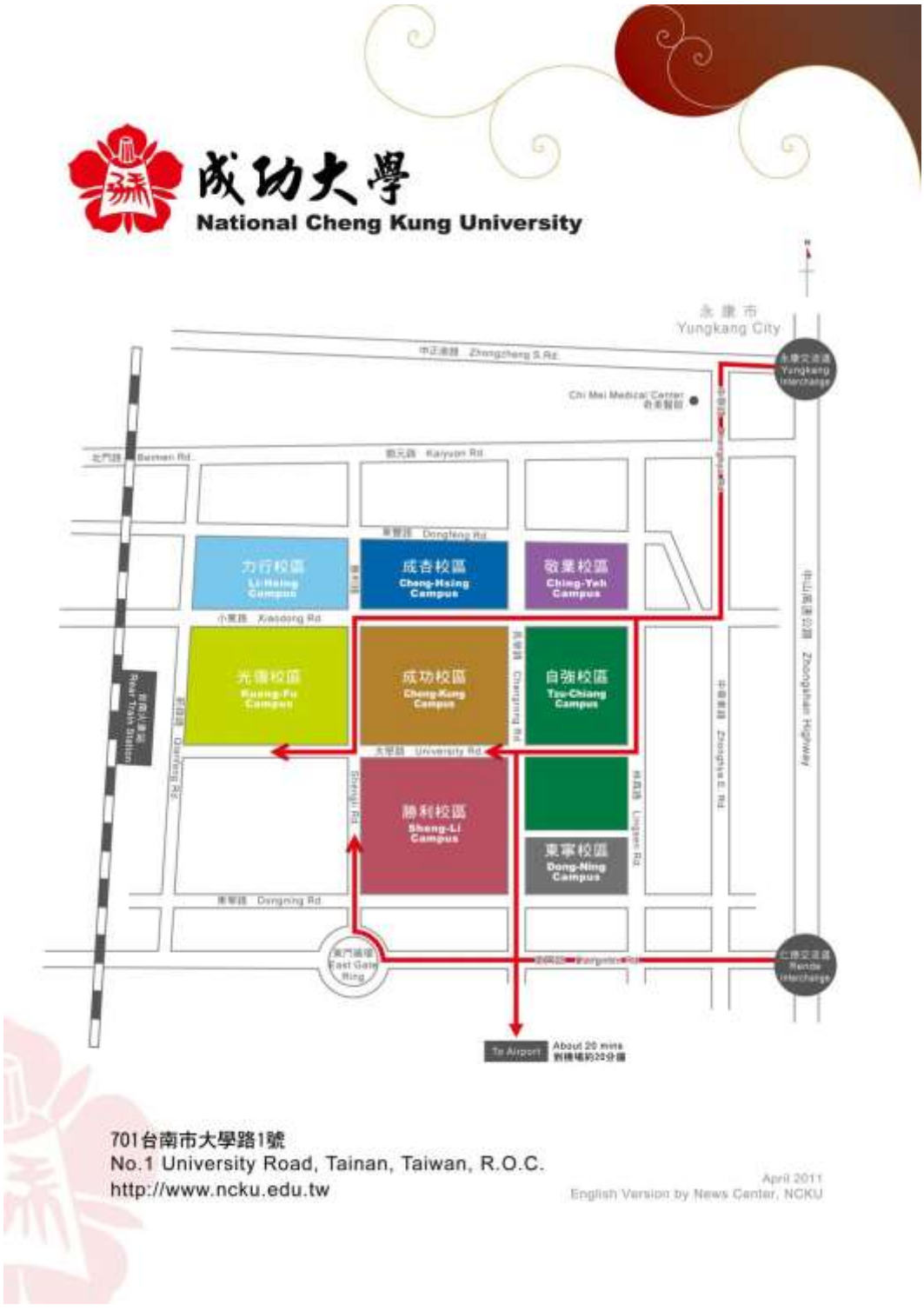
Link:

http://serv.oga.ncku.edu.tw/files/11-1072-11615.php?Lang=en

b. 國立成功大學位置　Location of the NCKU

701 臺南市東區大學路1號

No.1, University Road, Tainan City 701, Taiwan (R.O.C.)



2. Transportation

http://web.ncku.edu.tw/files/15-1000-57982,c7429-1.php?Lang=zh-tw
http://web.ncku.edu.tw/files/11-1000-82-1.php?Lang=en (English version)

(一) 自行開車（國道路線）

南下：
沿國道一號南下→下永康交流道右轉→沿中正北路、中正南路(南向)往台南市區直行→中華路左轉→沿中華東路前進→於小東路口右轉，直走即可抵達本校。
【自國道三號南下者，轉國道 8 號（西向），可接國道一號（南向）】
北上：
沿國道一號北上→下仁德交流道左轉→沿東門路(西向)往台南市區直走→遇林森路或長榮路右轉(北向)，即可抵達本校。
【自國道三號北上者，轉 86 號快速道路（西向），可接國道一號（北向）】

(二) 搭乘火車

於台南站下車後，自後站出口（大學路），大學路左側即為本校光復校區。

(三) 搭乘高鐵

搭乘台灣高鐵抵台南站者，可至高鐵台南站二樓轉乘通廊或一樓大廳 1 號出口前往台鐵沙崙站搭乘台鐵區間車前往台南火車站，約 30 分鐘一班車，20 分鐘可到達台南火車站；成功大學自台南火車站後站步行即可到達。

3. 會場無線網路 / On-Site Wireless Internet Access

帳號 username：asroc2016
密碼 password： ncku15651

4. 會員大會 / General Assembly

a) 理事長會務報告

b) 天問獎及譚天獎頒獎

得獎人 (Recipient) :

天問獎 — 徐遐生 (Frank H. Shu)

譚天獎 — 蘇漢宗教授及 APOD 中文翻譯團隊

(Han-Tzong Su and the APOD Chinese Translation Team)

c) 年會最佳壁報論文獎頒獎 (Best Poster Awards)

d) 最佳壁報論文獎獲獎人三分鐘報告 (3-minute presentation from each awardee)

5. 大會午宴及團體參訪內容與地理位置 / Location of Off-Site Events

a) 大會午宴 Banquet

國立成功大學光復校區國際會議廳之多功能廳

Mutifunction Room of International Conference Room at NCKU

b) 團體參訪 Group Tour

西濱漁鹽之旅 [遊七股潟湖、烤鮮蚵，以及北門的 井仔腳瓦盤鹽田]

Tour of Fishing and Salt Industry around West Coast

[Visiting Qi Gu Lagoon, eating grilled oysters, and

Jing-Zai-Jiao Tile-Paved Salt Fields]

6. 器材與書籍展示 / Exhibition of Books and Instruments

a) 台灣尼康精機股份有限公司 NIKON CORPORATION Glass Business Unit

新竹縣台元街28號, 電話: (03) 552-5812

b) 永光儀器有限公司 NICK ENTERPRISE, CO. LTD

台北市羅斯福路二段198號, 電話：(02) 2365-5790

c) 鴻宇光學科技 電話：(02) 2733-2345

台北市復興南路二段329號2樓, 電話：(02) 2579-1234

d) 上宸光學國際有限公司 MICROTECH INSTRUMENT Co., Ltd.

台北市信義路二段17巷13號1樓, 電話：(02) 2392-2606

e) 太陽光學事業有限公司 SUN OPTICAL

台北市中正區10050忠孝東路二段48號1F, 電話： (02)23414698

f) 信達光學 SYNTA OPTICAL Technology Corp.

竹北市新溪街219號, 電話：(03) 6561038

台北市漢口街一段71號2F, 電話：(02)2370-8000

g) 桂林圖書股份有限公司 / Kweilin Books

台北市重慶南路一段61號7樓716室, 電話： (02) 2311-6451

h) 林啟生先生/ Mr. Qi-sheng Lin

7. 住宿旅館/ Hotels

成大會館 地址：701台南市東區大學路2號
訂房專線：06-275-8999, 傳真：06-2095799， Email：1509030@zendasuites.com.tw。

台南大飯店地址：700 台南市中西區成功路一號
訂房專線：06-2232857，傳真：06-2268502，Email：booking@hotel-tainan.com.tw。

香格里拉台南遠東國際大飯店 地址：701 台南市東區大學路西段89號
傳真：06-702-8819，Email: marco.huang@shangri-la.com。

Program
會議議程

Day 1 (May 13, Friday)			第一天（5月13日, 星期五） **Venue /地點：NCKU/國立成功大學國際會議廳**
12:00 – 13:30	**Registration 註冊報到**		
13:30 – 13:45	**Opening remarks 大會開幕致詞** **Chair: You-Hua Chu** Welcome remark by Tung-Yang Chen (NCKU) 來賓致詞：陳東陽 副校長（國立成功大學）		
13:45 – 16:00	**Scientific oral session S1 科學論文宣讀 S1** **Chair: Shih-Ping Lai** **Star Formation**		
S1.1 **13:45 – 14:00**	Evolution of Filamentary Cloud in IC5146, Transition from Magnetically Subcritical to Supercritical	Jia-Wei Wang	NTNU
S1.2 **14:00 – 14:15**	A Two-temperature Model of Magnetized Protostellar Outflows	Liang-Yao Wang	NTU
S1.3 **14:15 – 14:30**	Magnetic Field Morphology in the Massive Protocluster W3 IRS 5	Vivien Chen	NTHU
S1.4 **14:30 – 14:45**	Magnetic Field versus Gravity: from SMA-CSO Results to ALMA	Patrick Koch	ASIAA
S1.5 **14:45 – 15:00**	Filament and Bipolar Bubble versus Magnetic Field Structure in RCW57A	Eswaraiah Chakali	NTHU
S1.6 **15:00 – 15:15**	Planet Induced Spirals in the Circumstellar Disk AB Auriga?	Ya-Wen Tang	ASIAA
S1.7 **15:15 – 15:30**	A Multi-epoch SMA Study of the HH 211 Protostellar Jet: Jet Motion and Knot Formation	Kai-Syum Jhan	NTU
S1.8 **15:30 – 15:45**	C_2H_4O Isomer in Orion KL	Kuo-Song Wang	ASIAA
S1.9 **15:45 – 16:00**	Gas Gaps in the Protoplanetary Disk around the Young Protostar HL Tau	Hsi-Wei Yen	ASIAA
16:00 – 16:30	**Coffee break and poster session P1 茶敘及壁報欣賞**		
16:30 – 18:45	**Scientific oral session S2 科學論文宣讀 S2** **Chair: Vivien Chen** **Star formation & Extragalactic**		
S2.1 **16:30 – 16:45**	Infalling Envelope Surrounding the Planet-Forming Circumstellar Disk in HL Tau	Chun-Ju Wu	NTU
S2.2 **16:45 – 17:00**	Star Formation Efficiency in Centaurus A	An-Li Tsai	NCU
S2.3 **17:00 – 17:15**	What Can (and Cannot) Observations Tell Us About GMCs and Galaxy's Molecular Gas? A Test of Observational Bias on GMC Properties	Hsi-An Pan	Hokkaido U /ASIAA
S2.4 **17:15 – 17:30**	Dust Enrichment in Hydrodynamic Galaxy Evolution Simulations	Kuan-Chou Hou	NTU
S2.5 **17:30 – 17:45**	On the General Form of Mass-to-Light Ratio of Elliptical Galaxies	Ting-Yun Cheng	NTHU
S2.6 **17:45 – 18:00**	Photometric Redshifts and Host Galaxy Properties of X-ray Selected AGNs	Li-Ting Hsu	ASIAA
S2.7 **18:00 – 18:15**	The Lensing Mass and the Dynamical Mass of Elliptical Galaxies in SLACS Survey by Modified Newtonian	Yong Tian	NCU
S2.8 **18:15 – 18:30**	Discovery of an Extremely Low Surface Brightness Galaxy in the SDSS-IV/MaNGA Survey	Lihwai Lin	ASIAA
S2.9 **18:30 – 18:45**	Peculiarity of the Acoustic Peak Positions in Planck Data	Lung-Yih Chiang	ASIAA
18:45 – 20:30	**Welcome reception and poster session P2 歡迎茶會及壁報欣賞 P2**		

Day 2 (May 14, Saturday)				第二天（5月14日, 星期六） **Venue /地點：NCKU/國立成功大學國際會議廳**
08:30 – 09:30	**Plenary talk (I)　大會講演(I)（科研類）　Chair: Yi-Jehng Kuan** *"The Exploration of Pluto and the Kuiper Belt by New Horizons"* Dr. Harold A. Weaver, Jr (John-Hopkins University)			
09:30 – 10:30	**Scientific oral session S3** **科學論文宣讀 S3**	**Education & Public Outreach session E1** **天文教育及業餘天文活動報告 E1**		
Scientific oral session S3　科學論文宣讀 S3　Chair: Yi-Jehng Kuan **Planetary Science**				
S3.1 **09:30 – 09:45**	A Quick Test on Rotation Period Clustering for the Small Members of the Koronis Family		Chan-Kao Chang	NCU
S3.2 **09:45 – 10:00**	The Discovery of Second Retrograde Trans-Neptunian Object in PS1: A Hint of Common Plane of High Inclination Objects		Ying-Tung Chen	ASIAA
S3.3 **10:00 – 10:15**	TAOSII Light Curves Simulator and Trigger		Chung-Kai Huang	NCU
S3.4 **10:15 – 10:30**	Discovering the Youngest Free-floating Planets--CFHT W-band Survey		Poshih Chiang	NCU
Education & Public Outreach session E1　天文教育及業餘天文活動報告 E1 **Chair: Min-Ti Chang　第三演講室**				
E1.1 **09:30 – 09:45**	高中天文台的經營—以新豐高中為例		謝翔宇	新豐高中
E1.2 **09:45 – 10:00**	星球之旅－第 70848 號行星		顏鴻選	台南市 天文協會
E1.3 **10:00 – 10:15**	從高中天文營活動探討天文教育之課外延續性		李瑾	TAM
10:30 – 11:00	**Coffee break, group photo and poster session P3** **茶敘、與會來賓團體照及壁報欣賞 P3**			
11:00 – 12:00	**Scientific oral session S4** **科學論文宣讀 S4**	**Education & Public Outreach session E2** **天文教育及業餘天文活動報告 E2**		
Scientific oral session S4　科學論文宣讀 S4　Chair: Yi-nan Chin **Facility Program**				
S4.1 **11:00 – 11:20**	Current Status and Future Plans at CFHT		Daniel Devost	CFHT
S4.2 **11:20 – 11:35**	Transneptunian Automatic Occultation Survey (TAOS II)		Shiang-Yu Wang	ASIAA
S4.3 **11:35 – 11:50**	Compton Spectrometer and Imager(COSI)		Chien-Ying Yang	NTHU
Education & Public Outreach session E2　天文教育及業餘天文活動報告 E2 **Chair: Mei-Yin Chou　第三演講室**				
E2.1 **11:00 – 11:15**	社群媒體於天文推廣之應用探討：臺北天文館臉書粉絲頁及 YouTube 頻道之個案分析		胡佳伶	TAM
E2.2 **11:15 – 11:30**	Dagik Earth 在校園天文教學上的應用		李奕德	中央 氣象局
E2.3 **11:30 – 11:45**	實體教具對於天文科普教育的衝擊與省思		葉秀蓉	南瀛 天文館
12:00 –14:00	**Banquet　大會午宴**			
14:00 – 18:30	Group discussions　**分組討論/自由參訪**			

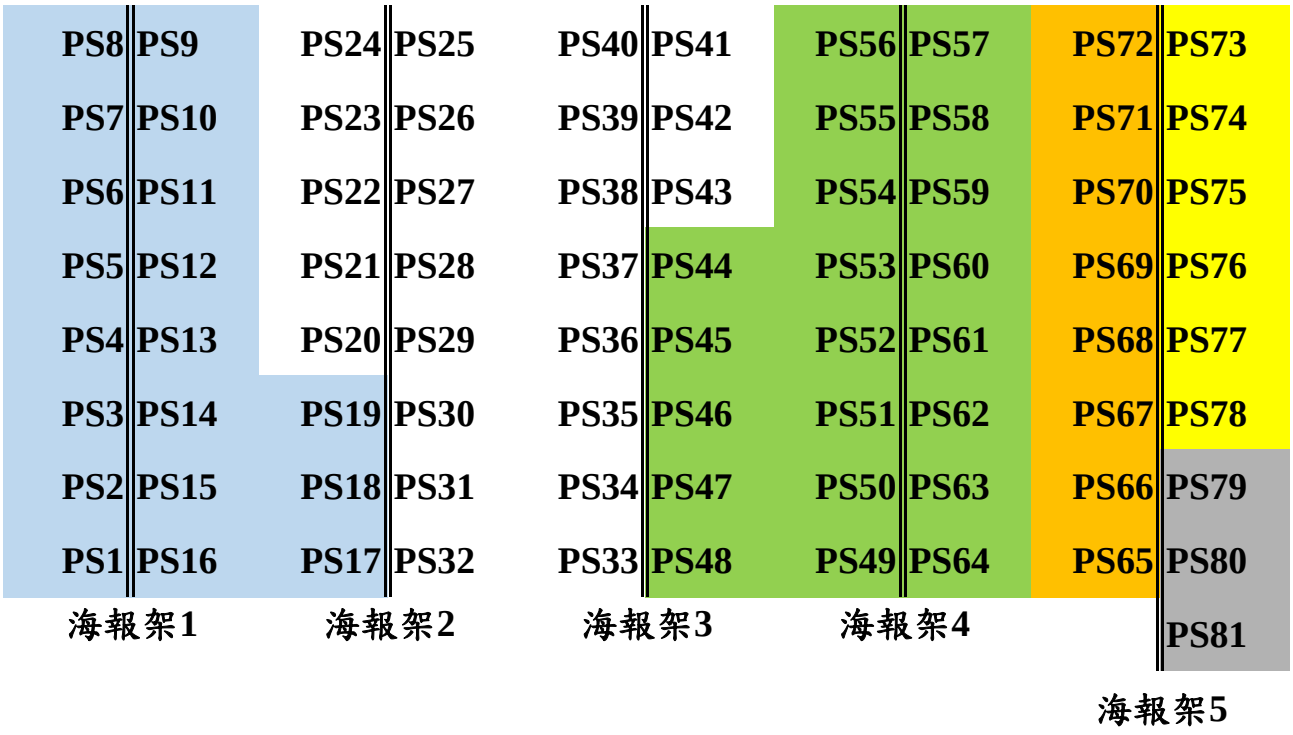
Day 3 (May 15, Sunday) 第三天（5月15日, 星期日） **Venue /地點：NCKU/國立成功大學國際會議廳**			
08:30 – 09:30	**Plenary talk (II)　大會講演(II)（科普類）　Chair: You-Hua Chu** *"Visualizing Hubble's Colorful Universe"* Mr. Zoltan G. Levay (Space Telescope Science Institute)		
09:30 – 10:35	**ASROC Awards Presentation Ceremony　頒發第三屆天文學會獎** **Chair: You-Hua Chu**		
09:30 – 09:35	Presentation of the 3rd ***Heaven Quest Award*** and ***Heaven Talk Award*** 頒發天文學會第三屆「天問獎」及「譚天獎」		
09:35 – 09:50	***Heaven Quest Award*** acceptance speech　「天問獎」得獎致辭 Academician Frank Shu (ASIAA) 徐遐生院士(中研院天文所)		
09:50 – 09:55	***Heaven Talk Award*** acceptance speech　「譚天獎」得獎致辭 Prof. Han-Tzong Su and the APOD Chinese translation team (NCKU) 蘇漢宗教授及APOD中文翻譯團隊(成功大學)		
09:55 – 10:35	General Assembly, best-poster awards & presentations, 會員大會、頒發最佳壁報論文獎及得獎論文口頭報告		
10:35 – 10:55	**Coffee break and poster session P4　茶敘及壁報欣賞 P4**		
10:55 – 12:25	**Scientific oral session S5** **科學論文宣讀 S5**	**Education & Public Outreach session E3** **天文教育及業餘天文活動報告 E3**	
Scientific oral session S5　科學論文宣讀 S5　Chair: Sheng-Yuan Liu **Stars**			
S5.1 **10:55 – 11:10**	Status of the East Asian Observatory	Paul Ho	ASIAA
S5.2 **11:10 – 11:25**	Energy Dependent Variability and Outburst Evolution in Black Hole X-ray Binaries	Holger Stiele	NTHU
S5.3 **11:25 – 11:40**	Potential Variable Gamma-ray Pulsar Candidate, PSR J0248+6021	Chia-Hsun Wu	NTHU
S5.4 **11:40 – 11:55**	Tracking X-ray Spectral Modulations of A 6-Hz Type-B Quasi-periodic Oscillation in GX 339-4 using Hilbert-Huang Transform	Yi-Hao Su	NCU
S5.5 **11:55 – 12:10**	Exploring the Diffuse Interstellar Band with the LAMOST OB Stars	Chao Liu	NAOC
S5.6 **12:10 – 12:25**	Cloud Morphology around Young Stellar Clusters	Anirudh Sharma	NCU
Education & Public Outreach session E3　天文教育及業餘天文活動報告 E3 **Chair: Yao-Huan Tseng　第二演講室**			
E3.1 **10:55 – 11:10**	Performance and Results from the Globe at Night – Sky Brightness Monitoring Network	Chun Shing Jason Pun	HKU
E3.2 **11:10 – 11:25**	高中天文社的實踐－以高雄天文幫為例	林子端	高雄天文學會
E3.3 **11:25 – 11:40**	南瀛天文魔法學校的嘗試	黃楚詒	南瀛天文館
E3.4 **11:40 – 11:55**	全國大專天文社論壇	歐柏昇	NTU
E3.5 **11:55 – 12:20**	全國首創天文與環境教育的第一支舞	巫嘉綺	南瀛天文館
12:25 – 13:30	**Lunch break　午餐**		
13:30 ~	**Departure　賦歸**		

Poster Presentation

壁報論文目錄

海報張貼位置圖

壁報欣賞　　poster session



A. Solar System
B. Stars
C. Extragalactic Studies
D. Star Formation
E. Instrumentation
F. Outreach and Education

A. Solar System

PS1	**Multicolor Photometric Observations of Near Earth Objects** Chung-Chien Cheng (NDHU), Yi-Chuan Lin (NDHU), Zhong-Yi Lin (NCU), Hsin-Chang Chi (NDHU)
PS2	**Rotation Period Clustering For Asteroid Family's Members** Kang-Shain Pan (NCU), Chan-Kao Chang (NCU), Chan-Kao Chan (NCU)
PS3	**Initial Orbital Distributions of Ejecta from the Impact Event of the RheasilviaCrater of Vesta** Hua-Shan Shi (NCU), Menghua Zhu (MUST, Macau), Liang-Liang Yu (MUST, Macau), Wing-Huen Ip (NCU)
PS4	**Identification and Characterization of Recent Break-up Events of Asteroids/Comets** Daisuke Kinoshita (NCU)
PS5	**ALMA Detections of sulfide compounds on Galilean moon Io** Ming-Chi Chung (NTNU), Yi-Jehng Kuan (NTNU), Yo-Ling Chuang (NTNU), Ya-Wen Yo (NTNU), Yu-Fu Yeh (NTNU)
PS6	**The Role of the Ring Atmosphere in the Saturnian System** Wei-Ling Tseng (NTNU), Han-Wei Hsiao (NTNU)
PS7	**A Statistical Study of Titan's Exospheric Structures under DifferentMagnetospheric Conditions via ENA Imaging and In-Situ Energetic Ion Observations by the Cassini MIMI Instrument** Ching Hua Shen (NCU), Wing-Huen Ip (NCU)
PS8	**Variations of H2 Density Distribution and Escape Flux in Titan's Thermosphere** J.-K. Hsu (NCU), W.-H. Ip (NCU), J. Cui (NAOC), R. S. Perryman (SWRI), J. H. Waite (SWRI)
PS9	**The Role of the HC3N and C2N2 Atmosphere of Titan in the Saturnian System** Hanjie Tan (CCU), Wei-Ling Tseng (NTNU)
PS10	**The H2 and CH4 Torus of Titan** J.-M. Yang (NCU), C.-H. Shen (NCU), J.-K. Hsu (NCU), W.-H. Ip (NCU)
PS11	**Surface Morphology of Prometheus** Cheng Chen (NCU), Wing-Huen Ip (NCU)
PS12	**Gas Outflow and Dust Transport of Comet 67P/Churyumov-Gerasimenko** I.-L. Lai (NCU), C.-C. Su (NCTU), W.-H Ip (NCU), J.-C. Lee (National Central University), Z.-Y. Lin (NCU), J.-S. Wu (NCTU)
PS13	**The Bimodal Ionospheric Model of Comet 67P/Churyumov–Gerasimenko** Chen-En Wei (NCU)

PS14	**Geomorphological Mapping on the Southern Hemisphere of Comet 67P/Churyumov-Gerasimenko** Jui-Chi Lee (NCU), Matteo Massironi (University of Padova), Lorenza Giacomini (University of Padova), Sabrina Ferrari (University of Padova), M. R. El-Maarry(University of Bern), Maurizio Pajola(University of Padova), Wing-Huen Ip (NCU),Zhong-Yi Lin (NCU) and the OSIRIS team
PS15	**Long-term Monitoring Program on Comet 103P by Pan-STARRS 1 Survey** Yu-Chi Cheng (NCU), Wing-Huen Ip (NCU)
PS16	**Primary Volatiles in the Inner Coma of Comet C/2012 F6 (Lemmon)** Yo-Ling Chuang (NTNU), Yi-Jehng Kuan (NTNU), Ya-Wen Yo (NTNU), Ming-Chi Chung (NTNU), Yu-Fu Yeh (NTNU)
PS17	**PS1 Discovery of High Inclination TNO and the Possible New Asteroid Belt** Hsing-Wen Lin (NCU), Ying-Tung Chen (NCU), Matthew J. Holman (CfA), Wing-Huen Ip (NCU), Wen-Ping Chen (NCU)
PS18	**Search for Serendipitous Occultation Events in X-rays Caused by OortCloud Objects** Chih-Yuan Liu (NTHU), Jie-Rou Shang (NTHU), Hsiang-Kuang Chang (NTHU)
PS19	**Interaction between Hypothetical Planet with Inner Oort Cloud Objects** Zong-Fu Sie (NCU), Wing-Huen Ip (NCU)

B. Stars

PS20	**The Updated Orbital Ephemeris of High Mass X-ray Binary Cyg X-3 Detected from Monitoring X-ray Telescopes** Nai-Hui Liao (NCU), Yi Chou (NCU)
PS21	**Studying Magnetars and/or their Side-products using the Fermi Large Area Telescope** Paul K. H. Yeung (NTHU), Albert K. H. Kong (NTHU)
PS22	**Fermi-LAT Observations of the Local Group Galaxy M33** Xian Hou (NTHU)
PS23	**Pulsar Detection of GRX in Low Earth Orbit** Chao-Hsiung Tseng (NTHU), Hsiang-Kuang Chang (NTHU), Steven Boggs (UC Berkeley), Pierre Jean (IRAP), COSI Collaboration
PS24	**Characterization of the Oldest Galactic Open Clusters Berkeley 17** Bhavana Lalchand (NCU), Wen-Ping Chen (NCU)
PS25	**Searching for Be Star In Open Clusters** Chang-Hsien You (NCU), Chan-Kao Chang (NCU), Chien-Cheng Lin (ShA O),Chien-De Lee (NCU), Chow-Choong Ngeow (NCU), Po-Chieh Yu (NCU), Chih-HaoHsia (University of Hong Kong)
PS26	**Characterization of the Low-Mass Stars in the Coma Berenices Star Cluster** S. Y. Tang (NCU), W. P. Chen (NCU)

PS27	**Finding New Cepheids in the Open Clusters with Their Location in the Color-magnitude Diagram -- Tests with Existing Data and Known Cepheids** Shih-Chang Luo (NCU), Chow-Choong Ngeow (NCU)
PS28	**SPARX -- the Numerical RT & Molecular Level State Coupling Software** I-Ta Hsieh (ASIAA), Eric Chung (ASIAA), Sheng-Yuan Liu (ASIAA)
PS29	**Photometry of Membership Stars in Old Open Cluster NGC7142** Yi-Hsiang Hsu (NTNU), Hsieh-Hai Fu (NTNU)
PS30	**Identifying and Characterizing Be Stars with LAMOST and GAIA** Chien-Cheng Lin (ShAO), Li Chen (ShAO), Po-Chieh Yu (NCU), Chien-De Lee (NCU)
PS31	**The Unusual Behavior of the Polarization of UXor Type Young Star GM Cep** Po-Chieh Huang (NCU), Chang-Yao Chen (NCU), Chia-Ling Hu (TAM), Chien-de Lee (NCU), Chi-Sheng Lin (NCU), Hsiang-Yao Hsiao (NCU), Shuhrat Ehgamberdiev(UBAI), Otabek Burkhonov (UBAI), Wen-Ping Chen (NCU)
PS32	**Refining Period of a Mira in M33 with Multi-band Analysis** Jia-Yu Ou (NCU), Chow-Choong Ngeow (NCU)
PS33	**Template Light Curves of Cepheid Variables Based on PS1 PAndromedaData through PEGASuS Approach** I Ling Lin(NCU), Chow-Choong, Ngeow (NCU)
PS34	**The Study of Cataclysmic Variables and Pulsating Variables With Synoptic Surveys** Michael Ting-Chang Yang (NCU), Yi Chou (NCU), Chin-Ping Hu (Hong Kong University), Yi-Hao Su (NCU)
PS35	**TAOS Observation of V404 Cyg during the 2015 Outburst** Ryoko Ishioka (ASIAA), Ying-Tung Chen (ASIAA), Sun-Kun King (ASIAA),Chih-Yi Wen (ASIAA), Shiang-Yu Wang (ASIAA), Matthew J. Lehner(ASIAA), Jen-Huang Wang (ASIAA), TAOS Team (TAOS Team), Mariko Kimura (Kyoto Univ.)
PS36	**Superflare Properties of G-type Kepler Eclipsing Binaries** Li-Ching Huang (NCU), Wing-Huen Ip (NCU), Han-Yuan Chang (NCU)
PS37	**A LAMOST-Kepler Spectrophotometric Study of Hyper Flares of M Dwarfs** Han-Yuan Chang (NCU), Wing-Huen Ip (NCU), Yihan Song (NAOC), Ali Luo (NAOC), Li-Ching Huang (NCU)
PS38	**UPSILoN: Automated Classification of Periodic Variable Stars Using Machine Learning** Dae-Won Kim (ASIAA), Coryn A.L. Bailer-Jones (MPIA)
PS39	**The Shaping of the Multipolar Pre-planetary Nebula CRL 618 by Multidirectional Bullets** Po-Sheng Huang (ASIAA/NTU), Chin-Fei Lee (ASIAA), Anthony Moraghan(ASIAA), Michael Smith (University of Kent)

PS40	**Molecular and Ionized Gas in the Central Part of the Bipolar Planetary Nebula NGC 6302** Naomi Hirano (ASIAA), Tatsuhiko Hasegawa (ASIAA), Franciska Kemper (ASIAA), Hyosun Kim (ASIAA), Mikako Matsuura (Cardiff University), Oscar Morata (ASIAA), Alfonso Trejo (ASIAA), Ronny Zhao-Geisler (ASIAA), Albert Zijistra (University of Manchester)
PS41	**Dust Particle Size of Evolved Stars Characterized by Polarization** Chien-De Lee (NCU), Wen-Ping Chen (NCU)
PS42	**Search for P-mode Oscillations in White Dwarf WD0044-121** Wen-Cheng Huang (NTHU)
PS43	**Search for P-mode Oscillation in White Dwarfs** Jie-Rou Shang (NTHU)

C. Extragalactic Studies

PS44	**The Circumgalactic Medium in low Redshift Galaxies** Zhen-Kai Gao (NTNU), Lin-Wen Chen (NTNU)
PS45	**Generalized Gauss's Law With Anisotropic Flux Distribution** to Describe the Flat Rotation Curves of the Disk Galaxies Te Chun Wang (CSIC)
PS46	**Diffuse Interstellar Bands in SDSS DR7 Galaxies** Bo Zhang (NAOC), Chao Liu (NAOC)
PS47	**Multiwavelength Investigation of Differences between Type Ia and Core-Collapse Supernova Remnants** Po-Sheng Ou (ASIAA/NTU), Chuan-Jui Li (ASIAA/NTU), You-Hua Chu (ASIAA)
PS48	The Relation of Mid Infrared and Radio Emission in Narrow-Line Seyfert 1 Galaxies Meng-Che Hsieh (NCU), Chorng-Yuan Hwang (NCU)
PS49	**The Properties of Barred Spiral Galaxies** Yin Fang Wang (NCU), Chorng-Yuan Hwang (NCU)
PS50	**AGN Selection by 18-band SED Fitting in Infrared** Ting-Chi Huang (NTHU)
PS51	**SCUBA-2 Ultra Deep Imaging EAO Survey (STUDIES)** Chen-Fatt Lim (NTU), Wei-Hao Wang (ASIAA)
PS52	**The Red Spiral Galaxies** Jen-Chao Huang (NCU)
PS53	**Survey for New Lensed Quasars from PS1** E. Koptelova (NCU)
PS54	**Searching for Changing-Look QSOs with PTF** P. C. Yu (NCU), C. K. Chang (NCU), M. J. Graham (Caltech), I. C. Chen (NCU), W. H. Ip (NCU), A. L. Luo (NAOC), Y. H. Song (NAOC), PTF Team (Caltech)

PS55	**Absorption Tests with a QSO at z=6.6** Yi Hang Valerie Wong (NTHU), Tomotsugu Goto (NTHU), Ji-Jia Tang (ASIAA/NTU)
PS56	**Missing Blue QSOs** Chia-Hsiang Huang (NCU), Chorng-Yuan Hwang (NCU)
PS57	**On the Dynamical Evolution of Supermassive Black Holes in Galaxies** Yu-Heng Ho (NTHU), Ing-Guey Jiang (NTHU)
PS58	**Constraint on Dust Evolution Processes by Normal Galaxies at High Redshift** Wei-Chen Wang (NTU, ASIAA), Hiroyuki Hirashita (ASIAA), Kuan-ChouHou (ASIAA)
PS59	**Strong Gravitational Lensing by a Deformed Spherical System in Modified Newtonian Dynamics** Shi-Pu Yang (NCU), Sih-Sian Fong (NCU), Chung-Ming Ko (NCU)
PS60	**Properties of the C60-containing Planetary Nebula Lin49 in the SmallMagellanic Cloud: Explaining the Strong Near-IR Excess** Masaaki Otsuka (ASIAA)
PS61	**The Statistical Test of the Slope of CO Luminosity-linewidth Correlation among Low and High z Galaxies** Yi-han Wu (NTHU), Tomotsugu Goto (NTHU)
PS62	**Cross-Correlation of WISE Galaxies and Planck Temperature Sky Maps** Dani C.Y. Chao (NTHU), Tomotsugu Goto (NTHU)
PS63	**The Effect of Accretion Flow Dynamics on the Black Hole Shadow of SgrA*** Hung-Yi Pu (ASIAA)
PS64	**AMiBA: Measuring Hot Gas Content of Galaxy Clusters via the Sunyaev-Zel'dovich Effect** Kai-Yang Lin (ASIAA), Ming-Tang Chen (ASIAA), Chih-Wei Locutus Huang (ASIAA), Patrick M. Koch (ASIAA), Yu-Wei Liao (ASIAA), Guo-Chin Liu (TKU), Hiroaki Nishioka (ASIAA), Keiichi Umetsu (ASIAA), Fu-Cheng Wang (NTU), Jiun-Huei Proty Wu (NTU)

D. Star Formation

PS65	**The Evolutionary Status of the Prestellar Core L1498** Ren-Shiang Sung (NTHU), Shih-Ping Lai (NTHU), Laurent Pagani(Observatoire de Paris)
PS66	**ALMA Imaging of Formic Acid in Orion KL** Ya-Wen Yo (NTNU), Yi-Jehng Kuan (NTNU), Yo-Ling Chuang (NTNU), Ming-Chi Chung (NTNU), Yu-Fu Yeh(NTNU)
PS67	**Probing the Inner Region with Infall Motions of the Massive ProtostarNGC 7538 IRS 1** Dino Chih-Chun Hsu (NTHU), Vivien Huei-Ru Chen (NTHU)

PS68	**Young Stellar Jets and Outflows in the M17 Cloud Complex** Manash Samal (NCU), Wen-Ping Chen (NCU)
PS69	**ALMA Observes Large Spiral Accretion Flows in Young MultipleProtostellar System VLA1623** Pou-Ieng Cheong (NCTU), Shih-Ping Lai (NTHU), Tao-Chung Ching (NTHU), Nadia Murillo (Leiden Observatory & MPE)
PS70	**Examining the Wiggle Morphology of HH 211 via Numerical Simulations** Anthony Moraghan (ASIAA), Chin-Fei Lee (ASIAA), Po-Sheng Huang (ASIAA), Bhargav Vaidya (University of Torino)
PS71	**Searching the First Hydrostatic Core Candidates in Perseus and Serpens Molecular Cloud** Has-Yuan Duan (NTHU)
PS72	**Probing Internal Structures of a Compact Bipolar Outflow in NGC2023 MM1** Chang-Chun Chen (NTHU)

E. Instrumentation

PS73	**GROWTHing the Lulin One-Meter Telescope** Chow-Choong Ngeow (NCU)
PS74	**A Systematic Investigation of the Lulin Site's Astro-climate** Yi-Chuan Lin (NDHU), Chung-Chien Cheng (NDHU), Zhong-Yi Lin (NCU),Hsin-Chang Chi (NDHU)
PS75	**The Effective Area Studing of the COSI** Sheng Feng Chung (NTHU), Che-Yen Chu (NTHU), Steven Boggs (UC Berkeley) Hsiang-Kuang Chang (NTHU), Pierre Jean (IRAP), COSI Collaboration
PS76	**ALMA Project and ARC-Taiwan Team** ARC-Taiwan team (ASIAA)
PS77	**Band-1 Receiver Front-End Cartridges for Atacama Large Millimeter/submillimeter Array (ALMA): Design and Development toward Production** Yuh-Jing Hwang (ASIAA), Yau-De Huang (ASIAA), Chau-Ching Chiong(ASIAA), Chi-Den Huang (ASRD, NCSIST), Ching-Tang Liu (ASRD, NCSIST), Yue-Fang Kuo (National Taipei University), Shou-Hsien Weng (ASIAA), Chin-Ting Ho (ASIAA), Po-Han Chiang (ASIAA), Hsiao-Ling Wu (ASIAA),Chih-Cheng Chang (ASIAA), Shou-Ting Jian, (ASIAA), Chien-Feng Lee, (ASIAA), Yi-Wei Lee (ASIAA), Marian Pospieszalski (NRAO), Doug Henke (NRC-CNRC HIA), Ricardo Finger (University of Chile), Alvaro Gonzalez (NAOJ)
PS78	**Design, Fabrication, and Thermal Analysis of the 1.5 THz Multi-pixel HEB Mixers Receiver Cartridge** Chuang-Ping Chiu (ASIAA), Cheng-Shun Chen (NTUT), Yen-Ru Huang (ASIAA), Ming-Jye Wang (ASIAA)

F. Outreach and Education

PS79	**Traditional Chinese Version of Zooniverse Projects in Astronomy** Mei-Yin Chou (ASIAA), EPO team (ASIAA)
PS80	**A Design and Test of A DIY Spectrograph** Meng-Hsien Shen (NTNU), Yen-Chun, Luo Cho (NTNU), Hsieh-Hai Fu (NTNU), Chih-yu Lee (NTNU), Po-Yen Huang (NTNU)
PS81	**Comparisons of the Sky Darkness in Taiwan** Kuei-Lan Chang (TAM), Yeah-Chun Yang (TAM), Albert Kong (NTHU), Hun-Chin Lin (NCU), Chu-Wing So (The University of Hong Kong), Chun ShingJason Pun (The University of Hong Kong), Sze Leung Cheung (IAU/NAOJ)

Heaven Quest and Heaven Talk Awardee

「天問獎」與「譚天獎」得獎者介紹

2016 Heaven Quest Awardee: Academician Frank H. Shu

Prof. Shu's hometown is Yongjia County, in Wenzhou City of Zhejiang Province. He was born on June 2, 1943 in Kunming in Yunnan Province of China. He moved to Taiwan with his family in 1948 and studied in an elementary school in Taipei for a year before his family moved to the USA in 1949. Prof. Shu received his BS in physics in 1963 at the Massachusetts Institute of Technology and his PhD in astronomy in 1968 at Harvard University.

Prof. Shu is known internationally as a leading astrophysicist with major contributions in spiral structures in galaxies and star formation theories. At the age of 21, he published the "density-wave theory" with his advisor Professor C. C. Lin. It was one of the most important astrophysics theories in the last fifty years. He is the author of several books, among them The Physical Universe: An Introduction to Astronomy has become one of the standard textbooks for undergraduate physics and astronomy courses at major universities in the U.S. He was also the first to correctly propose that comets contain rocks that had undergone high temperature metamorphosis and bombardment by energetic particles.

Prof. Shu has held faculty appointments at the SUNY Stony Brook (1968-1973), UC Berkeley (1973-2002), and UC San Diego (2006-2009). He served as chair of the astronomy department of UC Berkeley (1984-1988), and was Chancellor's Professor at UC Berkeley (1996-1998), the President of the American Astronomical Society (AAS) (1994-1996), and University Professor of Nine Campuses of University of California (1998-present). He was president of the National Tsing Hua University in Taiwan from 2002 to 2006. Since 2009 until his retirement in December 2015, he was a distinguished research fellow at the Institute of Astronomy and Astrophysics, Academia Sinica.

Aside from his international academic reputation, Prof. Shu is also revered for his contribution to Taiwan's higher education. In April 2008, he was awarded the Education-Culture Medal by the Ministry of Education for his special contribution to higher education in Taiwan.

His other honors and awards include:

In 2016, Senior Fellow at the Institute for Advanced Study at City U, Hong Kong

In 2009, The Shaw Prize (in recognition of his outstanding life-time contributions in theoretical astronomy)

In 2009, The Bruce Medal from the Astronomical Society of the Pacific

In 2008, The Centennial Medal from the Graduate School of Arts and Sciences at Harvard University

In 2003, Member of the American Philosophical Society

In 2000, The Dannie Heineman Prize for Astrophysics

In 1996, The Brouwer Award

In 1996, The Oort Professor/Lecturer at Leiden University, the Netherlands

In 1992, Fellow of the American Academy of Arts and Sciences

In 1990, Academician of the Academia Sinica in Taiwan

In 1987, Member of the National Academy of Sciences in the United States

In 1977, The Helen B. Warner Prize for Astronomy

The main-belt asteroid 18238 Frankshu is named after him.

In 2016, the Astronomical Society of the Republic of China presents the 3rd Heaven Quest Award to Academician Frank H. Shu for his distinguished contribution to astronomical research.

第三屆「天問獎」得獎人中央研究院徐遐生院士簡介

徐遐生院士祖籍浙江溫州，出生於雲南昆明。1948 年隨家人遷至台北，就讀一年小學後於 1949 年遷往美國。1963 年取得美國麻省理工學院物理學士，1968 年獲美國哈佛大學天文學博士。

徐院士為世界頂尖天文物理學者之一，其對天文學的貢獻與影響，則以星系漩渦臂結構及恆星形成理論著稱。21 歲時與指導教授林家翹聯合發表「密度波理論」(Density wave theory)，是 50 年來天文物理學最重要的理論之一，奠定他在全球學界的地位。而所著的「天文物理學」，更是哈佛大學物理系與天文系的必讀教科書。曾正確判斷彗星中應含有經歷過高溫的岩石，雖與當時主流理念相悖，但後來證實是正確的。

徐院士曾先後任教於美國紐約州立大學石溪分校(1971~1973)、加州大學柏克萊分校(1973~1996)、及加州大學聖地牙哥分校(2006~2016)。並曾任加州大學柏克萊分校天文系系主任(1984~1988)、美國天文學會主席(1994~1996)、加州大學柏克萊分校 Chancellor's Professor(1996-1998)及加州大學系統的 University Professor (1998-2002)。2002 年回台擔任國立清華大學校長一職 (2002-2006)，2009 年起任中央研究院天文及天文物理研究所特聘研究員，直到今年退休。

徐院士擔任清華大學校長期間，積極整合該校研發能量，學術產出及產學合作成果豐碩；奠立清華塑造積極追求卓越、成為世界一流研究型大學之企圖心，更擘劃未來具體執行目標；除致力於對學術機構的專業演講，更全力投入生活科學教育的推廣，展現出教育家對社會的影響力與關懷。

近年來徐院士有感於全球暖化問題的日漸嚴重，積極鑽研低碳永續能源的研究，除了碳回收技術外，也開發新的核能技術，希望能提高核電效率及解決核廢料問題。

徐院士曾獲的榮譽包括：
2009 香港邵逸夫獎
2009 美國太平洋天文學會布魯斯獎
2006 英國皇家天文學會外籍院士
2003 美國哲學學會院士
2000 美國天文學會德尼·海內門(Heineman)天文物理獎
1996 美國天文學會布勞威爾(Brouwer)獎

1996 荷蘭萊頓大學 Oort Professor
1992 美國國家藝術與科學院院士
1990 年入選第 18 屆中央研究院院士
1987 美國國家科學院院士
1977 美國天文學會海倫·B·華納 Warner 天文獎
小行星 18238（1241 T-2）以其英文名字命名，叫做「18238 Frankshu」
曾獲列入《美國科學名人錄》

本會於 2016 年將第三屆「天問獎」頒贈予中央研究院徐遐生院士，以表彰他對天文研究之卓越貢獻。　。

2016 Heaven Talk Awardee:
Professor Han-Tzong Su and the APOD Chinese Translation Team

Han-Tzong Su is a Professor of the Department of Physics at the National Cheng Kung University (NCKU). He obtained his B.S. from the Physics Department at the Chung Yuan Christian University in 1980, and PhD from the Physics Department at the Oregon State University in 1989. He joined NCKU as an Associate Professor of the Physics Department in 1989, and was promoted to Full Professor in 2001.

Prof. Su's research areas include Solid State Physics, Astronomy, and Atmospheric Electricity. He and Prof. Rue-Ron Hsu of NCKU co-led the project *Imager of Sprites and Upper Atmospheric Lightning (ISUAL),* the only science payload onboard the FORMOSAT-2 satellite. It was the world's first payload for a long-term global survey of lightning-induced transient luminous events (TLEs) from space.

After ten years of endeavor, the ISUAL team achieved the following with the ISUAL: (1) deploying several ground observation systems; (2) discovery of upward discharging gigantic jets towards the ionosphere; (3) obtaining the first global TLE distribution; (4) determining Elve as the most dominant form of TLEs; and (5) elucidating the possible physical mechanisms of gigantic jets.

Prof. Su has always been interested in astronomy. When he came across the website Astronomy Picture of the Day (APOD), where an astronomical image and non-technical captions were given each day, he was inspired to translate it into Chinese. He obtained the agreement from the editors of APOD to set up a mirror site of APOD at NCKU's Astronomy Laboratory, and the team started to translate APOD every day since 1997. Both the Chinese and English versions of APOD are provided at this site.

Prof. Su's translation of APOD has benefitted a large Chinese community. It is mirrored by one of the most influential astronomy websites in mainland China. A sightseeing group from Malaysia once visited NCKU just to thank the team in person.

In 2016, the Astronomical Society of the Republic of China presents the 3rd Heaven Talk Award to Professor Han-Tzong Su and the APOD Chinese translation team at the National Cheng Kung University for their outstanding achievements in education and popularization of astronomy.

第三屆「譚天獎」得獎人 蘇漢宗教授及「每日一天文圖」(APOD) 中文翻譯團隊簡介

蘇漢宗教授生於台灣台東，原籍台南。1980 年中原大學物理學系畢業，1989 年獲美國奧勒岡州立大學物理博士。1989 年起任教於國立成功大學物理系，2001 年升正教授。

蘇教授的主要研究領域是固態物理、天文學、大氣電學。與成大物理系許瑞榮教授共同領軍福爾摩沙二號衛星科學酬載計畫 ー 高空大氣閃電影像儀(Imager of Sprites and Upper Atmospheric Lightning ，ISUAL)」，為該衛星上唯一的科學酬載，也是世界上第一個長期從太空觀測高空短暫發光現象(Transient Luminous Events, TLEs)的衛星任務。該計畫在科學上獲得的重要研究成果包括：(1)建置了多部地面觀測系統，(2)發現向上發展直達電離層的巨大噴流，(3)獲得世界上第一幅 TLEs 的全球分布圖，(4)發現淘氣精靈(Elve)是 TLEs 數量最多的事件，(5)提出巨大噴流的可能物理機制。

蘇教授向來喜愛天文，當他發現美國的「每日一天文圖」（Astronomy Picture of the Day, APOD）網站圖文並茂、內容又大眾化時，便有意翻譯成中文。徵得網站負責人同意後，1997 年開始每天翻譯，並在成大天文實驗室設立「每日一天文圖」成大物理分站，帶領 APOD 中文翻譯團隊每天提供中英雙語的「每日一天文圖」資訊，內容和美國網站一致。

蘇漢宗教授領軍翻譯的「每日一天文圖」資料，讓全球華人獲益良多，曾有馬來西亞華人特地造訪成大當面感謝，中國大陸的天文網站也主動要求分享。

本會於 2016 年將第三屆「譚天獎」頒贈予國立成功大學蘇漢宗教授及「每日一天文圖」（APOD）中文翻譯團隊，以表彰他們多年來對天文教育推廣與天文知識普及的卓越貢獻。

Invited Speakers

大會邀請演講講者

Prof. Harold A. Weaver, Jr.

Dr. Harold A. Weaver has been pursuing space- and ground-based investigations in planetary sciences since 1978. He obtained his PhD in Physics from the Johns Hopkins University in 1982. His work on the ultraviolet spectra of comets obtained with the International Ultraviolet Explorer built a circumstantial case that water was the dominant volatile constituent in cometary nuclei. His infrared observations of Comet Halley from NASA's Kuiper Airborne Observatory provided the first direct detection of water in comets, for which he was awarded the NASA Medal for Exceptional Scientific Achievement in 1988. He has used both the Far Ultraviolet Spectroscopic Explorer and the Hubble Space Telescope to study comets, and he led the team investigating comet D/Shoemaker-Levy 9 as it plunged into Jupiter's atmosphere in July 1994. He continues his UV studies of comets as a Co-Investigator on the Alice Ultraviolet Spectrograph, which is one of the principal NASA contributions to the ESA-led Rosetta comet mission.

He is currently the Project Scientist on the New Horizons Mission, which is the first spacecraft mission to Pluto and the Kuiper belt. In 2005, Weaver co-led a team that discovered two new satellites around Pluto (Nix and Hydra), and he was on the team that discovered two other small Pluto satellites (Kerberos and Styx) in 2011 and 2013.

Mr. Zoltan G. Levay

Mr. Zoltan G. Levay of Space Telescope Science Institute (STScI) is the Imaging Team Lead and the Principle Investigator of the Hubble Heritage Project and has developed software for astronomical data display and analysis. He works with scientists at the STScI and around the world who provide images from the HST to present the data so they are easy to understand by the general public without compromising technical science content. The STScI's EPO Office for the Hubble Space Telescope has been extremely successful in attracting interests from people around the world. Its Hubble Heritage Program releases an image each month, and each image on the web gets millions of hits within the first day of release. The key to such success is in its sophisticated processing of images and construction of composite color images. Behind this process stood the imaging giant Mr. Zoltan G. Levay.

Mr. Levay has an astronomy background with a Master's degree. He started with scientific programming in his career, then added his artistic talents into his work. The outcome of his final product has been amazing. His processed images often allow scientists to see much more than what traditional image display offers. He was awarded a STScI Individual Achievement Award in 1997.

Abstracts
論文摘要

Plenary Talk I : The Exploration of Pluto and the Kuiper Belt by New Horizons

Dr. Harold A. Weaver, Jr (Johns Hopkins University Applied Physics Laboratory)

The New Horizons (NH) mission was selected by NASA in November 2001 to conduct the first in situ reconnaissance of Pluto and the Kuiper belt. The NH spacecraft was launched on 2006 January 19, received a gravity assist from Jupiter during closest approach on 2007 February 28, and flew 12,500 km above Pluto's surface on 2015 July 14. NH carried a sophisticated suite of seven scientific instruments, altogether weighing less than 30 kg and drawing less than 30 W of power, that includes panchromatic and color imagers, ultraviolet and infrared spectral imagers, a radio science package, plasma and charged particle sensors, and a dust counting experiment. These instruments enabled the first detailed exploration of a new class of solar system objects, the dwarf planets, which have exotic volatiles on their surfaces, escaping atmospheres, and satellite systems. NH also provided the first dust density measurements beyond 18 AU and cratering records that document both the ancient and present-day collisional environment in the outer solar system down to sizes of tens of meters. NH obtained unprecedented data on Pluto's small satellites (Styx, Nix, Kerberos, and Hydra), adding significantly to the scientific bounty returned from the NH mission. The NH spacecraft was targeted toward the flyby of a small ($\sim$30 km) KBO in late-2015, enabling the study of an object in a completely different dynamical class (cold classical) than Pluto, if NASA approves an Extended Mission phase.

Plenary Talk II : Visualizing Hubble's Colorful Universe

Mr. Zoltan G. Levay (Space Telescope Science Institute)

The Hubble Space Telescope is NASA's flagship space science mission. Hubble's long duration and its position in space, providing an unobstructed view of the universe for over 25 years, has led to an dramatic impact on astronomers' knowledge of the universe. Hubble has also become familiar to many non-scientists around the world via the media and popular culture, and influenced everyone's understanding of astronomy. One of the many reasons for this is a steady stream of dramatic, colorful images that show us wonders of the cosmos in more detail than ever before and help to communicate Hubble's science discoveries. A combination of objective science and more subjective, artistic principles are used in translating Hubble' s exquisite science data into engaging views of cosmic landscapes.

S1.1: Evolution of filamentary cloud in IC5146, transition from magnetically subcritical to supercritical

Jia-Wei Wang (National Tsing Hua University), Chakali Eswaraiah (National Tsing Hua University), Shih-Ping Lai (National Tsing Hua University), D. P. Clemens (Institute for Astrophysical Research, Boston University, U.S.A), Wen-Ping Chen (Institute of Astronomy, National Central University, Taiwan), Anil K. Pandey (Aryabhatta Research Institute of Observational-Sciences (ARIES), India)

The role of magnetic fields in the evolution of filamentary clouds is still an open question. The universal width of filaments revealed by Herschel Gould Belt Survey supports that the formation of filaments is dominated by large-scale MHD turbulence. On the other hand, optical and infrared polarization observations show that the filaments are well aligned with magnetic fields, either parallel or perpendicular. Here we present our optical and infrared polarization observations toward IC5146 taken with AIMPOL, TRIPOL and Mimir. Our observations reveal that the large-scale filaments in IC5146 are mostly perpendicular to the magnetic fields and are magnetically subcritical. However, it turns to magnetically supercritical and misaligned with B-field in local regions. In addition, the CO observations show that the gas is flowing along B-field in the subcritical region, but is freely flowing without the confinement of B-field in the supercritical regions. These results suggest that the cloud is likely in the transition stage between the strong magnetic field to gravity dominated condition from large-scale to small-scale.

S1.2: A Two-temperature Model of Magnetized Protostellar Outflows

Liang-Yao Wang (王亮堯) *(National Taiwan University/ASIAA), Hsien Shang* (尚賢) *(ASIAA), Ruben Krasnopolsky (ASIAA), Tzu-Yang Chiang* (江子揚) *(ASIAA)*

We explore kinematics and morphologies of molecular outflows driven by young protostars using magnetohydrodynamic simulations in the context of the unified wind model of Shang et al. The model explains the observed high-velocity jet and low-velocity shell features. In this work, we examine how the wind temperature and magnetic field strength affect these characteristics. We set up the problem of a warm wind running into a cold ambient toroid by using a tracer field that keeps track of the wind material. While an isothermal equation of state is adopted, the effective temperature is determined locally based on the wind mass fraction. In the unified wind model, the density of the wind is cylindrically stratified and highly concentrated toward the outflow axis. Our simulations show that for a sufficiently magnetized wind, the jet identity can be well maintained even at high temperatures. However, for a high-temperature wind with low magnetization, the thermal pressure of the wind gas can drive material away from the axis, making the jet less collimated as it propagates. We also study the role of the poloidal magnetic field of the toroid. It is shown that the wind-ambient interface becomes more resistant to corrugation when the poloidal field is present, and the poloidal field that bunches up within the toroid prevents the swept-up material from being compressed into a thin layer. This suggests that the ambient poloidal field may play a role in producing a smoother and thicker swept-up shell structure in the molecular outflow.

S1.3: Magnetic Field Morphology in the Massive Protocluster W3 IRS 5

Vivien Chen (NTHU)

The influence of magnetic fields on dynamics and timescales of star formation remains an open question. The alignment of magnetic field with respect to mass accretion flow renders greatly different expectations for kinematics. Polarized emission arising from magnetically aligned dust grains in the mm/sub-mm wavebands is often used to map the 2D morphology of the 3D magnetic fields on the plane of sky. As part of the SMA polarization legacy project, we have observed the polarized dust emission at 882 μm in the nearby (1.83 kpc) massive protocluster W3 IRS5 with an angular resolution of $2''.7$ (5000 AU). W3 IRS 5 is a luminous proto-cluster with at least eight hyper-compact HII regions and makes a much younger analogue to the Trapezium system. Our polarization maps show a pinched morphology while the CO emission suggests two pairs of bipolar outflows. We have developed radiative transfer models to interpret the observed polarized

dust emission and found a misaligned hourglass geometry of magnetic field. This suggests that the magnetic field does not necessarily remain well-aligned at scales of cluster formation.

S1.4: Magnetic Field versus Gravity: From SMA-CSO results to ALMA

Patrick Koch (Academia Sinica)

We present results from a 50-source sample, combining SMA and CSO dust polarization observations, that address the role of the magnetic field in star-forming regions. Our results clearly reveal generic magnetic field features and quantify the field force versus gravity. In particular, we identify magnetic field morphologies that allow for collapse, and others where the field is resisting gravity, leading to largely reduced star-formation efficiencies. We provide the statistical evidence - based on 4000 independent measurements - that the prevailing magnetic field orientation in star-forming regions is roughly perpendicular to a source major axis. We conclude with our first ALMA high-resolution polarization results toward a high-mass system where several cores show locally pinched magnetic field morphologies while the field morphology in between the cores indicates a global drag / collapse, likely toward the overall center of mass.

S1.5: Filament and bipolar bubble versus magnetic field structure in RCW57A

Eswaraiah Chakali (NTHU), Wen-Ping Chen (NCU), Shih-Ping Lai (NTHU)

The influence of magnetic fields (B-fields) in the formation and evolution of bipolar bubbles due to expanding HII regions in filaments has not been studied yet. We present the results based on NIR polarimetric observations using SIRPOL towards the central 8′x8′ region of a massive cluster-forming region RCW57A hosting an HII region, a filament and a bipolar bubble. Polarization measurements of reddened background stars reveal an hour-glass morphology of B-fields following the morphology of bipolar bubble and oriented perpendicular to the elongation of the filament. We propose that initially sheet like filament could have formed due to compression of cloud material along the B-fields, later B-fields lines were dragged towards the cloud center due to dominance of gravity over B-fields. In this process B-fields could have configured into an hour-glass morphology. These hour-glass B-fields could have introduced an extra anisotropic pressure (in addition to that due to the distribution of gas in filament) to the expanding ionization fronts from the centrally embedded Hii region. B-field driven expansion and propagation of ionization fronts lead to the formation of bipolar bubble. Present analysis suggest that B-fields not only important in the formation of filaments but also in the feedback processes such as in acceleration of expansion and propagation of ionization fronts/outflowing gas from the HII regions to form the bipolar bubbles.

S1.6: Mapping CO Gas in the GG Tauri A Triple System with 50 au Spatial Resolution

Ya-Wen Tang (ASIAA)

We aim to unveil the observational imprint of physical mechanisms that govern planetary formation in the young, multiple system GG Tau A. We present ALMA observations of ^{12}CO and ^{13}CO 3-2 and 0.9 mm continuum emission with $0''.35$ resolution. The ^{12}CO 3-2 emission, found within the cavity of the circumplanetary dust ring (at radius < 180 au) where no ^{13}CO emission is detected, confirms the presence of CO gas near the circumstellar disk of GG Tau Aa. The outer disk and the recently detected hot spot lying at the outer edge of the dust ring are mapped both in ^{12}CO and ^{13}CO. The gas emission in the outer disk can be radially decomposed as a series of slightly overlapping Gaussian rings, suggesting the presence of unresolved gaps or dips. The dip closest to the disk center lies at a radius very close to the hot spot location at 250-260 au. The CO excitation conditions indicate that the outer disk remains in the shadow of the ring. The hot spot probably results from local heating processes. The two latter points reinforce the hypothesis that the hot spot is created by an embedded proto-planet shepherding the outer disk.

S1.7: A Multi-epoch SMA Study of the HH 211 Protostellar Jet: Jet Motion and Knot Formation

Jhan, Kai-Syum (ASIAA), Lee, Chin-Fei (ASIAA)

HH 211 is a highly collimated jet with a chain of well-defined knots, powered by a nearby young Class 0 protostar. We have used 4 epochs (2004, 2008, 2010, and 2013) of Submillimeter Array (SMA) archive data to study the properties of the HH 211 jet in SiO (J=8-7). The jet shows similar reflection-symmetric wiggle structures in all epochs. The wiggle structures can all be fitted by an orbiting source jet model that includes a position shift due to proper motion of the jet, indicating that the wiggle propagates along the jet axis. Thus, this suggests the wiggle is indeed due to an orbital motion of the jet source. Proper motions of the knots are measured by using the peak positions of the knots in four epochs, and they are roughly the same and independent of the distance from the central source. The mean proper motion of the knots is $\sim 0''.087$ per year, resulting in a transverse velocity of $\sim$ 114 km s^{-1}, about 30% lower than that measured before. Knots BK2 and BK3 have a well-defined linear velocity structure, with the fast jet material upstream to the slow jet material. The gradient of the velocity structure decreases from knot BK2 to BK3. In addition, for each knot, the gradient decreases with time, as the knot propagates away from the central source. These results are both expected if the two knots trace internal shocks produced by a small periodical variation in ejection velocity of the jet.

S1.8: C_2H_4O isomer in Orion KL

Kuo-Song Wang (ASIAA), Sheng-Yuan Liu (ASIAA)

The superb sensitivity and resolution of ALMA observations are ideal in searching for astrobiologically important species in the ISM. In this contribution, we present ALMA observations of the C_2H_4O isomer (including CH_3CHO, CH_2CHOH, and c-C_2H_4O), which is related to the formation of simple amino acids, toward the Orion KL hot molecular core. We report their spatial distributions, fractional abundances, and implications.

S1.9: Gas Gaps in the Protoplanetary Disk around the Young Protostar HL Tau

Hsi-Wei Yen (ASIAA), Hauyu Baobab Liu (ESO), Pin-Gao Gu (ASIAA), Naomi Hirano (ASIAA), Chin-Fei Lee (ASIAA), Evaria Puspitaningrum (Institut Teknologi Bandung), Shigehisa Takakuwa (ASIAA/Kagoshima University)

We have analyzed the HCO^+ (1–0) data of the Class I–II protostar, HL Tau, obtained from the Atacama Large Millimeter/Submillimeter Array long baseline campaign. We generated the HCO^+ image cube at an angular resolution of $\sim 0''.07$ ($\sim$10 AU), and performed azimuthal averaging on the image cube to enhance the signal-to-noise ratio and measure the radial profile of the HCO^+ integrated intensity. Two gaps at radii of $\sim$28 AU and $\sim$69 AU and a central cavity are identified in the radial intensity profile. The inner HCO^+ gap is coincident with the millimeter continuum gap at a radius of 32 AU. The outer HCO^+ gap is located at the millimeter continuum bright ring at a radius of 69 AU and overlaps with the two millimeter continuum gaps at radii of 64 AU and 74 AU. On the contrary, the presence of the central cavity is likely due to the high optical depth of the 3 mm continuum emission and not the depletion of the HCO^+ gas. We derived the HCO^+ column density profile from its intensity profile. From the column density profile, the full-width-half-maximum widths of the inner and outer HCO^+ gaps are both estimated to be $\sim$14 AU, and their depths are estimated to be $\sim$2.4 and $\sim$5.0. These results are consistent with the expectation from the gaps opened by forming (sub-)Jovian mass planets, while placing tight constraints on the theoretical models solely incorporating the variation of dust properties and grain sizes.

S2.1: Infalling Envelope Surrounding the Planet-Forming Circumstellar Disk in HL Tau

吳俊儒 (NTU/ASIAA), Naomi Hirano (ASIAA), Shigehisa Takakuwa (ASIAA, Kagoshima University)

Recent high resolution ALMA and VLA continuum images of HL Tau had shown structures in the circumstellar disk which may indicate the early stage formation of planet or the existence of formed planet. On the other hand, the disk of HL Tau is still surrounded by a $\sim$3000AU scale protostellar envelope, which means that HL Tau is sill in early stage of

star formation. To understand the disk of HL Tau, it is important to learn about the relation between envelope and disk of HL Tau. We have analyzed the HCO^+ data observed by ALMA Long Baseline Campaign and ^{13}CO(2-1), $C^{18}O$(2-1), and SO(5,6-4,5) data that were newly observed by SMA. The high velocity blue shifted and red shifted components which have velocity higher than 2.5 kms^{-1} with respect to the system velocity show emission along the major axis of the disk. These emission components can be explained by the Keplerian disk surrounded a protostar with 1.3 solar mass. In the low velocity part, the velocity gradient of the emission along the minor axis may indicate the infalling motion of the envelope. To better understand the motion of the envelope, we conducted 2D simulations with different infall model and compare with the observations.

S2.2: Star formation efficiency in Centaurus A

Tsai, An-Li (National Central University), Hwang, Chorng-Yuan (National Central University)

The elliptical galaxies are believed to be passive galaxies with little star formation rate and molecular gas. Centaurs A is a lenticular galaxy or a giant elliptical galaxy with a superimposed dust lane. It is also the closest radio galaxy. The morphology is disturbed and is recognized as a merging system between two galaxies. In order to know the star forming activities in elliptical galaxies, we will study the the star formation rate and efficiency in Centaurs A by using ALMA SV image and Spitzer image.

S2.3: What Can (and Cannot) Observations Tell Us About GMCs and Galaxy's Molecular Gas? A Test of Observational Bias on GMC Properties

Hsi-An Pan (Hokkaido University/Academic Sinica), Yusuke Fujimoto (Hokkaido University), Elizabeth J. Tasker (Hokkaido University), Erik Rosolowsky (University of Alberta), Dario Colombo (University of Alberta), Samantha M. Benincasa (McMaster University), James Wadsley (McMaster University)

Observations with ALMA are about to resolve a wide population of giant molecular clouds (GMCs). This is immensely helpful for understanding star formation, since the cloud properties set the conditions for new star birth. However, while more structures and phases of the GMCs will be resolved, it is necessary to rethink what are we really looking at through the telescope. What is the underlying origin of the "observed" properties of GMCs, such as the measured quantities of mass, size, velocity dispersion, and their further implications, such as the Larson's scaling relations. Moreover, since observational bias, e.g., projection effects, galactic disc inclinations, finite resolution and sensitivity, are unavoidable, what can (and cannot) observations tell us about GMCs and galaxy's molecular gas? In this research, we compare the physical properties of the GMCs identified in simulated galaxies in 3 dimensional position-position-position space (PPP) and those in observational (projected) position-position-velocity space (PPV) in the same simulated galaxies. The synthetic observations are carried out using the ALMA simulator in CASA, assuming various galaxy inclinations, observed resolutions, and sensitivities. Our results show that the observed Larson's relations are not entirely driven by the underlying physical origin and therefore have to be used with caution when considering the environmental dependence, dynamical state, and the extragalactic CO-to-H_2 conversion factor of GMCs.

S2.4: Dust enrichment in hydrodynamic galaxy evolution simulations

Kuan-Chou Hou (ASIAA/NTU), Shohei Aoyama (Osaka University), Hiroyuki Hirashita (ASIAA), Kentaro Nagamine (Osaka University), Ikko Shimizu (Osaka University)

Dust enrichment is one of the most important aspects in galaxy evolution. However, the evolution of dust is tightly coupled with the nonlinear evolution of the ISM including star formation and stellar feedback, which drive the chemical enrichment in a galaxy. Numerical hydrodynamical simulation provides a powerful approach to studies of such nonlinear processes. In this work, we implement dust enrichment model into a smoothing particle hydrodynamics (SPH) simulation. We consider dust production in stellar ejecta, destruction in supernova shocks, dust growth by accretion and coagulation,

and dust disruption by shattering for the processes driving the dust evolution. We also treat the evolution of grain sizes distribution by representing the entire grain radius range by small (< 0.03 μm) and large (> 0.03 μm) grains. In comparison with previous one-zone models, our simulations give us information on the dependence of the above processes on the density, temperature, and metallicity in a spatially resolved manner. As a consequence of our modeling, we have succeeded in predicting the spatial distribution of dust abundance and dust properties (extinction curves, etc.) in galaxies. We compare the theoretical predictions with spatially resolved observational data of nearby galaxies, and discuss implication for high-redshift normal galaxies, which are being explored by ALMA.

S2.5: On the General Form of Mass-to-Light Ratio of Elliptical Galaxies

Ting-Yun Cheng (Institute of Astronomy, National Tsing Hua University, Taiwan), Ing-Guey Jiang (Institute of Astronomy, National Tsing Hua University, Taiwan)

The Mass-to-Light ratio (hereafter M/L) is usually assumed to be a constant for convenience in models of elliptical galaxies. This could be a bad assumption as dark matter might only dominate around parts of elliptical galaxies. The probable non-constant M/L was discussed briefly in Sargent et al. (1978) and Napolitano et al. (2005). In order to address this problem further, we allow M/L to be any arbitrary functions of distances from the centers of galaxies, and determine best forms of M/L numerically by fitting the surface brightness profiles and velocity-dispersion data. The resulting forms of M/L of some elliptical galaxies will be presented and discussed. In addition, the mass distributions of these galaxies will be determined and understood.

S2.6: Photometric redshifts and host galaxy properties of X-ray selected AGNs

Li-Ting Hsu (ASIAA)

To better investigate the AGN and galaxies coevolution, we need to have a complete characterization and census of AGNs with accurate redshifts. Spectroscopic redshifts are relatively reliable, however, it is time-consuming and difficult to be obtained for faint sources at high redshifts. Therefore we have to rely on photometric redshifts (photo-z) which need to be tuned specifically for AGNs. In our work, we studied on the X-ray selected AGNs in the Chandra deep filed-south (CDFS) region, mainly using de-blending Subaru intermediate bands and HST optical/near-infrared data to compute photo-z. We first matched the multi-wavelength counterparts for the X-ray sources, then applied proper magnitude priors and appropriate AGN-galaxy hybrid templates for SED fitting. We achieved a photo-z accuracy of 0.013 with an outliers fraction of 5.3% for X-ray sources. With the SED fitting results of our well-trained AGN-galaxy hybrids, we further studied the AGN host properties via the rest-frame color-magnitude diagram (CMD) which is an useful probe to trace the stellar populations. We made the corrections for dust extinction and AGN contamination for the host galaxy colors of AGNs, and found that it presents a bimodality in the CMD up to $z = 2.5$ as found in normal galaxies.

S2.7: The Lensing Mass and the Dynamical Mass of Elliptical Galaxies in SLACS Survey by Modified Newtonian Dynamics

Yong Tian (Institute of Astronomy, National Central University), Chung-Ming Ko (Institute of Astronomy, Department of Physics and Center of Complex System, National Central University)

Modified Newtonian Dynamics (MOND) is proposed by Milgrom 1983 to explain the “missing mass” problem in astronomy. In the framework of MOND, the stellar mass of elliptical galaxies (a.k.a. baryonic mass) can be estimated from gravitational lensing and stellar dynamics. We selected around sixty Einstein ring systems in the SLOAN Lens ACS survey (SLACS). We obtained the stellar masses by both methods, and found that they are consistent with estimates from stellar population synthesis with Salpeter initial mass function.

S2.8: Discovery of an extremely low surface brightness galaxy in the SDSS-IV/MaNGA survey

Lihwai Lin (ASIAA)

We present a study of a peculiar dry merger system that exhibits a giant H_{alpha} blob 6-7 kpc away from one of the merger component, MaNGA 7991-12702, as revealed in the SDSS-IV/MaNGA observations. Possible explanations of this H_{alpha} blob include that the H_{alpha} blob is associated with a low surface brightness galaxy (LSB), or is the gas cloud stripped from MaNGA 7991-12702 during the merger process. However, there is no optical or near-infrared counterpart found at the position of the H_{alpha} blob, which thus sets an upper limit on the surface brightness if the H_{alpha} blob itself is a LSB interacting with the dry merger. On the other hand, the ionization line ratio decreases from the main galaxy to the H_{alpha} blob, suggesting that the ionization source could be the radio faint AGN in the main MaNGA target 7991-12702, or something inside the H_{alpha} blob, independent of MaNGA 7991-12702. Combining all the multi-wavelength observations we have obtained thus far, we conclude that this giant H_{alpha} blob is likely to be a candidate of "dark galaxy".

S2.9: Peculiarity of the acoustic peak positions in Planck data

Lung-Yih Chiang (ASIAA)

The measurement of the acoustic peak positions of the cosmic microwave background temperature anisotropies has been instrumental in deciding the geometry and content of the universe. Acoustic peak positions vary from patch to patch in different parts of the sky. In this letter we present the statistics of the peak positions of small patches from Planck data. It is found that the peak positions have higher variance, particularly the total variance with only 1 out of 100 realizations higher than the CMB maps, which is equivalent roughly to a significance p-value 0.01 against the null hypothesis. We have examined possible systematics such as rotating non-symmetric beam and noise estimate, and the non-cosmological effect such as foreground residuals. It is unlikely for these effects to cause such anomaly. Apart from being simply a statistical fluke, the other possible interpretation implies that the peaks are rattled more than the standard ΛCDM with cosmological-constant model can describe.

S3.1: A QUICK TEST ON ROTATION PERIOD CLUSTERING FOR THE SMALL MEMBERS OF THE KORONIS FAMILY

Chan-Kao Chang (NCUIA), Hsing-Wen Lin (NCUIA), Wing-Huen Ip (NCUIA)

Rotation period clustering in prograde/retrograde rotators might be the preliminary indication of the Slivan state in the Koronis family as a result of the YORP effect. We follow the general scenario of dispersion in semimajor axis of asteroid family members to separate prograde and retrograde rotators in Koronis family. With available rotation periods obtained from PTF/iPTF, we were unable to find the rotation period clustering of objects with $H \gtrsim 12$ mag in the Koronis family. This could be the result of the intermittent collisional process for small asteroids ($D \lesssim 20$ km) leading to astray Yarkovsky drafting. Our primary result can be verified and our method can be validated, when the pole orientations of our samples are measured.

S3.2: The Discovery of Second Retrograde Trans-Neptunian Object in PS1: A Hint of Common Plane of High Inclination Objects.

Ying-Tung Chen (ASIAA), Hsing-Wen Lin (NCU), Matt Holman (CfA), Wen-Ping Chen (NCU), Wing-Huen Ip (NCU)

The Pan-STARRS 1 (PS1) is the deepest and widest all sky survey before LSST launch, producing a multi-science goals dataset. The PS1 Outer Solar System (PS1OSS) key project focuses on the search of moving objects beyond Jupiter, e.g. Centaur, Trans-Neptunian object (TNO). In this unique survey, we have detected more than 300 Centaurs and TNOs (50% are known) in four years survey, with small bias of sky area. Many sub-populations could be distinguished from our

candidate database. Here we report a very interesting discovery of the second retrograde TNO, after 2008KV42. We also analysis the known objects in this region with a special orbital domain, found a common plane for objects with high (or retrograde) inclination.

S3.3: TAOSII Light Curves Simulator and Trigger

Chung-Kai Huang (National Central University), Zhi-Wei Zhang (Academia Sinica), Dae-Won Kim (Academia Sinica), Matthew Lehner (Academia Sinica), Shiang-Yu Wang (Academia Sinica)

TAOSII is the second generation project searching KBOs with occultation event. Compare to the TAOSI project, there are a lots of improvements which make searching sensitivity reaches 100 times than before. The most important part is we use higher exposure cadence to capture slight flux difference. So we are not only can detect the KBOs, we also can know their characteristic property, suck as distance and size. In this presentation, I will show how to generate synthetic occultation light curves using our simulator and introduce the main parameters which effect light curves most. From the whole light curve to detect the event is also important part. We add the different intensity of noise into our synthetic light curve to show the minimum SNR we still can get the event back. Light curves simulator and trigger method will be describe with detail in this presentation.

S3.4: Discovering the youngest free-floating planets– CFHT W-band Survey

Poshih Chiang (National Central University)

Starting from 2015, an imaging survey to search for young substellar objects in Taurus star-forming complex has been initiated, using with CFHT/WIRCam. In addition to broad-band J and H band, the customized filter (W band) centering at 1.4 μm is designed to trace water absorption in cool atmospheres of substellar objects. The combination of J-, H-, and W-band photometry would be able to identify cool objects and to discard majority of contamination selected only via broad-band photometry. We will introduce the current status of the survey, and will present the results in one pioneer dark cloud L 1495.

S4.1: Current Status and Future Plans at CFHT

Daniel Devost (CFHT)

After an update of progress made on many fronts over the past few years is provided, future plans based upon evolving operations and instrumentation, as well as MSE, will be summarized. Some on-going challenges to Hawaii astronomy will be presented, and thoughts about how the Maunakea Observatories may operate in the 21st century to meet these challenges and provide world-class research opportunities for our international community will be offered.

S4.2: Transneptunian Automatic Occultation Survey (TAOS II)

Shiang-Yu Wang (ASIAA)

The Transneptunian Automated Occultation Survey (TAOS II) aims to detect occultations of stars by small (1 km diameter) objects in the Kuiper Belt and beyond. Such events are very rare ($< 10^{-3}$ events per star per year) and short in duration (200 ms), so many stars must be monitored at a high readout cadence. TAOS II will operate three 1.3 meter telescopes at the Observatorio Astronómico Nacional at San Pedro Mártir in Baja California, México. With a 2.3 square degree field of view and a high speed camera comprising CMOS imagers, the survey will monitor 10,000 stars simultaneously with all three telescopes at a readout cadence of 20 Hz. Construction of the site began in the fall of 2013. The foundation and piers has been completed. We expect to see the first light in late 2016 or early 2017. The full science operation will start in late 2017.

S4.3: Compton Spectrometer and Imager(COSI)

Chien-Ying Yang (Institute of Astronomy, National Tsing Hua University, Hsinchu 30013, Taiwan), Steven Boggs (Space Sciences Laboratory, UC Berkeley, 7 Gauss Way, Berkeley, CA, USA), Hsiang-Kuang Chang (Institute of Astronomy, National Tsing Hua University, Hsinchu 30013, Taiwan), Pierre Jean (IRAP Toulouse, 9 avenue du Colonel Roche, Toulouse, France), COSI Collaboration (COSI institutions include UC Berkeley, LBNL, NTHU, NCU, AS, NARL/NDL, IRAP)

The COmpton Spectrometer and Imager (COSI) is a balloon-borne soft gamma-ray (0.2-5 MeV) telescope.COSI consists of twelve germanium strip detectors that are 3D position-sensitive, providing high spectral resolution(0.2-1% FWHM), capability of tracking each photon interaction with full 3D position resolution to 2 mm^3, good sensitivity of polarization measurement and good hard X-ray imaging. COSI is expected to study astrophysical sources of nuclear line emission, continuum emission, and gamma-ray polarization. It has flown successfully on three conventional balloon flights to date, and the Crab Nebula was detected at a significance of 6σ in the second flight in 2009. The next mission will be a Ultra Long Duration Balloon flight(ULDB) from Wanaka, New Zealand in April 2016. In this talk I will briefly report the current status of the COSI project and then describe its polarization detection capability in particular.

S5.1: Status of the East Asian Observatory

Paul Ho (ASIAA)

It has been a year since the EAO took over the operations of the James Clerk Maxwell Telescope. In that time, we have brought the JCMT back on line with high efficiency (fault rate less than 25%), executed five calls for proposals, and started on 7 new Large Programs which occupy about 50% of the telescope time. During this past year, about 800 independent scientists received data from JCMT, and about 560 co-investigators are involved in the Large Programs. The majority of this users community is coming from the East Asian regions. In this talk, I will review the current status of EAO, and the future instrumentation program for JCMT, and the future initiatives that we will work on for EAO.

S5.2: Energy dependent variability and outburst evolution in black hole X-ray binaries

Holger Stiele (NTHU), Albert Kong (NTHU)

Almost all low mass black hole X-ray binaries are transient sources. Most of these sources show a certain pattern during outburst: the evolution from low hard state through intermediate state(s) into high soft state and the returning to the hard state at lower luminosity. However, there are outbursts that remain in the hard state. Using the technique of covariance spectra we can investigate the variability of individual spectral components on different time scales. Here we present the results of a comprehensive study of covariance spectra for a sample of black hole X-ray binaries obtained during the two outburst patterns outlined above and discuss what covariance spectra can tell us about outburst evolution. Furthermore we compare and discuss covariance spectra obtained during the rising and decaying branch of outbursts.

S5.3: Potential variable gamma-ray pulsar candidate, PSR J0248+6021

C. H. WU (National Tsing Hua University, Taiwan), XIAN HOU (National Tsing Hua University, Taiwan), C. W. NG (University of Hong Kong, Hong Kong), K. H. KONG (National Tsing Hua University, Taiwan), C. Y. HUI (Chungnam National University, South Korea), P. H. T. TAM (Sun Yat-Sen University, China), K. S. CHENG (University of Hong Kong, Hong Kong)

Pulsars are usually known as steady sources in gamma-ray sky. However, the discovery of the first variable gamma-ray pulsar PSR J2021+4026 challenges our understanding to pulsar astronomy. We here present the preliminary results of a detailed analysis of $\sim$ 7 years of 0.1- 100 GeV Fermi-LAT data of the variable gamma-ray pulsar candidate, PSR J0248+6021, a rotation-powered pulsar located in a dense gas cloud region with two glitches after Fermi being launched.

We found spectral variation before and after the first glitch but both the flux and the pulse profile did not show any differences. To inspect the origin of the spectral change, a phase-resolved spectral analysis was performed. The on-pulse spectrum did not show any changes before and after the glitches. Spectral variability might come from the curious off-pulse component that can be fitted with a powerlaw spectrum with a photon index of 3.12 ± 0.09, which is too soft to explain as pulsar wind nebula. The origin of the spectral change is still under discussion.

S5.4: Tracking X-ray Spectral Modulations of A 6-Hz Type-B Quasi-periodic Oscillation in GX 339-4 using Hilbert-Huang Transform

Yi-Hao Su (Graduate Institute of Astronomy, National Central University), Christopher S. Reynolds (Department of Astronomy, University of Maryland, USA), Yi Chou (Graduate Institute of Astronomy, National Central University)

We present the phase-resolved spectroscopy results based on the Hilbert-Huang transform (HHT) for a 6-Hz type-B quasi-periodic oscillation (QPO) in the black hole X-ray binary GX 339-4. It had been shown that type-B QPO frequencies have strong correlation with the hard X-ray flux, but the detail variations of hard X-ray spectral components during the oscillation is still not clear. To track modulations of spectral parameters, we utilized the HHT to characterize the HHT-based timing properties, extract the QPO instantaneous phases, and then construct its phase-resolved spectra. We found that the QPO is composed of a series of intermittent oscillations with a $\sim$ 1 s coherence time. Furthermore, the phase-resolved spectra illustrate significant modulations of Comptonization parameters with unignorable modulations of thermal disk components. Finally, we discuss differences of the HHT-based timing property between this type-B QPO and a 4-Hz type-C from XTE J1550-564 and give possible interpretations of the spectral modulations.

S5.5: Exploring the diffuse interstellar band with the LAMOST OB stars

Chao Liu (National Astronomical Observatories, CAS)

The diffuse interstellar bands (DIBs) are usually considered as the absorption lines induced by some interstellar molecules. Although a few hundreds of the DIBs have been detected in optical and infrared spectra, only two of them are recently associated with C60+. Exploring DIBs in a large observed sample is critical to study the nature of their carriers. From about 3000 low-resolution spectra of OB type stars from the LAMOST survey, 45 DIBs between 380 and 900 nm are clearly detected. We study their correlated coefficients with E($g-r$), HI, and CO gas and investigate whether the DIBs are more correlated with any of them. In the HI vs. CO comparison , we find that the DIBs are clearly split out into two groups, 6178, 6196, 6203, 6283, 6456 $\AA$ etc. are more correlated with HI and 4727, 5797, 6379, 6614 $\AA$ etc. are more correlated with CO. In the HI vs. E($g-r$) comparison, we find most show quite tight linear correlation between the correlated coefficients with E($g-r$) and that with HI except 6203, 6283, 6309 and 6318 $\AA$, who show much higher correlation with HI than with E($g-r$) beyond 2-σ from the majority. The DIBs more favoriting HI gas are likely exposed under strong radiation environment, while those more favoriting the molecular gas or dust probably need radiation shielding provided by the relatively denser molecular clouds or dust. These environmental dependence may help to constrain the nature of the carrier molecules of these DIBs. Moreover, the mean values of the equivalent widths of the DIBs do not related to the correlated coefficients with HI, CO, or dust extinction. It is evident that the relative intensities of the DIBs may not rely on the environment but reflect some intrinsic features of the carrier molecules of DIBs.

S5.6: Cloud Morphology around Young Stellar Clusters

Anirudh Sharma (National Central University), Wen-Ping Chen (National Central University)

This study aims to understand the association of young star clusters with the gas clouds from which they are formed. Our targets include two known clusters, namely NGC 1960 (in Auriga) and NGC 2129 (in Gemini), and one of the cluster candidates newly discovered, using the Pan-STARRS1 data, towards the Galactic anti-center. Star clusters are known to form out of the dense molecular clouds in giant molecular clouds. Stars are formed as a result of gravitational collapse

of gas and dust at the densest parts of the dense cores. But star formation is an inefficient process such that most of the cloud mass does not transform to stars, so newly formed star clusters are surrounded by dense envelopes. We investigate the three clusters with ages of some 107 years, and in association with CO molecular data obtain as a part of the Purple Mountain Observatory sky survey. Optical and near-infrared photometric measurements of Pan-STARRS1 have been used to identify and characterize member stars in each cluster to diagnose the interplay between molecular cloud and cluster formation.

E1.1: 高中天文台的經營—以新豐高中為例

謝翔宇 (新豐高中)

位於台南的國立新豐高中是一所綜合高中，天文的教學資源相當豐富，共有天文台、星象館及專科教室。歷年來培養天文社同學參與天文觀測、社區活動及科展、學科能力競賽皆有成果，雖然學校歷史悠久，但近年來在天文教育推廣方面已成為新興的活躍者！

E1.2: 星球之旅－第 **70848** 號行星

顏鴻選 (台南市天文協會)

星球工作室的成立初衷到執行，確實的行動與展望，其中會以南十字這個團體提到大學以下的天文活動生態，以及我們的合作方式。

E1.3: 從高中天文營活動探討天文教育之課外延續性

李瑾 (臺北天文館)

臺北天文館自 1997 年成立至今，於寒暑假辦理國小低年級至國中等教學營隊，以及教師研習活動，頗受各界好評，唯獨高中學生天文館尚未提供相關活動。由於高中生已具基礎理化、天文科學能力，對電腦與資訊作業較熟悉。此外，大多數高中擁有天文社團，但大多以天文攝影、認星座等活動為主。因此，臺北天文館為了提供對天文科學有興趣之高中職學生深化學習的環境，並誘導對天文研究的熱忱。自 2013 年起，由臺北市教育局資訊教育科提供經費，辦理「高中職數位天文活動」，已辦理三屆。每屆學員約 40 名。三屆活動研習主題不相同，依序為『變星觀測』、『太陽系小天體』與『恆星演化與星團觀測』，在 2016 年仍會以新主題繼續辦理。本報告將討論天文館為社教單位，與學校教育與課外社團活動相異處，以及優勢與限制，未來發展走向。

E2.1: 社群媒體於天文推廣之應用探討：臺北天文館臉書粉絲頁及 **YouTube** 頻道之個案分析

胡佳伶 (臺北市立天文科學教育館), 林琦峯 (臺北市立天文科學教育館，國立臺灣師範大學), 吳志剛 (臺北市立天文科學教育館), 詹佩菁 (臺北市立天文科學教育館), 賴怡璇 (臺北市立天文科學教育館)

近年來博物館教育面臨極大的觀念革新，由傳統詮釋展品資訊的單向傳遞，轉換為互動性的敘事溝通。自 1970 年代末期，以美國為首的博物館開始倡導行銷概念。這是由於博物館逐漸由隊展品物件的研究，轉向對民眾的教育與推廣，目的在讓大眾瞭解博物館內涵、博物館對大眾的服務，以及博物館與大眾的關係等，而這些都需要藉助媒體推波助瀾。因此博物館必須有效運用行銷概念及工具。在博物館需求和社群媒體蓬勃發展下，近年來大多數的國內外博物館都運用社群媒體提供即時資訊，嘗試帶動觀眾參與和意見交流。臺北市立天文科學教育館自 2014 年底開始經營「臺北天文通」臉書粉絲頁和 YouTube「天文科學影片頻道」等社群媒體，希冀觸及更多目標群眾。目前「臺北天文通」臉書粉絲頁有近 1 萬 8000 名粉絲，總觸及人次超過 584 萬。而 YouTube「天文科學影片頻道」則有超過 8500 位訂閱者，近 60 部有中文字幕的天文科學影片，及 73 萬的觀看次數。我們將透過幾個成功的推廣案例分析，像是 Kepler-452b、國際太空站飛掠、重力波、日食等新聞事件，分析社群媒體互動表現，以及與傳統主流媒體的合作關係。善用社群媒體的力量吸引傳媒報導，其推廣效果可說是事半功倍。我們將透過這些量化資料及天文事件引發的媒體效應，研究如何更有效地運用社群媒體推廣天文。

E2.2: Dagik Earth 在校園天文教學上的應用

李奕德 (中央氣象局)

Dagik Earth 最初是由日本九州大學的 Aki Satio 老師及其團隊所設計開發，只需要透過投影機、半球投影螢幕和電腦中的軟體相互搭配，讓聽眾宛如自太空中自由地俯視著星球。便於設計與更新教材內容的方式，不單是應用在地球科學的領域，更能拓展到不同領域中的教學上。

E2.3: 實體教具對於天文科普教育的衝擊與省思

葉秀蓉 (南瀛天文館)

實體教具不但可以提升受教者學習天文的樂趣，同時也有助於較為抽象性的天文概念。國內大多數孩童學習天文的第一步，都始於課本上的天文名詞，而缺乏對大自然觀察與探索，造成學習天文較高的門檻。對於國小階段的孩童，自製天文實體教具，重拾了教授者與受教者學習天文的樂趣。

E3.1: Performance and Results from the Globe at Night – Sky Brightness Monitoring Network

Chun Shing Jason Pun (The University of Hong Kong), Albert K.H. Kong (National Tsing Hua University), Chu Wing So (The University of Hong Kong), Kui Lan Chang (Taipei Astronomical Museum), Yeah Chun Yang (Taipei Astronomical Museum), Sze Leung Cheung (IAU Office for Astronomy Outreach, National Astronomical Observatory of Japan, Tokyo, Japan)

Light pollution is a rapidly-growing and global environmental degradation in which excessive outdoor lighting affects the natural environment and the ecosystem. The propagation of light pollution in the atmosphere leads to skyglow which is the result of scattering of artificial light in the atmosphere. Measurements of the night sky brightness affected by skyglow provide an effective way to measure the extent of light pollution. The Global at Night - Sky Brightness Monitoring Network (GaN-MN) is an international project for systematic and long-term monitoring of night sky conditions around the world. The GaN-MN consists of fixed monitoring stations each equipped with a Sky Quality Meter - Lensed Ethernet (SQM-LE), a specialized light sensor for night sky brightness (NSB) measurement. NSB data are continuously collected and are instantly made available to the general public to provide a real-time snapshot of the global light pollution condition. A single data collection methodology, including data sampling frequency, data selection criteria, device design and calibration, and schemes for data quality control, was adopted to ensure uniformity in the collected data. Launched in 2015, the GaN-MN currently has 15 stations operating in 8 countries/regions in 3 continents (3 stations in Taiwan). Over ten million individual measurements had been collected by March 2016. The huge NSB database provides the basis for studies of the temporal and geographical variations of light pollution and its correlation with various natural and artificial factors. This presentation will cover the methodology and early performance of the GaN-MN, including the characteristic NSB of each station in earlier (22:00-00:00) versus late night (01:00- 03:00). The findings will also provide the scientific backbone in our efforts to contribute to dark sky conservation through education to the general public and policy makers. The GaN-MN is supported by the Knowledge Exchange fund of The University of Hong Kong.

E3.2: 高中天文社的實踐－以高雄天文幫為例

林子端 (高雄天文學會)

1. 高中社團的意義與迷思: 社團是一群有共同夢想的人所結合，過程大於結果，很多是生活中所沒經歷過的。社團也是正式課程之外的學習與休閒，學技能、結交朋友，大多是課本所沒有的。2. 高中生的天文夢: 星空是迷人的，宇宙是奧妙的，生命是難以捉摸的，這些都是吸引人進入天文的領域。3. 共享資源的天文幫: 高雄天文幫齊聚了 18 個高中天文社，就是以共享資源為議題。4. 需要挹注資源的高中社團。

E3.3: 南瀛天文魔法學校的嘗試

黃楚詒 (南瀛天文館)

南瀛天文魔法學校為全台首創的客製化天文主題課程，在現下的教育環境急速變遷的情況下，學習需求的主導性也逐漸提升，我們以多元化課程設計 (菜單) 與客製化的教學活動 (料理手段)，發揮最大化的學習效果 (美味餐點)，打造近距離、無隔閡的專業天文場域。

E3.4: 全國大專天文社論壇

歐柏昇 (國立臺灣大學)

全國大學天文社聯盟成立於 2015 年，使得各大學天文社從原來孤軍奮戰的局面，至今廣泛合作，遍地開花。大學天文社型態多元，有學術‘攝影‘科普推廣‘聯誼‘服務等各種導向的天文社。聯盟扮演統合的角色，使各校天文社資源整合‘互助‘經驗交流，並推動全台各地的在地天文及跨地域的天文教育交流。大學天文社不論對於天文推廣者的培養‘學術上的自主學習以及業餘天文界的形成，都是重要的溫床。聯盟期盼積極與各界合作，讓各校的同學在大學階段培養天文興趣，用多元的視野及創新的方法玩天文。

E3.5: 全國首創天文與環境教育的第一支舞

巫嘉綺 (南瀛天文館)

南瀛天文館於今年向環保署提出環境教育場域認證申請，期許成立全台「唯一」以天文主題的場域，以天文的觀點引起學生的興趣，進而探討我們所遭遇到的環境議題，主軸為課程多元化、教學趣味性、五感體驗式、生活連結度。

PS01: Multicolor Photometric Observations of Near Earth Objects

Chung-Chien Cheng (National Dong Hwa University), Yi-Chuan Lin (National Dong Hwa University), Zhong-Yi Lin (Institute of Astronomy, National Central University, Taiwan), Hsin-Chang Chi (Department of Physics, National Dong Hwa University, Hualien Taiwan 974, Republic of China)

Studies of NEAs are important for understanding their origin and evolution, the links between meteorites and their parent bodies, and for assessing the impact hazard. More than 10,000 near-Earth objects have been discovered but only a few percentages of them have been investigated. By using the data obtained last summer, we will present the results of NEAs' multicolor photometric measurements, that can be used for classifying the spectral class for each NEA and contribute a significant fraction of NEA taxonomy. According to this investigation, we can not only find members of an asteroid family that provide important clues about the corresponding orbital evolution but also investigate some special NEAs like Low-inclination near-earth asteroids, which are also classified as a potentially hazardous asteroids (PHAs).

PS02: Rotation Period Clustering For Asteroid Family's Members

Kang-Shain Pan (NCU), Chan-Kao Chang (NCU), Chan-Kao Chan (NCU)

The Slivan state describes the spin vector alignment of the Koronis family's members. However, to obtain asteroid spin vector needs intensive light curve, which is very time consuming. Therefore, we use a simple assumption from asteroid family formation that prograde members will move outward, and retrograde members will move inward. Consequently, the rotation periods of the outskirt members at the far-side would cluster between 7-10 hr, while those at the near-side would cluster in < 5 and > 13 hr. We will test this idea to asteroid families in the main belt with rotation periods obtained from iPTF.

PS03: Initial orbital distributions of ejecta from the impact event of the Rheasilvia crater of Vesta

Hua-Shan Shi (Institute of Space Science, NCU), Menghua Zhu (Space Science Institute, Macau University of Science and Technology, Macau), Liang-Liang Yu (Space Science Institute, Macau University of Science and Technology, Macau), Wing-Huen Ip (Institute of Astronomy, NCU)

The impact event of the Rheasilvia crater about one billion years ago had helped to shape the geomorphology of Vesta which is the second largest dwarf planet in the asteroidal belt. The injection of fragments into heliocentric orbits has led to the formation of the Vesta family containing the so-called V-type asteroids of basaltic composition. Because of their unique compositional signature, the V-type asteroids serve as useful tracers of the orbital dynamics and evolution of the asteroids. The shock physics code iSALE has been performed to simulate the formation of Rheasilvia basin and the initial velocity distribution of the impact ejecta of the Rheasilvia event was derived from which the corresponding orbital elements can be computed. A set of different impact conditions is examined and supplemented by long-term orbital integration to follow the dispersal of the V-type asteroids.The initial results are presented in this work.

PS04: Identification and Characterization of Recent Break-up Events of Asteroids/Comets

Kinoshita Daisuke (National Central University)

Small solar system bodies, including asteroids and comets, are having break-up events. Possible mechanisms of these break-up events include, but not limited to, collision of other asteroids or comets, tidal effect by major planets, and rotational fission by YORP effect. The surface of small solar system bodies are suffered from irradiation of high energy cosmic rays and solar UV photons, thermal alteration by solar insolation, and micro-meteorite bombardments. Current chemical composition and physical properties of the surface of small solar system bodies are thought to be different from those of

the primordial material. Break-up events excavate the surface and may expose the less altered sub-surface material to the space. This program tries to identify recent ($\sim$ 1 Myr) break-up events of small solar system bodies by orbital integrations, and investigate the physical properties and chemical composition of the fragments to reveal the primordial material and speed of space-weathering / thermal alteration. This paper presents the aims, methods, and preliminary results of orbital integrations.

PS05: ALMA Detections of sulfide compounds on Galilean moon Io

Ming-Chi Chung (National Taiwan Normal University), Yi-Jehng Kuan (National Taiwan Normal University), Yo-Ling Chuang (National Taiwan Normal University), Ya-Wen Yo (National Taiwan Normal University), Yu-Fu Yeh (National Taiwan Normal University)

Io, the most dynamic and nearest Galilean moons to Jupiter, attracts people with its tenuous but active atmosphere together with the mystery of formation of the moon itself. According to the Grand Tack (GT) scenario model, Jupiter is believed to have migrated close to the Sun. Io' s atmosphere was destroyed due to non-thermal XUV-driven escape during the GT. Thus, the sulfide compounds in the atmosphere present are mostly form from volcanic plumes. Thanks to the ever-high sensitivity and resolution of ALMA (Atacama Large Millimeter/submillimeter Array), we are able to resolve Io' s disc. High spectral-resolution ALMA spectra were obtained with two strong SO2 transitions and a 34SO2 line detected.

PS06: The role of the ring atmosphere in the Saturnian system

Wei-Ling Tseng (Department of Earth Sciences, NTNU), Han-Wei Hsiao (Department of Earth Sciences, NTNU)

The Cassini spacecraft has confirmed the presence of an O2 atmosphere over Saturn' s main rings at SOI (Waite et al., 2005; Tokar et al., 2005). During the Cassini Grand Finale mission, more information will be provided to define the coupling dynamics between the main rings and the Saturnian system. To complement this effort, we will re-examine the role of the main rings as a source of neutrals (i.e., H) and plasma (i.e., O2+) in the Saturnian system by 1) advancing the modeling of seasonal and solar-cycle-induced variations in the ring atmosphere/ionosphere to determine the impact fluxes of oxygen molecules and ions into Saturn, which can further clarify the relationship between the main rings and Saturn' s atmosphere/ionosphere; 2) simulating the spatial and temporal morphology of the H cloud of the main rings, with an optically-thick radiative transfer modeling, to quantify this source of the atomic H cloud seen in the Cassini UVIS data; and 3) investigating the spatial distribution and temporal variation of the plasma environment in the inner magnetosphere, in order to characterize the neutral sources of plasma in this region and the physics of processes responsible for the steep radial dependence of heavy ion density observed by Cassini CAPS.

PS07: A Statistical Study of Titan's Exospheric Structures Under Different Magnetospheric Conditions via ENA Imaging and In-Situ Energetic Ion Observations by the Cassini MIMI Instrument

ChingHua Shen (National Central University), Wing-Huen Ip (National Central University)

Besides solar UV radiation, Titan's exosphere is subject to heating by magnetospheric interaction. These include atmospheric sputtering by energetic ions and electron impact. The imaging observations of energetic neutral atoms (ENA) created by charge transfer process between the neutral gas and energetic H^+ and O^+ obtained during close Titan encounters and in-situ measurements of the energetic charged particles can be combined to produce a consistent picture of the dynamical response of Titan's exosphere to the Saturnian magnetosphere, in either the lobe or the current sheet. The results of some typical cases will be described in this report.

PS08: Variations of H2 Density Distribution and Escape Flux in Titan's Thermosphere

J.-K. Hsu (Graduate Institute of Space Science, National Central University, Taoyuan City, Taiwan), W.-H. Ip (Graduate Institute of Astronomy, National Central University, Taoyuan City, Taiwan), J. Cui (National Astronomical Observatories, Chinese Academy of Sciences, China), R. S. Perryman (Space Science and Engineering Division, Southwest Research Institute, San Antonio, Texas, United States of America), J. H. Waite (Space Science and Engineering Division, Southwest Research Institute, San Antonio, Texas, United States of America)

In planetary atmospheres, the thermal escape flux is given by the Jeans formula. However, Yelle et al. (Icarus, 182 (2006) ,567–576, doi:10.1016/j.icarus.2005.10.029) examined the escape flux is larger than Jeans value in Titan's thermosphere by analyzing the H2 density distribution. In previous studies, the observed density distribution of H2 in the thermosphere of Titan below 1500 km can be described with an isothermal diffusion model with a most probable flux of $(1.37\pm0.01)\times10^{10}$ cm^{-2} s^{-1}. This flux corresponds to a temperature of 152.5 ± 1.7 K, derived from the background N2 density distribution (cf. Cui et al. Distribution and escape of molecular hydrogen in Titan's thermosphere and exosphere, JGR, 11., E10004, 2008). In this study, we present the density distribution and escape flux of molecular hydrogen in Titan' s thermosphere based on the measurements made with the Cassini Ion Neutral Mass Spectrometer (INMS) at Titan encounters from year 2005 to the most recent time. We will investigate the variations of the H2 escape flux under different conditions including diurnal variation, change in the solar EUV flux, and passages through different regions of the Saturnian magnetosphere.

PS09: The role of the HC_3N and C_2N_2 atmosphere of Titan in the Saturnian system

Hanjie Tan (Chinese Culture University), Wei-Ling Tseng (National Taiwan Normal University)

In this paper we present a study of the compounds HC3N and C2N2 base on the data of Cassini/INMS (Ion Neutral Mass Spectrometer) measurements in the CSN (Closed Source Neutral) mode. Cassini have measured Saturn's moons hundreds times since 2004 when Cassini spacecraft went into the orbit around Saturn. By the end of Feb.2016, we obtained during 36 raw data files of Titan from 2005 to 2012 in total 117 Titan's flybys. Titan is an magnetized planetary body, so as all our data are obtained in the Saturn's magnetospheric environment. Meanwhile we also searched for how the Latitude, Longitude and local time affect the altitude profiles of impact ionization by influencing magnetospheric particles at Titan orbit location. Many challenges come to us, for example, there are several situations in which the number density of HC_3N and C_2N_2 stay unsteady. In this study, we try to suppressing irrelevant variable then find the relationship between compounds HC_3N, C_2N_2 and Cassini location and the magnetized environment.

PS10: The H_2 and CH_4 Torus of Titan

J.-M. Yang (NCU), C.-H. Shen (NCU), J.-K. Hsu (NCU), W.-H. Ip (NCU)

A large amount of H_2 and CH_4 molecules escape from the exobase of Titan. The H_2 production rate can be estimated to be of the order of 8×10^{27} molecules/s, and about 3×10^{27} for CH_4 at maximum. In this study, we will present our first results on simulating the orbital structures and density distributions of these gases by taking into account their photolytic loss effects. We will also discuss the corresponding process of injecting the H_2^+ and the CH_4-group ions (i.e., CH_4^+, CH_3^+, CH_2^+, and CH^+) into the Saturnian magnetosphere.

PS11: Surface Morphology of Prometheus

Cheng Chen (Institute of Astronomy, National Central University), Wing-Huen Ip (Institute of Astronomy, National Central University)

In the previous studying, we have succeeded in depicting the orbital motion of F-ring's particles which interact with Prometheus by elliptic restricted three-body calculation. Some of particles are scattered out from F-ring and finally impact the trailing side of Prometheus. This phenomenon will change the surface morphology of Prometheus. We use images from Cassini spacecraft to calculate the size frequency distribution of craters for Prometheus and other mid-size Saturnian satellites. We found out the pow law index of Prometheus is different with other Saturnian satellites. This situation can be contributed from refilling of particles or the original formation of two Shepherd Satellites, Prometheus and Pandora.

PS12: Gas outflow and dust transport of comet 67P/Churyumov-Gerasimenko

I.-L. Lai (National Central University), C.-C. Su (National Chiao Tung University), W.-H Ip (National Central University), J.-C. Lee (National Central University), Z.-Y. Lin (National Central University), J.-S. Wu (National Chiao Tung University)

Because of the diurnal thermal cycle and the irregular shape of the nucleus, gas outflow of comet 67P/Churyumov-Gerasimen ko could be highly anisotropic as possibly indicated by the colliminated dust jet structures on the sunlit side. Based on the preliminary study of the outgassing effect from the early phase of the Rosetta mission, a simple model of surface sublimation can be constructed by taking into account the dependence on the solar insolation. By implementing the time variability of the global gas production rate, a sequence of gas coma models can be generated at different epochs before and after perihelion. At selected time intervals, we will also investigate the size change of the cometary ionosphere as the nucleus rotates as well as the ejection of dust particles into bounded and unbounded trajectories.

PS13: The Bimodal Ionospheric Model of Comet 67P/Churyumov–Gerasimenko

Chen-En Wei (Graduate Institute of Astronomy, NCU)

From the observation of ROSINA (Rosetta Orbiter Spectrometer for Ion And Neutral Analysis), it was found that H2O, CO and CO2 variations have strong correlation with the rotational period of the comet and the surface latitude.The intense solar illumination of the northern (summer) hemisphere led to a higher sublimation rate of H2O and thus a CO2/H2O ratio $\leq$ 5%. On the other side (southern hemisphere) of comet which is during the winter, the ratio of CO2/H2O could be around 1. This is because the temperature at and below the surface of the nucleus may be sufficient to sublimate CO and CO2 but not H2O. Once the H2O come out, due to the photoionization reaction H2O will become H2O+ . After that, H2O + will react with H2O and become H3O+ . As a result, the ratio of H3O+/H2O+ in the sunlit side will be higher than the other side. In the present model, we consider two conditions. First is the water-rich case which represents the sunlit side. Second case is the CO2-rich case which represents the southern side without northern sunlight. We will compare the H3O +/H2O+ ratio and abundance of other species with different heliocentric distance of these two cases.

PS14: Geomorphological Mapping on the Southern Hemisphere of Comet 67P/Churyumov-Gerasimenko

Jui-Chi Lee (NCU), Matteo Massironi (University of Padova), Lorenza Giacomini (University of Padova), Sabrina Ferrari (University of Padova), M. R. El-Maarry(University of Bern), Maurizio Pajola(University of Padova), Wing-Huen Ip (NCU), Zhong-Yi Lin (NCU) and the OSIRIS team

Since its rendezvous with comet 67P/Churyumov-Gerasimenko on the sixth of August, 2014, the Rosetta spacecraft has carried out close-up observations of the nucleus and coma of this Jupiter family comet. The OSIRIS, the Scientific Imaging Camera System onboard the Rosetta spacecraft, which consists of a narrow-angle and wide-angle camera (NAC

and WAC), has made detailed investigations of the physical properties and surface morphology of the comet. From May 2015, the southern hemisphere of comet 67P/C-G became visible and the resolution was high enough to carry out a detailed analysis of the surface. The southern hemisphere of the nucleus surface reveals quite different morphologies from the northern one. Previous work shows that the fine particle deposits are the most extensive geomorphological unit in the northern hemisphere. Southern hemisphere is dominated by rocky-like stratified terrain. In this work, we provide the geomorphological maps of the southern hemisphere with linear features and geological units identified. The geomorphological maps described in this study allow us to gain a better understanding of the processes and the possible origin of the comet.

PS15: Long-term monitoring program on comet 103P by Pan-STARRS 1 survey

Yu-Chi Cheng (NCU) and Wing-Huen Ip (NCU)

Comet 103P is the target of NASA's EPOXI flyby mission after deep impact experiment. In-situ spacecraft measurement shows 103P is rich in hyper-volatiles such as carbon dioxide that may result of wild and continuous coma activity when it move close to the Sun. Out-burst activities was reported during its last perihelion passage in the last decade. For those reasons, we analyze the survey images taken by Pan-STARRS 1 project to monitor the active history of this comet. With the successful of Pan-STARRS 1 surveying project in the past 6+ years, it provides large amount of high-quality and well-calibrated observing images for scientific study. In this work we retrieved 162 individual images of comet 103P which covered more than 2/3 of its full orbit from pre-perihelion to post-aphelion epoch. It is an ideal sample to show up the long-term change of a comet morphologically over 6-years with the same instrumental set. We found the mass loss of comet 103P increase significantly near the perihelion passage. Possible out-burst events appeared when it moved 4AU and 5.6 AU away from the Sun.

PS16: Primary Volatiles in the Inner Coma of Comet C/2012 F6 (Lemmon)

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Among various small Solar-System bodies, comets, as relics of the pre-Solar Nebula (PSN), are the most important subjects for the study of the forming history of our Solar System. A comet is believed to be an aggregate of cometesimals, the building block of a cometary nucleus; hence the physical and chemical structure of a cometary nucleus is the consequence of a contemporaneous formation environment of individual cometesimals. Chemical compositions of cometesimasl, similar to that of their forming regions, are thought to be homogeneous initially. However, recent dynamic models suggest that long-period and short-period comets may have separated birthplaces, followed by very distinct evolutionary routes due to planet migration. Because of radial mixing, a cometary nucleus might consist of cometesimals formed in diverse regions in the PSN at varied distances from the proto-Sun. In such case, significant heterogeneity of chemical composition may exist potentially in cometary nucleus. Furthermore, during the accretion phase of the proto-Sun, some original materials in the nucleus inherited from the PSN may be destroyed and some may get modified. Meanwhile, more complex molecular species may be produced under specific conditions hence expanding the inventory of cometary molecules. Study of the chemical inhomogeneity of cometary nuclei thus could provide us pivotal information to rebuild the missing link between pre-Solar Nebula and the present-time Solar System. We therefore used the Atacama Large Millimeter/submillimeter Array to image the spectral emission of two primary volatiles, HCN and CH_3OH, in the inner coma of Comet C/2012 F6 (Lemmon) when the comet passed its perihelion in 2013 May and June. Rapid variation of the HCN and CH_3OH emission is clearly revealed. An anti-correlation of the spatial distributions and kinematic behaviors of these two volatiles was also disclosed. Our observing results indicate the existence of dissimilar chemical components and physical conditions for reaction processes to take place, and support the argument of the possible presence of two separate ice phases, polar and apolar, in the ancient past.

PS17: PS1 discovery of high inclination TNO and the possible new asteroid belt

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In this study, we report a new high inclination, retrograde motion TNO, "Niku", discovered by PS1 survey. It can be stable for about 0.1Gyr with the 4 outer planets configuration of solar system. We compared "Niku" with the other five high inclination objects, who have distant perihelion distance, and found that all of them have very similar longitude of the ascending nodes (Ω). This result means the high incline, distant objects have common orbital plane, and moreover, the prograde and retrograde objects have opposite orbital axes. Our numerical integration shows that all of the six objects can not preserve the common ascending nodes in current 4 outer planets configuration; after 1Myrs their ascending nodes will distribute randomly and lose the common orbital plane. The hypothetical planet nine or the other perturber may the possible solution to preserve their ascending nodes. Finally, we propose a possible new asteroid, or comet belt perpendicular to the ecliptic plane of our solar system. The future solar system object surveys, i.e. PS2 and LSST, will be able to find more high incline, distant objects with common orbital plane.

PS18: Search for serendipitous occultation events in X-rays caused by Oort Cloud Objects

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Up to now, we still do not know much about the proposed Oort Cloud, such as the population properties of Oort Cloud Objects (OCOs). By analyzing all the RXTE archival data of Sco X-1 and GX 5-1, we searched for serendipitous occultation events caused by OCOs. Our search is sensitive to objects of size 300 m in the inner Oort Cloud, taking 4000 AU as a representative distance, and of 900 m in the outer Oort Cloud, taking 36000 AU as the representative distance. No occultation events were found. We present the estimate of upper limits to the number of OCOs of aforementioned size scale in this paper. This is the first estimate of this kind, which is based on observations rather than on theoretical modeling of different OCO injection mechanisms.

PS19: Interaction between hypothetical planet with inner Oort cloud objects

Zong-Fu, Sie (IANCU), Wing-Huen, Ip (IANCU)

The discovery of several Sedna-like objects (Chen et al. 2013; Trujillo and Sheppard 2014) leads to that recent study focus on the source of perturbation. One hypothesis is that there is an additional planet at outer solar system. Batygin and Brown (2016a) demonstrates the existence of distant eccentric planet can provide an explanation why the Sedna-like objects have similar longitudes of perihelion and inclination. Furthermore, Batygin and Brown (2016b), Malhotra et al. (2016) estimate the parameters of the hypothetical planet by simulations and observational constraint. They shows the hypothetical planet have a mass with 7 – 10 Earth mass, a semi-major axis with 500-700 AU, an eccentricity with larger than 0.18 and a corresponding inclination to the ascending node. Here, we investigate that the hypothetical planet interact with Inner Oort cloud object.

PS20: The updated orbital ephemeris of high mass X-ray binary Cyg X-3 detected from monitoring X-ray telescopes

Nai-Hui Liao (Graduate Institute of Astronomy, National Central University), Yi Chou (Graduate Institute of Astronomy, National Central University)

We present our analysis results for updating the orbital ephemeris of the high mass X-ray binary Cyg X-3 using the light curve collected by the all sky monitor (ASM) on broad Rossi X-ray Timing Explorer (RXTE), the Monitor of All-sky X-ray Image (MAXI) and The Burst Alert Telescope (BAT) on broad Swift. To make clear orbital modulation profiles, the light curve from each observation was divided into several segments with duration of 100 days, and folded by a linear ephemeris. The folded light curves were cross-correlated with the standard template proposed by van der Klis and Bonnet-Bidaud (1989) to get the phase shifts. Alternatively, we also used multiple sinusoidal functions to fit the folded light curves for comparison. The errors of phase shifts were estimated from Monte Carlo simulations. We found that the evolution of the phase shift is better described as a quartic ephemeris rather than a cubic function as reported from previous studies with significant third order orbital period derivative of $(2.06 \pm 0.89) \times 10^{-12}\mathrm{yr}^{-2}$.

PS21: Studying magnetars and/or their side-products using the Fermi Large Area Telescope

Paul K. H. Yeung (National Tsing Hua University), Albert K. H. Kong (National Tsing Hua University)

Results from detailed $\gamma-$ray investigations in the regions of several magnetars are reported here. With $>$7 years of data collected by the Fermi Large Area Telescope, we have still never found a pulsation of MeV-GeV flux associated with the spinning of a magnetar. Nevertheless, from the morphological and energetic points of view, we may have detected some side-products of magnetars such as supernova remnants and pulsar wind nebulae, where the latter, if any, are much more closely related to the magnetars. The long-term variabilities of fluxes in some of our targeted regions also induce our speculation about the possible association of variabilities with past activities of magnetars.

PS22: Fermi-LAT observations of the local group galaxy M33

Xian Hou (NTHU)

Star-forming galaxies produce diffuse gamma-ray emission through interactions of cosmic-ray (CR) particles with the interstellar medium. Studying this emission can inform us about CR acceleration and transport processes in galaxies, and comparing different systems will reveal how galactic properties, such as star formation rate (SFR), gas content, or size, affects the CR population. Previous studies on a large sample of star-forming galaxies have revealed a possible correlation between the gamma-ray luminosity and SFR for both Local Group galaxies and nearby starburst/star-forming galaxies. We present a detailed analysis of Fermi-LAT observations of the previously non-detected Local Group Galaxy M33 using 7 years of Pass 8 data. A point source is detected at the 4-5σ level in the vicinity of the nominal center of M33. We discuss possible source associations in different contexts, including M33, a pulsar and an unknown AGN.

PS23: Pulsar detection of GRX in Low Earth Orbit

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The Compton Spectrometer and Imager (COSI) is a soft gamma-ray telescope (0.2-5 MeV) designed to study astrophysical sources. The function of COSI has been tested with five balloon campaigns up to 2016. The Gamma Ray Explorer

(GRX) is an upgraded instrument of COSI for a future satellite mission. GRX consists of 16 High-Purity-Germanium (HPGe) strip detectors in a 2x2x4 array configuration, which provides a good tracking capability on each interactions, which are reconstructed as Compton events. Here I present the detection prediction and timing analysis of a couple of bright pulsars with GRX in Low Earth Orbit circumstances. It provides us a pulsar candidate list for the satellite mission in the future.

PS24: Characterization of the oldest Galactic open clusters Berkeley 17

Bhavana Lalchand (National Central University), Wen-Ping Chen (National Central University)

We present here photometric and kinematic characterization of a list of member giant stars of the Galactic open cluster Berkeley 17 in order to determine accurately its distance and age. With an age of 10 Gyr, the cluster rivals the oldest Galactic open cluster. Dynamically it is of interest to investigate how such an aged stellar system could survive the perturbing galactic environments with tidal disruption and differential rotation. The cluster has a 10 pc diameter, larger than typical open clusters, and is known to associate with a tidal tail, both likely as evidence of a disintegration process. We discuss the role Berkeley 17 plays in understanding the formation and evolution of globular versus open clusters.

PS25: Searching for Be Star In Open Clusters

Chang-Hsien You (National Central University), Chan-Kao Chang (National Central University), Chien-Cheng Lin (Shanghai Astronomical Observatory), Chien-De Lee (National Central University), Chow-Choong Ngeow (National Central University), Po-Chieh Yu (National Central University), Wing-Huen Ip (National Central University), Chih-Hao Hsia (The University of Hong Kong)

The comprehensive survey of Be stars in star clusters of different ages is crucial to understand the formation of Be stars. We used Hα photometry of the Palomar Transient Factory (PTF) to search for Be stars in 100 open clusters. We have analyzed 79 star clusters with distance between 1.5 and 2.5 kpc and identified 52 Be star candidates. Then we used LOT (Lulin One-meter Telescope) and BAO (Beijing Astronomical Observatory) 2.16m telescope to conduct spectroscopy observations for 17 Be candidates. More candidates will be confirmed by using BOAO (Bohyunsan Optical Astronomy Observatory) 1.8m and OAO (Okayama Astrophysical Observatory) 1.8m telescope in the future.

PS26: Characterization of the Low-Mass stars in the Coma Berenices Star Cluster

S. Y. Tang (Department of Physics, NCU), W. P. Chen (Graduate Institute of Astronomy, NCU)

Low-mass members in a star cluster are most vulnerable to mutual stellar gravitational interaction, so they provide evidence of the dynamic story of the cluster. Nearby young clusters such as Hyades ($\sim$47 pc, 625 Myr), Praesepe ($\sim$170 pc, 757 Myr) and the Coma Berenices star cluster ($\sim$90 pc, 500 Myr) are particularly suitable targets to identify the lowest-mass hydrogen burning member stars. The Coma cluster has been relatively poorly studied because its members are difficult to distinguish from field stars by spatial position, proper motions (-11.5, -9.5 mas/yr) or by main sequence fitting. Here we present the use of photometry and proper motion data of the Galactic Clusters Survey (GCS) as a part of the UKIRT Infrared Deep Sky Survey (UKIDSS) to select the members of the Coma cluster, reaching J$\sim$19.3 mag. For proper motion diagnostic, in addition to the UKIDSS measurements, we also incorporate those of the PPMXL and of the USNO Robotic Astrometric Telescope (URAT, to R$\sim$18 mag). Our list of member candidates of the Coma cluster is the most comprehensive ever obtained.

PS27: Finding new Cepheids in the open clusters with their location in the color-magnitude diagram – tests with existing data and known Cepheids

Shih-Chang Luo (National Central University), Chow-Choong Ngeow (National Central University)

Cepheids in open clusters can be used to calibrate the period-luminosity relation. Currently there are ∼30 Cepheids found in the open clusters, in comparison there are more than ∼1000 open clusters in our Galaxy. The goal of our project is to find new Cepheids in the open clusters, by using their location in the color-magnitude diagram (CMD). To test our method, we first construct the CMD for the ∼ 30 open clusters that host Cepheids by using the cluster data from WEBDA. In this Poster, we will present our preliminary test results, as this is an on-going work.

PS28: SPARX – The numerical RT & molecular level state coupling software

I-Ta Hsieh (ASIAA), Eric Chung (ASIAA), Sheng-Yuan Liu (ASIAA)

The numerical software SPARX is the tool to investigate the observational molecular line emission from the theoretical approach. SPARX can handle spherical/cylindrical cartesian and their nested mesh, also utilize MPI and multithreading feature. Some useful visual techniques are presented by using VTK for scientific interpretation.

PS29: Photometry of Membership Stars in Old Open Cluster NGC7142

Yi-Hsiang Hsu (徐逸翔) (NTNU), Hsieh-Hai Fu (傅學海) (NTNU)

To understand the structure and evolution of Galactic disk, astronomer study on stellar cluster in many ways, such like photometry, astrometry, polarimetry, etc. We have determined the membership stars of NGC7142 base on Vasilevskis' method with parallax corrected proper motion in the previous research. In this research, we work on UBV photometry of selected membership stars. The reddening and extinction correction is correct the stars individually with their photometry data. The initial result shows the average reddening E(B-V) = 0.33, distance modulus is 12.4 mag and logarithm age is around 9.15.

PS30: Identifying and Characterizing Be Stars with LAMOST and GAIA

Chien-Cheng Lin (Shanghai Astronomical Observatory, CAS), Li Chen (Shanghai Astronomical Observatory, CAS), Po-Chieh Yu (Graduate Institute of Astronomy, NCU), Chien-De Lee (Graduate Institute of Astronomy, NCU)

The sample of Be stars remains imcomprehensive due to the insufficient information of rotation, age, and distance. With a large field of view and the highest spectral acquisition rate, the Large Sky Area Multi-Object Spectroscopic Telescope (LAMOST) survey thus provides us an opportunity to conduct a systematic survey of Be stars. More than 350 new Be stars are identified with the LAMOST three-year data, and, most of these stars are field stars. The outermost Be star candidates with photometric distances toward Galactic Anti-Center are about 20-25 kpc. With Gaia's high-resolution spectroscopic survey, the surface temperatures, chemical abundances, masses, and rotational speeds can be characterized. The revised sample of Be star can be used to study the formation and evolution of massive stars, and to trace the spiral arms towards the Galactic Anti-Center.

PS31: The Unusual Behavior of the Polarization of UXor Type Young Star GM Cep

Po-Chieh Huang (IANCU), Chang-Yao Chen (IANCU), Chia-Ling Hu (Taipei Astronomical Museum), Chien-de Lee (IANCU), Chi-Sheng Lin (Lulin Observatory), Hsiang-Yao Hsiao (Lulin Observatory), Shuhrat Ehgamberdiev (UBAI), Otabek Burkhonov (UBAI), Wen-Ping Chen (IANCU)

UX Orionis stars, or UXORs, are a sub-type of Herbig Ae/be or T Tauri stars exhibiting sporadic extinction of stellar light due to circumstellar dust obscuration. GM Cep is such a UXOR in the young ($\sim$ 4 Myr) open cluster Trumper 37 at $\sim$ 900 pc, showing prominent infrared access, H-alpha emission, and flare activity. Here we present intense multi-color photometric monitoring from 2009 to 2016, together with the century-long photometric behavior reported in the literature GM Cep to show (i) sporadic brightening on a time scale of days due to young stellar accretion, (ii) cyclic, but not strictly periodical, occultation events, each lasting for a couple months, with a probable recurrence time of about two years, (iii) normal dust reddening as the star became redder when dimmer, (iv) the unusual "blueing" phenomena near the brightness minima, when the star appeared bluer when dimmer. The occultation events may be caused by a dust clump, signifying the density inhomogeneity in a young stellar disk from grain coagulation to planetesimal formation. GM Cep is moderately polarized, from 4% to 9% in g, r, and i bands. The level of polarization is anticorrelated with the brightness in the bright state during which the dust clump backscatters stellar light, and the polarization reaches maximal values when the clump is at greatest elongations, in consistent with the Rayleigh sky model. Most unusual, the g band showed ordinarily the highest polarization, yet gradually became the lowest when the clump was expected to position before and after conjunction. We discuss the physical interpretation and important implication of the phenomena.

PS32: Refining period of a Mira in M33 with multi-band analysis

Jia-Yu Ou (National Central University), Chow-Choong Ngeow (National Central University)

[HBS 2006] 40671 is a confirmed long period Mira found in M33. Using observed light curves from Hartmann et al (2006) data, Barsukova et al. (2011) found a period of 665 day for this Mira. In addition to Hartmann's data (2005 2006), we also collected PTF (Palomar Transient Factory) data taken from 2009 to 2015. Combining these two datasets that spanned 10 years we can refine the period of this Mira. The preliminary results show that the period of [HBS 2006] 40671 could be 520 days. In addition to Hartmann's data and PTF data in R band, several nights of LOT data and Thai National Observatory (TNO) data were also collected. We combined these datasets spanned in different bands and refine the period further using the multi-band Lomb-Scargle method. In this poster, we present our lasted investigation on the period refinement of this Mira.

PS33: Template Light Curves of Cepheid Variables Based on PS1 PAndromeda Data through PEGASuS Approach

LIN, I LING (IANCU), Chow-Choong, Ngeow (IANCU)

Cepheids are well-known standard candles, which have well-calibrated Period-Luminosity (PL) relations. We can derive distances to nearby galaxies based on these relations. Improving the accuracy of mean magnitudes of Cepheids reveals the first and important step when applying the well-calibrated PL relations of Cephieds. However, it is still early to study the properties of Cepheids in grizy photometric system, in contrast to the BVI photometric bands. Our objective is to analyze jo6 light curves of Cepheids from Pan-STARR1 (PS1) PAndromeda data (Kodric et al., 2012 [AJ 145:106]) by generating a set of template light curves of these Cepheids over wide range of periods in grizy filters. We first normalized these light curves before stacking them together with similar shapes based on high values of cross correlation coefficients. Finally we obtained a group of template light curves in r and i bands based on a new approach called PEGA SUS (PEriodic GAuSsian Uniform and Smooth) to reprocess the same observed data set (Inno et al., 2015 [A&A 576A:230]). We present several such template light curves in this poster.

PS34: The Study of Cataclysmic Variables and Pulsating Variables With Synoptic Surveys

Michael Ting-Chang Yang (Graduate Institute of Astronomy, National Central University), Yi Chou (Graduate Institute of Astronomy, National Central University), Chin-Ping Hu (Hong Kong Univresity), Yi-Hao Su (Graduate Institute of Astronomy, National Central University)

The long-term variations of cataclysmic variables (CVs) has been systematically studied with the synoptic survey projects. The data from Palomar Transient Factory (PTF) and Catalina Realtime Transient Survey (CRTS) were taken for our work. With a series of temporal analysis, about a dozen of the sources found to possess the long-term periodic signals. Some of the possible formation mechanisms are dressed and discussed in this presentation, e.g. intrinsic variation of the accretion disk, precession of the accretion disk, magnetic field change of the companion star, hierarchical triple star system. Besides, the studies on the galactic pulsating variables (RR Lyrae and Cepheids) will also be demonstrated. We use some machine learning technique to extract the features of the light curves and the classify them according to some key features. This poster will present the preliminary result.

PS35: TAOS Observation of V404 Cyg during the 2015 Outburst

Ryoko Ishioka (ASIAA), Ying-Tung Chen (ASIAA), Sun-Kun King (ASIAA), Chih-Yi Wen (ASIAA), Shiang-Yu Wang (ASIAA), Matthew J. Lehner (ASIAA), Jen-Huang Wang (ASIAA), TAOS Team (TAOS Team), Mariko Kimura (Kyoto Univ.)

V404 Cyg is an X-ray binary consisting of a black-hole and a low mass late-type star. The object has been known to show episodic outbursts for 30 100 days with intervals of several decades. On June 15th, 2015, V404 Cyg underwent an outburst after 26 years of quiescence. The outburst was first detected by the Burst Alert Telescope on NASA's Swift satellite, which sent out an alert. TAOS telescopes automatically responded to the alert, and started to observe the black hole at 150 sec after the outburst detection. This was the earliest optical observation among numerous amount of observations by many instruments around the world triggered by this outburst. TAOS's observation revealed that repetitive patterns in short-term variations, which are similar to the X-ray patterns observed in another black-hole binary GRS 1915+105, already existed in the very early stage of the outburst. This was the first time that this kind of variations in black holes were observed in optical light. We present the earliest light curves obtained by TAOS and the results of collaboration with the Kyoto Univ. Team.

PS36: Superflare Properties of G-type Kepler Eclipsing Binaries

Li-Ching Huang (Institute of Astronomy, National Central University), Wing-Huen Ip (Institute of Astronomy, National Central University), Han-Yuan Chang (Institute of Astronomy, National Central University)

In the 4-year observation (2009-2013), Kepler had observed 2,400 eclipsing binaries. According to Huber's work (2014), which revised the properties of 190,000 Kepler targets, there are 1,057 eclipsing binaries with G-type primary stars. Close binaries have been found to display superflare phenomenon, an interesting question is therefore about the corrsponding probability of flare occurrences. Of the eclipsing G-type binaries detected by Kepler, about 4.07% are with flares. What are the differences between the flaring and non-flaring EBs? To understand how the secondary stars trigger the superflare events, we would like to know the flare timing in their orbital periods, the types of the secondary stars, and the distances between the components in the binary systems. LAMOST has 83 good spectra of Kepler G- type eclipsing binaries until 2014. There are also about 5 binary systems show flare events in the Kepler light curves. Those spectra might help us to understand the spectral types and sizes of the secondary stars. Kepler light curves would help us to find the orbital periods and the distance between the two stars in a system. The light curves also tell us if the flare events are correlated with the position between two stars. This work might help us to know more about the superflare events in the exoplanet (especially Hot-Jupiter) systems.

PS37: A LAMOST-Kepler spectrophotometric study of hyper flares of M dwarfs

Han-Yuan Chang (張瀚元) (National Central University, Institute of Astronomy), Wing-Huen Ip (葉永烜) (National Central University, Institute of Astronomy), Yihan Song (National Astronomical Observatories , Chinese Academy of Sciences), Ali Luo (National Astronomical Observatories , Chinese Academy of Sciences), Li-Ching Huang (黃立晴) (National Central University, Institute of Astronomy)

M dwarfs are known to be magnetically active displaying impulsive energy release effects in terms of stellar flares. In DR1 of LAMOST (Large Sky Area Multi-Object Fibre Spectroscopic Telescope), 11032 M dwarfs are identified and 7179 of them have H alpha emission. The corresponding H alpha (emission) equivalent widths vary between 0.1 and 4.5 *(Å)*. Four of these active M dwarfs have counterparts in the Kepler catalog (KID 2692708, KID 4731525, KID 5791720, KID 6436291). An analysis of their light curves shows that they all have flare activity with explosive energy (Ef) reaching > 0.5% of the stellar luminosity (L^*). One of them, KID 5791720, which EW ≈ 4.5 *(Å)*, is characterized by hyper-flares with Ef comparable to L^*. This LAMOST-Kepler spectrophotometric study thus suggests that hyper-flares could be a common phenomenon in M dwarfs.

PS38: UPSILoN: Automated Classification of Periodic Variable Stars Using Machine Learning

Dae-Won Kim (Academia Sinica), Coryn A.L. Bailer-Jones (Max-Planck Institute for Astronomy)

UPSILoN is a machine learning package for the classification of periodic variable stars. The package is intended to be general: it can classify any single band optical light curve comprising at least a few tens of observations covering durations from weeks to years with arbitrary time sampling. We use 143,923 light curves of periodic variable stars taken from OGLE and EROS-2 to train the model. To make our classifier relatively survey-independent, it is trained on 16 features extracted from the light curves (e.g., period, skewness, Fourier amplitude ratio). To assess classification performance, we applied it to the MACHO, LINEAR, and ASAS periodic variables, which gave recall/precision of 0.92/0.98, 0.89/0.96, and 0.84/0.88, respectively. We also investigate how the performance varies with the number of data points and duration of observations. We find that recall and precision do not vary significantly if there are more than 80 data points and the duration is more than a few weeks. The classifier software is available (in Python) from the GitHub repository (http:// https://goo.gl/xmFO6Q).

PS39: THE SHAPING OF THE MULTIPOLAR PRE-PLANETARY NEBULA CRL 618 BY MULTIDIRECTIONAL BULLETS

Po-Sheng Huang (ASIAA/NTU), Chin-Fei Lee (ASIAA/NTU), Anthony Moraghan (ASIAA), Michael Smith (Centre for Astrophysics and Space Science, University of Kent)

In order to understand the formation of the multipolar structures of the pre-planetary nebula CRL 618, we perform 3D simulations using a multidirectional bullet model. The optical lobes of CRL 618 and fast molecular outflows at the tips of the lobes have been found to have similar expansion ages of 100 yr. Additional fast molecular outflows were found near the source along the outflow axes with ages of 45 yr, suggesting a second episode of bullet ejections. Thus, in our simulations, two episodes of bullet ejections are assumed. The shaping process is simulated using the ZEUS-3D hydrodynamics code that includes molecular and atomic cooling. In addition, molecular chemistry is also included to calculate the CO intensity maps. Our results show the following: (1) Multi-epoch bullets interacting with the toroidal dense core can produce the collimated multiple lobes as seen in CRL 618. The total mass of the bullets is ∼0.034 solar mass, consistent with the observed high-velocity (HV) CO emission in fast molecular outflows. (2) The simulated CO J=3–2 intensity maps show that the low-velocity cavity wall and the HV outflows along the lobes are reasonably consistent with the observations. The position–velocity diagram of the outflows along the outflow axes shows a linear increase of velocity with distance, similar to the observations. The ejections of these bullets could be due to magneto-rotational explosions or nova-like explosions around a binary companion.

PS40: Molecular and ionized gas in the central part of the bipolar planetary nebula NGC 6302

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NGC 6302 is a remarkable planetary nebula (PN) with a butterfly shape. The central region of this PN was imaged in the ^{13}CO 2–1, C^{18}O 2–1, SO 5_6–4_5, H30α, and 1.3 mm continuum with the ALMA at an angular resolution of $\sim$0.7$''$. The 1.3 mm continuum and H30α images show a ring-like structure with a size of $\sim$5$''$(6,000 AU) $\times$ 3$''$(3500 AU) near the base of the eastern lobe. The geometrical center of this ring does not coincide with the location of the central star, but is located at $\sim$2$''$NE from the star. The ^{13}CO, C^{18}O, and SO maps reveal a ring-like structure having a radius of $\sim$7$''$(8200 AU) and a width of $\sim$1$''$(1200 AU) at the waist of the nebula. The molecular ring is expanding at a velocity of $\sim$9 km s^{-1}. There are several signatures of dynamical interaction between molecular and ionized gas; the ionized ring corresponds to the inner edge of the molecular ring, knotty structures seen in the ^{13}CO image show the larger velocity offsets at the interface between ionized and molecular gas, and the molecular bullet with ballistic velocity feature requires an additional acceleration of $\sim$9 km s^{-1} in the central region. It is likely that the molecular ring started expanding by the overpressure caused by the ionization. The southern part of the molecular ring is missing probably because of the effect of ionization.

PS41: Dust particle size of evolved stars characterized by polarization

Chien-De Lee (National Central University), Wen-Ping Chen (National Central University)

The evolved stars provide the huge amount of the cosmic dust. In contrast to an young stellar object collecting the existed dust from the interstellar neighborhood, an evolved star raises and grows the dust grains in its atmosphere, wind and expanding shell, so these newly condensed dust grains should be small in size. We study the grain size distribution of evolved stars characterized by wavelength dependence of polarization, i.e., a wavelength with maximum polarization known as λ_{max}. The result shows that the asymptotic giant branch stars are likely to have smaller λ_{max} than post-asymptotic giant branch stars. The correlation between grain size and evolutionary status indicates that the evolved stars with early stage are dominated by smaller dust grain than those with later stage.

PS42: Search for p-mode oscillations in white dwarf WD0044-121

WenCheng Huang (National Tsing Hua University)

G-mode oscillations in white dwarfs have been observed, while p-mode oscillations have not. To search for p-mode oscillations in white dwarfs, we use multi-object instrument MIOSOTYS (consists of fiber positioning arms, an Acquisition and Guiding Image System and an EMCCD) mounted on the 1.23m and 2.2m telescopes at Calar Alto Observatory to observe WD0044-121 at a frequency 20Hz for 5 nights and 3 nights respectively. In this paper, we introduce MIOSOTYS and present data reduction, timing analysis and discussion of the observation.

PS43: Search for P-mode oscillation in white dwarfs

Jie-Rou Shang (Institute of Astronomy, National Tsing Hua University, Hsinchu 30013, Taiwan), Chih-Yuan Liu (Institute of Astronomy, National Tsing Hua University, Hsinchu 30013, Taiwan), Wen-Cheng Huang (Institute of Astronomy, National Tsing Hua University, Hsinchu 30013, Taiwan), Xiang-Rui Wu (National Experimental High School at Hsinchu Science Park), Hsiang-Kuang Chang (Institute of Astronomy, National Tsing Hua University, Hsinchu 30013, Taiwan)

P-mode oscillation of a white dwarf has pressure as the restoring force and frequencies higher than those of g-modes. Probably because of high frequencies and small amplitudes, p-mode oscillation has not been observed in white dwarfs. In our work, we chose two bright white dwarfs (WD1134+300 and WD0501+527) as targets to observe with a commercial

CMOS camera mounted on LOT of Lulin at 20 Hz. In this paper, we describe our efforts in searching periodic oscillations using discrete Fourier transform. No oscillations in the frequency range from 1 to 10 Hz was found. We present estimation of the upper limit to the amplitude of p-mode oscillations in these white dwarfs, if they exist.

PS44: The circumgalactic medium in low redshift galaxies

Zhen-Kai Gao (Department of Earth Sciences, National Taiwan Normal University), Lin-Wen Chen (Department of Earth Sciences, National Taiwan Normal University)

The baryonic circumgalactic medium (CGM) can serve as a cold gas reservoir to modulate the star formation of its associated galaxy. Although its origin remains uncertain, current galaxy evolution scenarios suggest it can be supplied or driven by internal feedback and by accretion from outside, depending on the properties of the host galaxy and environments. In this work, we investigate how (or whether) the CGM properties vary with different morphological types and masses of galaxies (or vice versa) at low redshift (z<1), the CGM data are compiled from quasar-absorption-line selected samples reported in previous studies, with additional information of morphology and derived physical properties (e.g. stellar mass) of the host galaxies respectively from Galaxy Zoo and the Sloan Digital Sky Survey. Based on a toy model of the CGM, we have analyzed CGM galactocentric profiles as well as the major properties of the CGM host galaxies, particularly focusing on the similarity and differences between those of early and late type galaxies.

PS45: Generalized Gauss's Law With Anisotropic Flux Distribution to Describe the Flat Rotation Curves of the Disk Galaxies

Te-Chun Wang (私立中山工商)

A generalized Gauss's law of gravity with anisotropic flux distribution is proposed to describe the rotation curves of disk galaxies. It is pointed out that the flux distribution concentrated on the side wall of a shallow disk Gaussian surface of cylindrical symmetry may provide an exact limiting condition for the Newtonian law of gravitation with a direct inverse distance dependence instead of the conventional inverse-square law. And this direct inverse law results in the observed flat orbiting velocity for the stars far from the galaxy center. In this shallow cylindrical symmetry of the Gaussian surface, the orbiting velocity depends on the disk thickness. Evidences related to the generalized Gauss's law scenario are discussed, including the disk thickness effects on the rotation of luminous disk structure, alignment of disk galaxies with respect to the larger structure and the asymmetry of gravitational lensing by the luminous disk structure.

PS46: Diffuse Interstellar Bands in SDSS DR7 galaxies

Bo Zhang (National Astronomical Observatories, CAS), Chao Liu (National Astronomical Observatories, CAS)

We present the measurements of the Equivalent Widths (EWs) of the two strong Diffuse Interstellar Bands (DIBs) $\lambda 5780$ and $\lambda 6284$ from a set of $\sim$ 88,907 normal galaxies from SDSS DR7. Using the integrated Equivalent Width of the DIBs, we are able to investigate the correlation with the stellar extinction A_V and other evolution properties of the host galaxies. It is evident that the relative intensity of DIB to A_V increases dramatically when Dn(4000)$<$ 1.26 and decreases with Dn(4000) when Dn(4000)>1.26. This trend implies that the DIB carriers should not be the same particles who produce the interstellar extinction and the evolutions of the DIB carriers may be quite different with the dust particles, although in general, they are correlated with each other.

PS47: Multiwavelength Investigation of Differences between Type Ia and Core-Collapse Supernova Remnants

Po-Sheng Ou (Academia Sinica/ NTU), Chuan-Jui Li (Academia Sinica/ NTU), You-Hua Chu (Academia Sinica)

Supernovae (SNe) can be roughly divided into two categories: Type Ia SNe originating from white dwarfs in binary systems, and core-collapse SNe from massive stars. As their progenitors have different physical properties, evolutionary histories, and interstellar environments, the resultant supernova remnants (SNRs) are expected to have different morphologies and structures. A large number of SNRs in the Large Magellanic Cloud (LMC) have been unambiguously identified as Type Ia or core-collapse SNRs. We have used multi-wavelength observations of these SNRs to quantify the differences between them. The observations used include: Hubble Space Telescope images to reveal detailed distribution of ionized gas; CTIO 4m MOSAIC H-alpha images to show large-scale distribution of ionized interstellar gas; Chandra and XMM-Newton X-ray images to show the 106 K shocked-heated gas; Australian Telescope Compact Array (ATCA) data of radio continuum to show nonthermal synchrotron radiation, and HI 21-cm line to show the distribution of neutral atomic component of the ISM; Spitzer Space Telescope images to examine the distribution and excitation of dust. The differences between Type Ia and core-collapse SNRs we find will help us understand and classify the SNRs in more distant galaxies. The rates and distributions of Type Ia and core-collapse SNRs determined empirically/observationally can help constrain the energy feedback in evolutionary models of the ISM in a galaxy.

PS48: The Relation of Mid Infrared and Radio Emission in Narrow-Line Seyfert 1 Galaxies

Hsieh, Meng-Che (NCU), Hwang, Chorng-Yuan (NCU)

We investigate the relation of mid-infrared and radio emission in narrow-line Seyfert 1 galaxies, using the data from the Sloan Digital Sky Survey (SDSS), the Wide-Field Infrared Survey Explorer (WISE), and the Faint Images of the Radio Sky at Twenty cm (FIRST). We find that there is a positive correlation between the mid-infrared (W4, at 22μm) and the radio (1.4GHz) emission. We also show the Hα λ6563,Hβ λ4861,and [O III] λ5007 luminosity versus the mid-infrared and the radio luminosity. Our results suggest that most of the mid-infrared emission is from the central AGNs.

PS49: The Properties of Barred Spiral Galaxies

Yin Fang Wang (National Central University), Chorng-Yuan Hwang (National Central University)

We studied the properties of field barred spiral galaxies and normal spiral galaxies. We selected 351154 galaxies in the field from the Sloan Digital Sky Survey DR12 with redshifts between 0.001 and 0.1. We considered a galaxy as a barred spiral galaxy if the source has a barred spiral vote fraction greater than 0.5 in the Galaxy Zoo; we considered a galaxy to be in the field if the galaxy has less than 100 neighbors within 1 Mpc. Our result shows that there is a positive correlation between the ratios of the barred spirals to the normal spiral galaxies and the numbers of their neighbor galaxies. Our results also show that higher fractions of AGN-host galaxies in the bar-spiral than in the normal spiral galaxies independent of their companions, indicating that bars might play an important role in triggering AGNs. On the other hand, the fractions of AGN-host galaxies in the normal spiral galaxies highly depend on their companions, suggesting that the AGNs in the normal spirals are mainly triggered by galaxy interaction.

PS50: AGN selection by 18-band SED fitting in infrared

Ting-Chi Huang (Department of Physics, NTHU)

Many AGN are obscured by gas and dust. Those obscured AGN tend to be missed in UV and X-ray observations. Recovering and quantifying missing population of AGN is of extreme importance. Mid-infrared (IR) light can help us to recover them, in an obscuration free way, since both AGN and SFG have strong yet different emissions in mid-IR.

However, in previous mid-IR surveys only 3 or 4 filters were available, and thus, the selection was limited. We, for the first time, combined 18-bands from WISE, AKARI, and Spitzer, and performed the SED fitting to select AGNs including obscured ones. We compare our selection with traditional AGN selections such as X-ray data from Chandra, optical spectra, and mid-IR selection boxes from Spitzer and WISE. We show that in our 18-band fitting, we select more AGN than the previous method by 20%.

PS51: SCUBA-2 Ultra Deep Imaging EAO Survey (STUDIES)

Lim, Chen-Fatt (National Taiwan University), Wang, Wei-Hao (Academia Sinica Institute of Astronomy and Astrophysics (ASIAA))

Dust absorbs the UV/optical starlight and re-radiates it into the far infrared (FIR). Therefore, to understand the star formation history completely, we need to study the star formation that is surrounded by dust, which can be traced from the ground through the submillimeter windows. In the last two decades, the James Clerk Maxwell Telescope (JCMT) first revealed a population of luminous submillimeter galaxies (SMGs). They are believed to be dusty galaxies couple with extreme infrared luminosities (LIR $> 10^{12}$ L_*), implying high star-formation rates (SFRs 100-1000$M_\odot$ yr^{-1}). Furthermore, the redshift distribution of SMGs peak at roughly the same epoch (z$\sim$2) as the peak in the QSO activity. Through studies of this population can therefore help us to understand the growths of galaxies and supermassive black holes in this key epoch. To achieve the above, we have to detect and identify all the SMGs that give rise to the integrated FIR light. We will present an ultra deep 450μm imaging named STUDIES (SCUBA-2 Ultra Deep Imaging EAO Survey), which is taken with SCUBA-2 on the 15m JCMT starting from December 2015. The STUDIES images will be taken within the deep extragalactic CANDELS-COSMOS footprint under the grade-1 weather on Mauna Kea. The total observing time of the observations will be 330 hours. So far, one-third of the observing time ($\sim$100 hours) had been taken. We will discuss the details about the observation and the properties of our data.

PS52: The red spiral galaxies

Jen-Chao Huang (IANCU)

We investigated the spectroscopic properties and environments of red spiral galaxies selected from the Galaxy Zoo 2 project. The star-formation activities and stellar ages of these red spirals are between those of normal spiral galaxies and elliptical galaxies. We found that the red spirals tend to be in high density regions and have similar bar-fraction to normal spirals. We also discussed the possible process to form the red spirals and the roles of these red spirals in galaxy evolution.

PS53: Survey for new lensed quasars from PS1

E. Koptelova (IANCU)

We present results of lensed quasar selection from the PS1 multi-epoch multi-band data. Our goal is to find new bright and well-resolved lensed quasars that can be easily observed with the middle-size telescopes for time delay studies and Hubble constant measurements. We developed a search algorithm that was tested using known lensed quasars with the wide range of image separations discovered in SDSS and HST Snapshot surveys. The completeness rate of the algorithm is 78%. From the PS1 3pi data we selected about 75 lensed quasar candidates that exhibit photometric properties similar to known lensed quasars. Moreover, 5-10% of them show the presence of an additional light in residuals after subtracting the quasar light. This additional light might be associated with a lensing galaxy. The great advantage of PS1 is that it provides variability information via multi-epoch photometry, unavailable in other surveys such as SDSS or HSC. The observation of correlated variability in the lensed quasar candidates, that is typical for known lensed quasars, will unambiguously confirm their lensed nature. In this work we examine correlation between brightness variations of the multiple components of the lensed quasar candidates selected by us.

PS54: Searching for Changing-Look QSOs with PTF

P. C. Yu (IANCU), C. K. Chang (IANCU), M. J. Graham (Caltech), I. C. Chen (IANCU), W. H. Ip (IANCU), A. L. Luo (NAOC), Y. H. Song (NAOC), PTF Team (Caltech)

Quasi-stellar objects (QSOs) are powerful radio-loud AGNs, and usually show random continuum/line emission variabilities, while changing-look QSOs show decreasing of flux by a factor of 2-3 within 3-5 years at optical band. The broad-line regions (BLRs) disappear in changing-look QSOs with the decreasing of continuum flux. The mechanisms causing the disappearance of BLRs are still unclear. We searched for changing-look QSOs using photometric data of Palomar Transient Factory (PTF), Sloan Digital Sky Survey (SDSS), and Pan-STARRS, along with the spectra of SDSS, LAMOST, and Palomar. In total, 414 QSOs are selected as changing-look QSO candidates on the basis of their decreasing of flux within 3-5 years at either g- or R-band. By comparing the SDSS spectra of earlier epoch with the new spectra of LAMOST and Palomar telescopes, we are able to investigate the "changing-look" behavior at different epochs. Particularly, we also presented multi-epoch spectral observations for a double-peak emitter, which shows extremely a broad ($>$10000 km/s) and flat-top Hβ emission line. The blue component of the Hβ emission line imply strong outflows from the QSO.

PS55: Absorption tests with a QSO at z=6.6

Yi Hang Valerie Wong (National Tsing Hua University), Tomotsugu Goto (National Tsing Hua University), Ji-Jia Tang (National Taiwan University; Academic Sinica Institute of Astronomy and Astrophysics)

Last year, we found a luminous z=6.6 QSO using the Subaru telescope. Using the spectroscopic data obtained from the observation, we aim to probe the re-ionization of the early Universe. In order to accomplish our goal, we carried out several absorption tests on the spectrum. 1.) We performed the Gunn-Peterson test to observe the Ly-alpha, Ly-beta and Ly-gamma absorptions of neutral hydrogen. 2.) We measured the dark gap statistics to better measure the separation between sparse remaining flux. 3.) The size of ionized bubble around the QSO was measured to interpret x_{HI}. 4.) Model free constraints were also obtained by directly measuring covering fraction of dark pixels. We present our results at the ASROC meeting.

PS56: Missing Blue QSOs

Chia-Hsiang Huang (NCU), Chorng-Yuan Hwang (NCU)

Quasi-stellar objects (QSOs) are very bright and distant objects. They are generally considered as the bright Active Galactic Nuclei (AGNs). Typical QSOs are expected to be blue because of their UV bumps. Recent studies also found that the color distributions of QSOs showed an obvious red tail, which might be caused by dust extinction or be caused by the intrinsic spectra of the QSOs. However, when we investigated the color and luminosity relations of QSOs, we found that bright blue QSOs seem to be missing. There is a clear boundary for the blue color of bright QSOs; the brighter the QSOs are, the redder the color cut. To investigate the origin of the color boundary, we studied the color and physical properties of the QSOs selected from SDSS using both spectral and photometric information. We show our results in the poster and discuss their implication on the origin of the missing bright blue QSOs.

PS57: On The Dynamical Evolution Of Supermassive Black Holes In Galaxies

Yu-Heng Ho (National Tsing Hua University), Ing-Guey Jiang (National Tsing Hua University)

Using the supermassive black hole, galaxy, and dark matter halo mass scaling relations, we've constructed several initial conditions for N-body simulations to test galaxy mergers in different mass regime, and investigated the evolution of binary supermassive black holes in merged galaxies. The stellar responses, velocity dispersions, and the projected surface

density profile has been studied, and the effect of the binary supermassive black holes on the observed systems has also been discussed.

PS58: Constraint on dust evolution processes by normal galaxies at high redshift

Wei-Chen Wang (NTU, ASIAA), Hiroyuki Hirashita (ASIAA), Kuan-Chou Hou (ASIAA)

The origin and evolution of dust in the Universe are linked to the production and recycling of gas and metals in galaxies. Recent ALMA observations of high-redshift normal galaxies have been providing a great opportunity to clarify the general origin of dust in the Universe, not biased to very bright special objects. In this work, to clarify what drives the dust enrichment, we use a theoretical model that includes a few major processes driving dust evolution in a galaxy and predict the dust emission flux based on radiative equilibrium modeling. The major processes include dust condensation in stellar ejecta, dust growth by the accretion of gas-phase metals, and supernova destruction. Using the dust emission flux detected in two high-z normal galaxies at $z > 6$ by ALMA as a constraint, we can get the range of the time-scales of the above mentioned processes. We find that extremely high condensation efficiency in stellar ejecta ($f_{\rm in} \geq 0.5$) can raise the dust luminosity rapidly enough to explain the observed ALMA flux in their early evolutionary stage, unless the dust destruction by supernovae in those galaxies is stronger than that in nearby galaxies. If we assume a condensation efficiency expected from theoretical calculations ($f_{\rm in} \leq 0.1$), strong dust growth (even stronger than assumed for nearby galaxies) is required. In this case, the stardust fails to explain the ALMA observations, so including strong dust growth is required to raise the dust abundance in a later epoch. Thus, we conclude that the ALMA detection of those normal galaxies provides a support for efficient dust growth by accretion as the major source of dust at $z > 6$.

PS59: Strong gravitational lensing by a deformed spherical system in Modified Newtonian Dynamics

Shi-Pu Yang (Institute of Astronomy, National Central University), Sih-Sian Fong (Institute of Astronomy, National Central University), Chung-Ming Ko (Institute of Astronomy, Department of Physics and Center for Complex Systems, National Central University)

Modified Newtonian Dynamics (MOND) is a viable alternative to dark matter paradigm for the missing mass problem in astronomy. However, plagued by its nonlinear nature, many analyses were done under highly symmetric assumptions. Recently, we developed a method to study slightly deformed spherical systems systematically. In this contribution, we present our analysis on strong gravitational lensing and provide some examples.

PS60: Properties of the C60-containing Planetary Nebula Lin49 in the Small Magellanic Cloud: Explaining the strong near-IR excess

Masaaki Otsuka (ASIAA)

We performed a detailed spectroscopic analysis of the fullerene C60-containing planetary nebula (PN) Lin49 in the Small Magellanic Cloud using the ESO/VLT XSHOOTER and the Spitzer/IRS instruments. From the more than 180 nebular emission lines detected in the spectra, we derived the nebular abundances of nine elements. We used the TLUSTY code to derive photospheric parameters of the central star. Lin49 is a C-rich and metal-deficient PN (Z$\sim$0.0006). The nebular abundances are in good agreement with the Asymptotic Giant Branch nucleosynthesis model for initially 1.25 Msun stars with Z = 0.001, from Fishlock et al. (2014). Using the TLUSTY theoretical synthetic spectrum of the central star to define the heating and ionising source, we constructed the photoionisation model with the CLOUDY code that matches the observed spectral energy distribution (SED) and the line fluxes in the UV to far-IR wavelength ranges simultaneously. We could not fit the $\sim$ 1-5 μm SED using a model with 0.005-0.1 μm-sized graphite grains and a constant hydrogen density owing to the prominent strong near-IR excess, while at other wavelengths the model gave reasonable fit to the observed

values. We argue that the near-IR excess might indicate either (1) the presence of very small grains in the form of small carbon clusters, small graphite sheets, or fullerene precursors, or (2) the presence of a high-density structure surrounding the central star. This work was supported by the research fund 104-2811-M-001-138 and 104-2112-M-001-041-MY3 from the Ministry of Science and Technology (MOST), R.O.C.

PS61: The statistical test of the slope of CO luminosity-linewidth correlation among low and high z galaxies

Yi-han Wu (NTHU), Tomotsugu Goto (NTHU)

It has been suggested that the correlation between CO luminosity and the line width can be used to measure luminosity distances to sub-millimeter galaxies (SMGs). However, these samples were biased towards high redshift. Thus, it was not entirely clear whether the correlation is free from redshift evolution or not. The goal in this study is to test if the L-FWHM correlation evolves with redshift. To accomplish the goal, we compiled published CO data from the literature, both at low and high redshifts, and examined the L-FWHM correlation. We found that the slope of the correlation of low-z samples is consistent with that of high-z ones after careful analysis, leaving a room for the cosmological application of the correlation.

PS62: Cross-Correlation of WISE Galaxies and Planck Temperature Sky Maps

Dani C.Y. Chao (NTHU), Tomotsugu Goto (NTHU)

In this study, we measure the cross-power spectra of a sample of galaxies from the Wide-field Infrared Survey Explorer (WISE) with CMB temperature data from the latest Planck data release. The galaxies sample is efficiently selected and carefully masked with a median redshift z=0.158, containing 2.3×10^6-3.7×10^6 galaxies with coverages at 1.4×10^4-$1.9 \times 10^4\ deg^2$. We carefully check the dependence on masks, component-separated methods, and galactic cuts, and from the cross-power spectra, we detect positive signals of integrated Sachs-Wolfe (ISW) effect, which is consistent with λCDM prediction at 1.09-2.47 σ. Our reliable result shows a sign of the existence of Dark Energy.

PS63: The Effect of Accretion Flow Dynamics on the Black Hole Shadow of Sgr A*

Hung-Yi Pu (ASIAA)

The shadow cast by the super-massive black hole at Galactic center, Sagittarius A* (Sgr A*), is expected to be imaged by the millimeter/submillimeter VLBI observations with the forthcoming, fully assembled Event Horizon Telescope (EHT). From the shadow image and observed data, can we constrain the flow dynamics? We suggest a positive answer to this question by comparing the resulting shadow images and visibilities for flow models with different dynamics, including the dynamics characterize a radiative inefficient accretion flow (RIAF), which is a favored accretion type for Sgr A* to explain its extremely dim luminosity. At near millimeter wavelengths, the emission is dominated by the accretion flow within several Schwarzschild radii. The redshifts due to the flow motions become important and distinguishable, resulting in different observable features.

PS64: AMiBA: Measuring Hot Gas Content Of Galaxy Clusters Via The Sunyaev-Zel'dovich Effect

Kai-Yang Lin (ASIAA), Ming-Tang Chen (ASIAA), Chih-Wei Locutus Huang (ASIAA), Patrick M. Koch (ASIAA), Yu-Wei Liao (ASIAA), Guo-Chin Liu (Dept. of Physics, Tamkang University), Hiroaki Nishioka (ASIAA), Keiichi Umetsu (ASIAA), Fu-Cheng Wang (Dept. of Physics, NTU), Jiun-Huei Proty Wu (Dept. of Physics, NTU)

The Yuan-Tseh Lee Array for Microwave Background Anisotropy (AMiBA) is an arcminute-scale interferometer that operates at 3mm wavelength in Hawaii. During 2011-2014, we have used AMiBA to measure the SZ effect from more

than 30 clusters. At least 12 of the clusters were robustly detected at more than 5σ, and we are able to determine the amount of hot gas in those clusters. In this talk, I will present our results on Abell 1689 and compare those with other SZE mesurements. Adopting the ”universal” pressure profile modeling, we show, however, that halo mass is not well constrained by AMiBA measurement alone, due to the large intrinsic scatter of the gas profile parameters.

PS65: The Evolutionary Status of the Prestellar Core L1498

Ren-Shiang Sung (NTHU), Shih-Ping Lai (NTHU), Laurent Pagani (Observatoire de Paris)

It is very important to investigate the initial conditions of gravitational collapse in order to understand star formation. Starless and prestellar cores are thus the best place for studying the physical properties at the beginning of star-forming stage. L1498 is an extensively studied prestellar core located in Taurus, and there are many species reported, such as HCO^+, NH_3, and N_2H^+. Pagani et al. (2013) showed that H_2D^+, which is the parent molecule of above molecules, is a key species for modelling the physical properties and evolutionary status of starless/prestellar cores. Here we present our JCMT H_2D^+ detections in L1498. Together with the previously obtained HCO^+, NH_3, and N_2H^+ data, we are able to derive the depletion and of CO and N_2 molecules, which gives a constraint on the age of L1498.

PS66: ALMA imaging of formic acid in Orion KL

Ya-Wen Yo 游雅雯 (National Taiwan Normal University, Department of Earth Sciences), Yi-Jehng Kuan 管一政 (National Taiwan Normal University, Department of Earth Sciences), Yo-Ling Chuang 莊幼玲 (National Taiwan Normal University, Department of Earth Sciences), Ming-Chi Chung 鍾明錡 (National Taiwan Normal University, Department of Earth Sciences), Yu-Fu Yeh 葉育甫 (National Taiwan Normal University, Department of Earth Sciences)

As the closest massive star-forming region ($\sim$ 450pc), Orion KL is one of the important laboratories for studying the forming processes of large organic molecules with its rich chemistry. The Orion KL hot molecular core consists of two major components, the hot core (HC) and the compact ridge (CR). Many organic molecular species have been detected in Orion KL, including formic acid which is an essential molecule prebiotically. Formic acid may be the precursor of some important complex organic molecules, such as methyl formate and glycine. Grain-surface chemistry is thought to be necessary for the formation of formic acid; hence, HCOOH is crucial for studying grain-surface chemistry (Andrade et al. 2013). Previous BIMA and SMA observations reported that formic acid is mainly concentrated toward a region near the CR (e.g. Liu et al. 2002). Theories predict that cis-HCOOH is the precursor of trans-HCOOCH3. Using the Atacama Large Millimeter/ submillimeter Array (ALMA), with its superb angular resolution and mighty sensitivity, we could observe Orion KL in much more detail. Compared with previous studies, a much finer spatial distribution of formic acid among HC and CR in Orion KL was obtained. In particular, we are able to distinguish the spatial distribution of cis-HCOOH from that of trans-HCOOH, which may help us to comprehend grain-surface chemistry in massive star-forming region.

PS67: Probing the Inner Region with Infall Motions of the Massive Protostar NGC 7538 IRS 1

Dino Chih-Chun Hsu (Institute of Astronomy, National Tsing Hua University), Vivien Huei-Ru Chen (Institute of Astronomy and Department of Physics, National Tsing Hua University)

The formation processes of massive stars are not fully-understood. Studying the infall motions in forming massive stars can help us further understand the processes. Infall motions are usually inferred from the inverse P-Cygni profiles, which mean the molecular line spectra with redshifted-absorption lines. Here we select the high-mass star forming region NGC 7538 IRS 1, which has been observed with the inverse P-Cygni profiles. In previous observations of the Submillimeter Array (SMA) in 1.3 mm wave band, the line emissions of the molecules remain spatially unresolved ($\sim 3'' \times 2''$). Using the SMA in compact and very extended configurations, we present the spatially resolved 0.87 mm continuum observations, with a high angular resolution ($\sim 0.4'' \times 0.3''$). For line observations, we select CH3OH ($7_(k) - 6_(k)$) and CH3CN

$(19_(k) - 18_(k))$ transitions to study the kinematics and dynamics of this region, and the multiple transitions in these lines can be used to probe the inner region of the source.

PS68: Young Stellar Jets and outflows in the M17 cloud complex

Manash Samal (National Central University), Wen-Ping Chen (National Central University)

We report identification of 50 jet and outflow sources in a sky region of $\sim$ 3.5 square deg toward the M17 cloud complex. These sources signpost star birth in molecular clouds. However, their studies at optical bands are limited by large extinction, and at molecular bands by resolution and field-of-view. We made use of UWISH data, a wide-field narrow-band imaging survey of molecular hydrogen at 2.12 μm (H2 1-0 S(1) line), to detect emission knots as jets and outflows. Only three of our emission knots were previously known as Spitzer extended green objects. Using Spitzer IRAC and MIPS data, we associate majority of the outflow sources to young stellar objects (YSO) as the exciting sources of our jets and outflows. The YSOs are typically bright at 24 microns, and the associated jets and knots have lengths 0.07 to 0.5 pc, with dynamical ages 10,000 to 100,000 years. The majority of the emission knots are associated with cold dust emission at 850 microns, and with the shock tracer SiO emission. Our study shows that recent star formation is not limited to the main HII region, but occurs at several sites in the complex. We discuss the evolutionary status of the M17 complex, in the context of the frequency of outflow and jet sources in comparison to other nearby cloud complexes.

PS69: ALMA Observes Large Spiral Accretion Flows in Young Multiple Protostellar System VLA1623

Pou-Ieng Cheong (National Chiao Tung University), Shih-Ping Lai (National Tsing Hua University), Tao-Chung Ching (National Tsing Hua University), Nadia Murillo (Leiden Observatory & MPE)

Multiple protostellar systems (MPSs) are common in low mass star forming regions. It is important to study their evolutions, especially in their early stage. In this work, we study a young MPS consisting of VLA1623A (Class 0), B (Class 0) and W (Class I) (hereafter VLA1623) using ALAM Cycle 2 observations of C18O (J=2-1). We discovered large spiral accretion flows around VLA1623 within $\sim$ 3000AU, and the accretion flow motion show that they are not coplanar and connect to VLA1623A&B. These spirals appear to be more complicated than the accretion flows previously discovered around L1521F. Detailed studies on the kinematics of these flows will help us advance our knowledge in the early accretion history of MPSs.

PS70: Examining the wiggle morphology of HH 211 via numerical simulations

Anthony Moraghan (ASIAA), Chin-Fei Lee (ASIAA), Po-Sheng Huang (ASIAA), Bhargav Vaidya (University of Torino)

Recent high-resolution high-sensitivity observations of protostellar jets have shown many to possess deviations to their trajectories. HH 211 is one such example where sub-mm observations with the SMA have revealed a clear reflection-symmetric wiggle. The most likely explanation is that the HH 211 jet source could be moving as part of a protobinary system. Here we test this assumption by simulating HH 211 through 3D hydrodynamic jet propagation simulations using the PLUTO code with a molecular chemistry and cooling module, and initial conditions based on an analytical model derived from SMA observations. Our results show the reflection-symmetric wiggle can be recreated through the assumption of a jet source perturbed by binary motion at its base, and that a regular sinusoidal velocity variation in the jet beam can be close to matching the observed knot pattern. However, a more complex model with either additional heating from the protostar, or a shorter period velocity pulsation may be required to account for enhanced emission near the source, and weaker knot emission downstream. Position velocity diagrams along the pulsed jet beam show a complex structure with detectable signatures of knots and show caution must be exercised when interpreting radial velocity profiles through observations. separate ice phases, polar and apolar, in the ancient past.

PS71: Searching the First Hydrostatic Core Candidates in Perseus and Serpens Molecular Cloud

Hao-Yuan Duan (Institute of Astronomy, National Tsing Hua University), Shih-Ping Lai (Institute of Astronomy, National Tsing Hua University)

First Hydrostatic Cores (FHCs) are the transient phase between prestellar cores and Class 0 protostars. It is a key to understand the earliest stage of star formation. Recently, some potential candidates of FHCs have been suggested, but not enough to enable statistical property studies. In this project, we identify FHCs candidates in Perseus and Serpens molecular cloud from CARMA Classy data. Since FHCs are characterized by weak infrared and (Sub-)millimeter continuum (low temperature $\sim$ few K), and its slow outflows (a few km/s). We first identify dense cores with N_2D^+ emission, and exclude the cores coincide with Spitzer sources. We next examine the Herschel dust continuum maps and the cores are excluded from our sample if the flux is higher than a greybody spectrum of 10K. The properties of these final candidates may be studied by future ALMA observations to confirm whether they are true FHCs.

PS72: Probing Internal Structures of a Compact Bipolar Outflow in NGC2023 MM1

Chang-Chun Chen (NTHU)

Protostellar outflows are ubiquitous phenomena and play a key role in removing excessive angular momentum in the star-forming process. They are believed to be materials entrained by the primary jets, which, however, cannot be observed directly in early embedded phases, such as Class 0 proto-stars. Recent observations of molecular outflows have revealed compact jet components with large velocity offsets, indicating their close connection to the underlying primary jets (Lee et al. 2015). Observations of molecular outflows and high-velocity components (HVCs) are the most feasible way to probe primary jet since they are materials entrained by the primary jets. We select the class 0 protostar NGC2023 MM1, which shows HVCs in previously unresolved JCMT observations. With the Submillimeter Array (SMA), we resolved, for the first time, the HVCs in this bipolar outflow in both CO (2-1) and SiO (5-4) lines with angular resolution of $4''$. Three continuum sources are identified on our 1.3mm continuum map. The source responsible for the bipolar outflow has a core mass $\sim 1M_{\odot}$. The bipolar outflow shows a highly collimated component near the source. In particular, the red-shifted HVCs have an extremely high-velocity offset of ~ 50 km/s and a spatial extent of $\sim 2pc$ away from the central star. These HVCs can reveal the mass-losshistory of central protostars.

PS73: GROWTHing the Lulin One-Meter Telescope

Chow-Choong Ngeow (Graduate Institution of Astronomy, National Central University)

"Global Relay of Observatories Watching Transients Happen" (GROWTH) is a NSF funded international collaborative project to perform follow-up observations of fast transients (with characteristic decay time less than a day; for example the light curve produced from a NS-NS merger, where NS=neutron star) and near Earth asteroids (NEA) discovered by the current intermediate Palomar Transients Factory (iPTF) and the up-coming Zwicky Transients Facility (ZTF) projects. Both iPTF and ZTF utilize the 48-inch robotic Schmidt telescope (known as the P48 Telescope) located at the Palomar Observatory to patrol the northern sky for discovering transients and NEA. Since the P48 Telescope will be observing the sky with a single broad-band filter in every clear nights (until $\sim$ 2020), follow-up observations with other telescopes around the world are needed to characterize the fast transients and track the NEA. Hence, the GROWTH telescopes network was established. Our institution, the IANCU, is participating the iPTF project and anticipates to join ZTF, therefore we have joined the GROWTH network to perform the necessary follow-up observations using the Lulin One-meter Telescope (LOT, owned and operated by IANCU). We plan to fully robotise the LOT in coming years such that follow-up observations can be carried out in an automatic fashion. We urge the current and potential LOT users in the future to discuss possible impact of such automatic LOT observations on their science with the author of this Poster.

PS74: A Systematic Investigation of the Lulin Site's Astro-climate

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For many projects related to photometry analysis, determination of atmospheric extinction is necessary in order to report the standard photometry of a target object. First-order extinction must normally be determined each night. The higher order terms are typically smaller, and arise because the extinction coefficients vary as a result of changes in the atmosphere and differences in the spectra or colors of the stars. Lulin observatory is the most actively done of the optical observations in Taiwan. Although the Lulin site's astro-climate have been done in 2005 [1], it might change a little bit in last ten years due to the environmental change. In this report, we present a statistical analysis of the parameters [2,3] describing the site's astro-climate including first order extinction coefficients, typical seeing, and statistics on the number of clear nights and average sky brightness, based on data gathered by Lulin one-meter telescope (LOT) and 40cm telescope (SLT) from the last two years at Lulin observatory. References [1]. D. Kinoshita et al. 2005. Characteristics and Performance of the CCD Photometric System at Lulin Observatory, C.J.A.A. 5, 315-326 [2]. Landolt, A. U. 1992, UBVRI Photometric Standard Stars in the Magnitude Range $11.5 < V < 16.0$ Around the Celestial Equator, AJ, 104. [3]. Gil-Hutton, R. 1993, The Atmospheric Extinction at Estacion Astronomica "Dr. Carlos Ulrrico Cesco". Rev. Mexicana Astron. Astrof., 25, p 91-94

PS75: The Effective Area Studing Of The COSI

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The Compton Spectrometer and Image (COSI) is a wide-field gamma-ray telescope whose energy range is from 0.2MeV to 10MeV. In this energy range, we use Compton scattering as the mechanism to detect incoming photons. By the design of the compact array of twelve cross-strip germanium detectors, each with 15mm x 80mm x 80mm in dimension, COSI can resolve cosmic gamma rays with very high spectral and spatial resolution. Currently, COSI is a balloon-borne telescope as a prototype for a future satellite mission. In this paper we present effective-area study for COSI. The effective area is a function of frequency and directions. With effective-area information obtained from simulations we show a mock exposure map based on the flight track of the SPB flight conducted by CSBF in New Zealand in 2015. Later with improved simulation, incorpo-rating calibration data, we will be able to produce the exposure map of the COSI SPB flight in spring 2016.

PS76: ALMA project and ARC-Taiwan team

ARC-Taiwan team (ASIAA)

We introduce ALMA project and ALMA regional center in Taiwan (ARC-T).

PS77: Band-1 Receiver Front-End Cartridges for Atacama Large Millimeter/submillimeter Array (ALMA): Design and Development toward Production

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The ALMA Band-1 receiver front-end prototype cold and warm cartridge assemblies, including the system and key components for ALMA Band-1 receivers have been developed and two sets of prototype cartridge were fully tested. Based on the cryogenically cooled broadband low-noise amplifiers and the cascode MHEMT mixers, the receiver noise temperature can be as low as 15 – 28K for pol-0 and 17 – 34K for pol-1. Other key testing items, including the beam pattern, pointing error, 5% power compression, image band suppression, the cross talk between orthogonal polarizations, the amplitude stability, the signal path phase stability, the IF output phase variation, the IF output power level, and IF output power flatness are all fully characterized and meet the specifications. The configuration of the cartridge is to be finalized in mid 2016 for future production. The prototype cartridge will be installed on site for further commissioning before the end of 2016.

PS78: Design, Fabrication, and Thermal Analysis of the 1.5 THz Multi-pixel HEB Mixers Receiver Cartridge

Chuang-Ping Chiu (Academia Sinica), Cheng-Shun Chen (National Taipei University of Technology), Yen-Ru Huang (Academia Sinica), Ming-Jye Wang (Academia Sinica)

We have designed and constructed the engineering model of the ALMA-type receiver cartridge with four-pixel hot-electron-bolometer (HEB) mixers. A cooled frequency multiplier (at 110K stage) is used to increase the output power of local oscillator (LO, f=1.45-1.55 THz). A power distributor (four beams) is designed and fabricated to provide LO power for each HEB mixer. The HEB mixer consists of a NbN ultrathin superconducting nano-bridge and a twin slot antenna (TSA). The HEB mixer is mounted on a Si lens with 10 mm diameter. Four Si lenses with HEB mixers are arranged in 2×2 format with a spacing of 18 mm. A large area dielectric beam splitter is used to couple the LO and signal power. Most of parts working at room temperature are integrated in a worm cartridge assembly. The whole assembly of the cartridge is completed, and the thermal deformation analysis of each stage is ongoing by ANSYS. Based on the simulation results, we can figure out the distortion of optics and compensate it in advance. We will test LO performance after loading the cartridge into the dewar. The cartridge is ready for cold testing. We expect that RF performance in single pixel configuration could be done by the end of this year.

PS79: Traditional Chinese Version of Zooniverse Projects in Astronomy

Mei-Yin Chou (ASIAA), EPO team (ASIAA)

Since 2013, ASIAA began collaborating with the Zooniverse, an internationally well-known web-based citizen science platform, to translate their projects. Through school lectures and teachers' workshops, the ASIAA outreach staff has officially become Zooniverse ambassadors bridging science and public in the Chinese world. Zooniverse initiated from the original Galaxy Zoo projects in 2009, and now has launched dozens of science projects. These projects include many disciplines such as astronomy, ecology, biology and humanity. ASIAA has translated six astronomy projects in Zooniverse into Traditional Chinese, and I will briefly introduce these projects and their science backgrounds.

PS80: A Design and Test of A DIY Spectrograph

Meng-Hsien Shen (National Taiwan Normal University), Yen-Chun, Luo Cho (National Taiwan Normal University), Hsieh-Hai Fu (National Taiwan Normal University), Chih-yu Lee (National Taiwan Normal University), Po-Yen Huang (National Taiwan Normal University)

For a developing astronomical program, a light and handy spectrograph is designed and made by the team of NTNU. This ethereal spectrograph include three main parts: a 25 mm Plossl ocular, a holographic diffraction grating film with 1000 lines/mm, and a slit with 20∼40 μm width. The spectrum of heaven objects are taken with a Canon EOS camera or a ImageSource CCD camera. For the stellar spectrum, an optical fiber with 50 μm, of THORLABS M14L02 were connected between the telescope and (spectrograph + camera). The spectrum of the Sun, the night sky, and two bright stars, were taken for the testing. The spectrum of Capella (mag. = 0.08, spectral type = G1III) and Sirius (mag. = -1.47, spectral type = A1V) are taken with exposure time, 2 second with ISO 6400 and 0.5 second with ISO 3200, respectively. The results showed that the spectrograph with an optical fiber is suitable for research work and teaching job.

PS81: Comparisons of the Sky Darkness in Taiwan

Kuei-Lan Chang (Taipei Astronomical Museum), Yeah-Chun Yang (Taipei Astronomical Museum), Albert Kong (National Tsing Hua University), Hun-Chin Lin (Lulin Observatory), Chu-Wing So (Department of Physics, The University of Hong Kong), Chun Shing Jason Pun (Department of Physics, The University of Hong Kong), Sze Leung Cheung (IAU Office of Astronomy Outreach, National Astronomical Observatory of Japan, Tokyo, Japan)

Taipei Astronomical Museum (TAM) is one of 15 monitoring stations of the Globe at Night - Sky Brightness Monitoring Network (GaN-MN). This is an international cooperation project which is supported by Department of Physics at the University of Hong Kong and IAU Office of Astronomy Outreach, and has continued for more than one year. There are 3 stations in Taiwan, including TAM, National Tsing Hua University and Lulin Observatory of National Central University. Interestingly, these 3 stations are located separately at big city, medium-sized city and countryside in a high mountain. In this poster, we compare the sky brightness conditions collecting by naked eyes and Sky Quality Meter - Lensed Ethernet (SQM-LE) last year at TAM. Besides, we also simply compare the darkest sky brightness of the 3 stations in Taiwan to see how difference the lights pollute their sky at these stations. The GaN-MN is supported by the Knowledge Exchange fund of The University of Hong Kong.

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