2015 Annual Meeting of

ASROC

中華民國天文學會2015年會員大會暨研究成果發表會

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大會議程與論文摘要

Conference Book

May 22~24, 2015

國立宜蘭大學

主辦單位：中華民國天文學會/協辦單位：國立宜蘭大學、中央研究院 天文及天文物理研究所
贊助單位：科技部、NIKON CORPORATION Glass Business Unit

背景圖片©王為豪

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General Information

會議資訊

1. 年會會場 / Meeting Venue

a. 國立宜蘭大學行政大樓/綜合教學大樓萬斌廳；

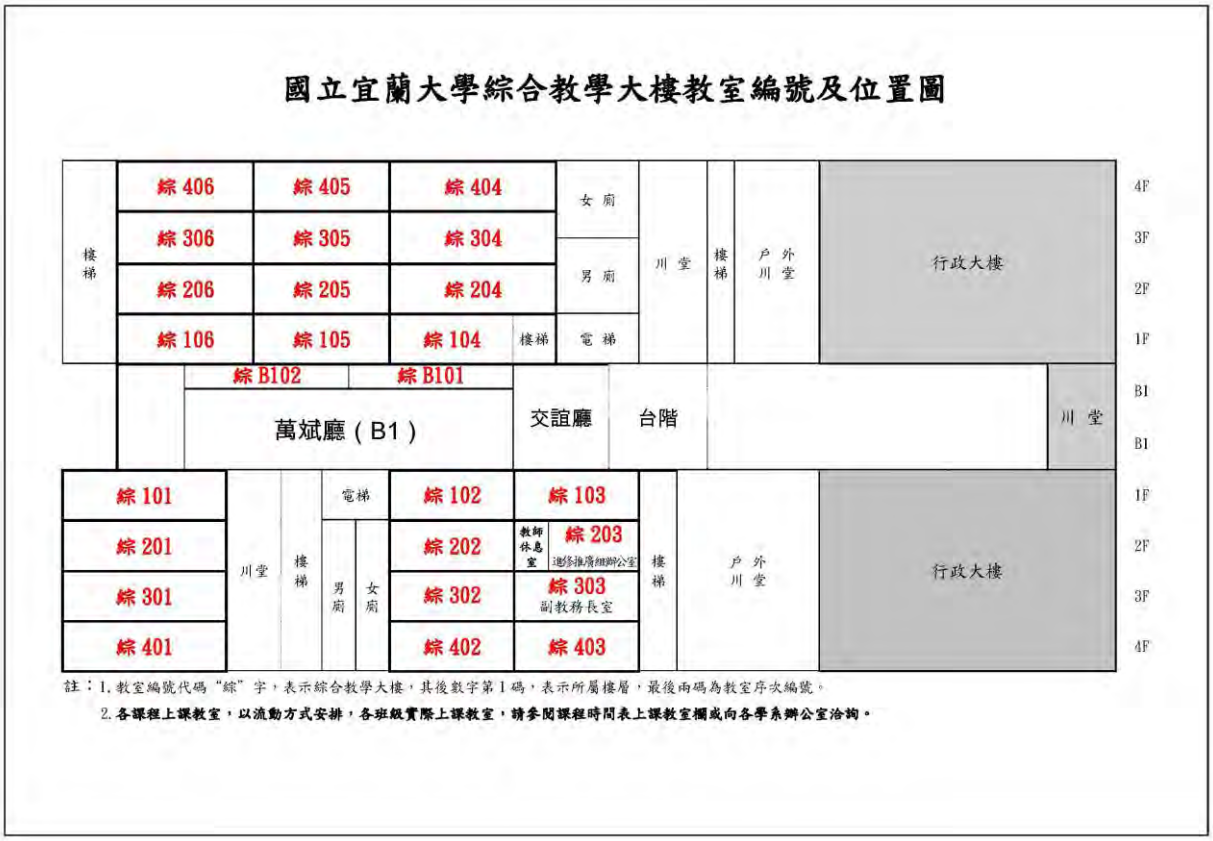
National Ilan University (NIU), Administrative Building Building Wan-Bin Hall

◎主會場: 地下一樓萬斌廳 ; Main Venue: B1 Wan-Bin Hall

◎科普演講（Session E2.1）: 綜101

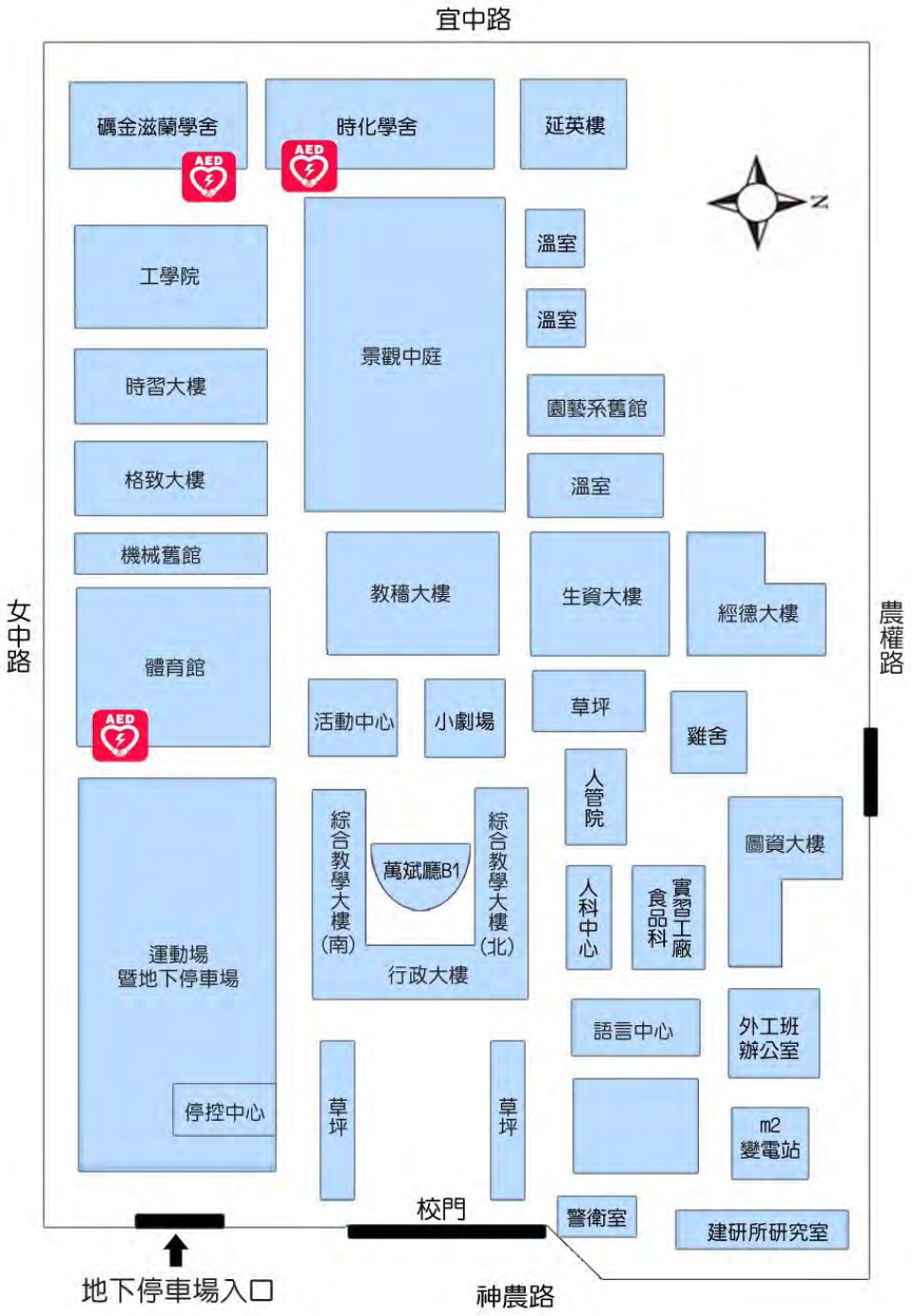
◎教育推廣活動地點(Outreach Activities) : 綜102

◎午餐區（Lunch Area）: 綜103



b. 國立宜蘭大學行政大樓/綜合教學大樓與停車場位置

Location of the General Classroom Building and Parking Areas in NIU Campus



c. 國立宜蘭大學位置

Location of the NIU

260宜蘭縣宜蘭市神農路一段1號

1, Sec. 1, Shen-Lung Road, I-Lan, 26047, Taiwan, R.O.C

2. 市區公車(小巴士) / Shuttle Transportation
http://www.niu.edu.tw/newniu/niu/aboutniu_location.html

(一) 751 (宜蘭轉運站－普門醫院)：伯朗咖啡館對面搭車
(二) 753 (宜蘭轉運站－雙連埤)：伯朗咖啡館對面搭車
(三) 771 (大福路口—宜蘭後火車站—金六結)：伯朗咖啡館前搭車
(四) 772 (新生國小－縣政中心)：伯朗咖啡館前搭車

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

帳號 username : NiuGuest
密碼 password : CRTBC-MQKNG
PDCLD-KKMJY
KSDOH-TJKZQ
DCDFO-XQCKZ

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 — 李太楓 (Typhoon Lee)、譚天獎 — 孫維新(Wei-Hisn Sun)
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. 會議相關活動內容與地理位置 / Location of Off-Site Events

a) 大會晚宴 Banquet
渡小月餐廳 Du Hsiaw Uyea Restaurant,
地址：宜蘭縣宜蘭市復興路三段58號
Add: No.58, Sec. 3, Fuxing Rd., Yilan City
Tel: 03-932-4414

b) 團體參訪 Group Tour
蘭陽博物館 LanYang Musuem

6. 器材與書籍展示 / Vendors

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) 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

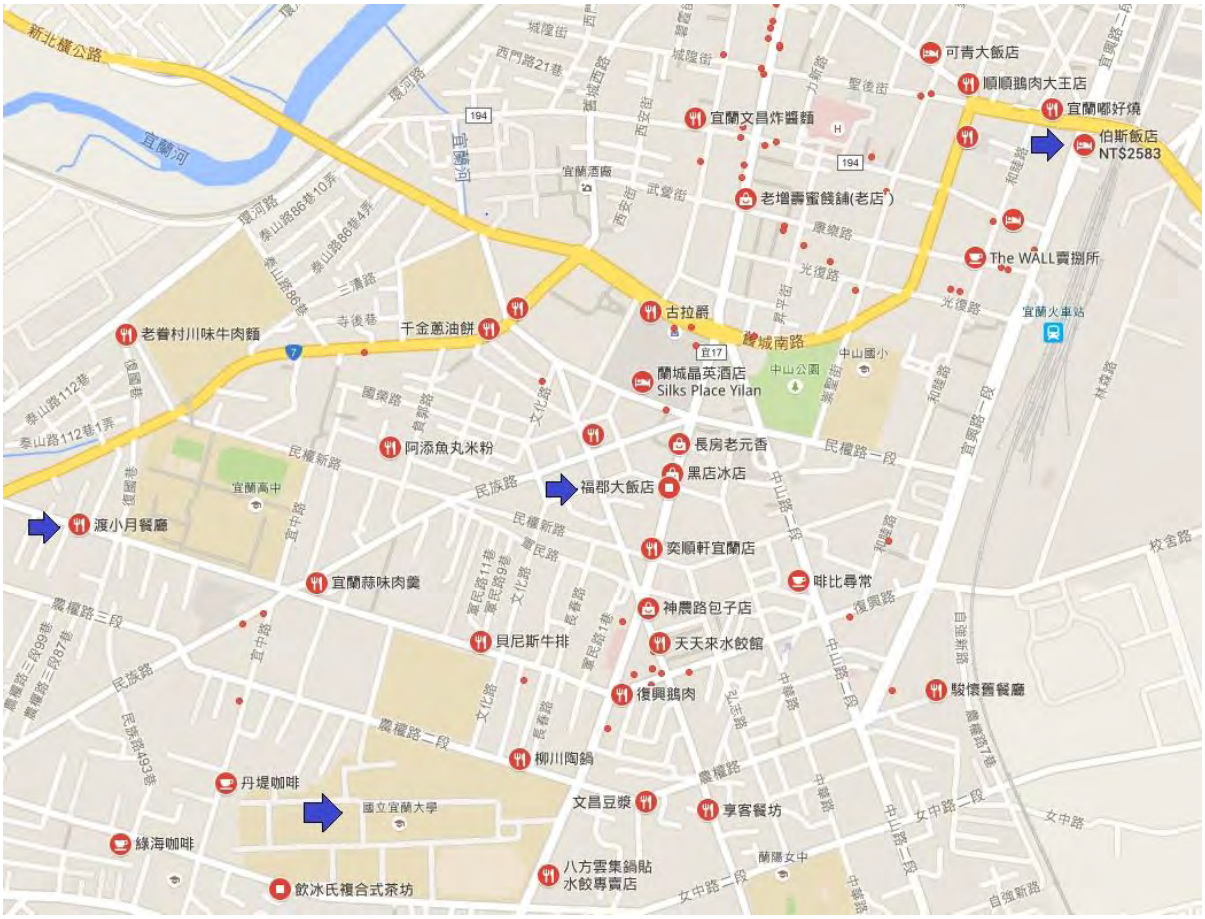
c) 永光儀器有限公司 NICK ENTERPRISE, CO. LTD
台北市羅斯福路二段198號, 電話：(02) 2365-5790

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) 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

7. 住宿旅館/ Hotels

福郡大飯店	宜蘭市神農路2段55號	03-9367799
伯斯飯店	宜蘭市宜興路一段366號	03-9312999
亞諾時尚溫泉戀館	宜蘭縣礁溪鄉仁愛路3號	03-9876611




亞諾時尚溫泉戀館 262宜蘭縣礁溪鄉仁愛路3號
國立宜蘭大學 260宜蘭縣宜蘭市神農路一段1號
立即出發
途經北宜公路/台9線
24 分
交通順暢時 20 分 · 顯示路況圖層
10.1 公里
詳細資訊
途經北宜公路/台9線和環河路
25分
41分
香檜溫泉大飯店
湯圍溪
溫泉路
源來如池
添喜海鮮小吃部
北海岸海鮮樓
德陽路
德陽路24巷
礁溪溫泉旅館
亞諾時尚溫泉戀館
和風嘉一館
北宜公路
仁愛路
仁愛路15巷
好窩溫泉住宿
中冠礁溪大飯店
一路香海鮮
宜蘭酒之鄉
礁溪心曠神怡溫泉渡假飯店Living Water...
成功路18巷
仁愛路66巷
礁溪艾瑪溫泉渡假行館
礁溪.冠翔世紀溫泉會館
湯圍溝溫泉公園
礁溪路五段108巷
冒煙的石頭溫泉度假旅館
天泡溫泉度假行館
美順軒礁溪店
信義路34巷
合鴨米灶腳
多愛溫泉會館
有鱻煮私房小吃
礁溪路五段90巷
仁愛路90巷
礁溪路五段23巷
德陽宮
信義路
礁溪路五段
湯圍溝
礁溪路五段100巷
皇泰大飯店
宜蘭礁溪悠朵養生館
郭媽媽純手工韓式養生溫泉泡菜館
東森房屋
阿和烤肉

Program
會議議程

Day 1 (May 22, Friday)	第一天（5月22日, 星期五） **Venue /地點：NIU/國立宜蘭大學 行政大樓萬斌廳**		
13:00 – 14:00	**Registration 註冊報到**		
14:00 – 14:15	**Opening remarks 大會開幕致詞** **Chair: You-Hua Chu** Welcome remark by Wei-Ming Chen (Dean of Student Affairs, NIU) 來賓致詞：陳偉銘 學務長（國立宜蘭大學）		
14:15 – 16:00	**Scientific oral session S1 科學論文宣讀 S1 Chair: Chorng-Yuan Huang** **Extragalactic**		
S1.1 **14:15 – 14:30**	A class of low-mass but extremely star-forming galaxy at z ~ 2	Chen Fatt Lim	NTNU
S1.2 **14:30 – 14:45**	z>6.5 QSOs from PS1 optical and WISE mid-infrared surveys	E. Koptelova	NTHU
S1.3 **14:45 – 15:00**	Color Variability of Red QSOs	I-Chenn Chen	NCU
S1.4 **15:00 – 15:15**	Star formation in central region of AGNs	Mengchun Tsai	NCU
S1.5 **15:15 – 15:30**	On detecting halo assembly bias with galaxy populations	Yen-Ting Lin	ASIAA
S1.6 **15:30 – 15:45**	Clustering analysis and large-scale environments of galaxies at 0<z<3	Lihwai Lin	ASIAA
S1.7 **15:45 – 16:00**	Evolution of dust abundance and grain size distribution in galaxies	Hiroyuki Hirashita	ASIAA
16:00 – 16:30	**Coffee break and poster installation 茶敘及壁報張貼**		
16:30 – 18:30	**Scientific oral session S2 科學論文宣讀 S2 Chair: Yi-Nan Chin** **Instrumentation and star formation**		
S2.1 **16:30 – 16:45**	SED Machine: The proper instrument for astronomical objects classification	Hsing Wen Lin	NCU
S2.2 **16:45 – 17:00**	Nikon glass development	Minako Azumi	Nikon
S2.3 **17:00 – 17:15**	OIR projects in ASIAA	Shaing-Yu Wang	ASIAA
S2.4 **17:15 – 17:30**	The Role of the Magnetic Field in Star Formation	Patrick Koch	ASIAA
S2.5 **17:30 – 17:45**	Magnetic field mapping in star-forming regions: NGC1893 and Carina nebula	E. Chakali	NCU
S2.6 **17:45 – 18:00**	Signs of Magnetic Braking in a Class 0 Protostar B335	Hsi-Wei Yen	ASIAA
S2.7 **18:00 – 18:15**	Magnetic Field Structure in the Flattened Envelope and Jet in the Young Protostellar System HH 211	Chin-Fei Lee	ASIAA
S2.8 **18:15 – 18:30**	The structural transition of the NGC 6251 jet	Chihyin Tseng	ASIAA
18:30 – 20:30	**Welcome reception and poster session P1 歡迎茶會及壁報欣賞 P1**		
19:00 – 20:30	**MOST policy discussion** **Chair: Albert Kong** **Room102**		

Day 2 (May 23, Saturday)	第二天（5月23日, 星期六） **Venue /地點：NIU/國立宜蘭大學 行政大樓萬斌廳**		
08:30 – 09:30	**Plenary talk (I)　大會講演(I)（科研類）** **Chair: Yi-Jehng Kuan** "*Gaia Mission and Status*" Dr. Timo Prusti (European Space Agency)		
09:30 – 10:30	**Scientific oral session S3　科學論文宣讀 S3　Chair: Yi-Jehng Kuan** **Stars and star formation**		
S3.1 **09:30 – 09:45**	Searching for Possible Members of Nearby Moving Groups in the Kepler Field	Chang Yao Chen	NCU
S3.2 **09:45 – 10:00**	Photometry and Polarization of the UXor Type Young Star GM Cep	Po-Chieh Huang	NCU
S3.3 **10:00 – 10:15**	Influence of Interstellar FUV Radiation on the Abundance Ratio of ^{13}CO to C^{18}O in L 1551	Sheng-Jun Lin	NTHU
S3.4 **10:15 – 10:30**	On the Circumbinary Ring, Circumstellar Disks, and Accretion Flows in Binary System	Ya-Wen Tang	ASIAA
10:30 – 11:00	**Coffee break, group photo and poster session P2** **茶敘、與會來賓團體照及壁報欣賞 P2**		
11:00 – 12:30	**Scientific oral session S4　科學論文宣讀 S4　Chair: Sheng-Yuan Liu** **Cosmology**		
S4.1 **11:00 – 11:15**	A new distance measure using the correlation between CO luminosity and its line width	Tomo Goto	NTHU
S4.2 **11:15 – 11:30**	Deblending Foreground CO Emission in a CII Intensity Mapping Experiment	Yun-Ting Cheng	ASIAA
S4.3 **11:30 – 11:45**	Cross-correlation of WISE galaxies and Planck temperature sky maps	Dani C.Y. Chao	NTHU
S4.4 **11:45 – 12:00**	Determination of 21 com Brightness Fluctuations at z~0.8 in Autocorrelation.	Chun-Hao To	ASIAA
S4.5 **12:00 – 12:15**	Impact of Gravitational Slingshot of Dark Matter on Galactic Halo Profiles	Yao-Yu Lin	NTU
S4.6 **12:15 – 12:30**	The Inner Mass Distribution of the Gravitational Lens SDP.81 from ALMA Observations	Kenneth Wong	ASIAA
12:30 – 13:30	**Lunch break and poster session P3　午餐及壁報欣賞 P3**		
13:30 – 18:30	Group discussions　分組討論/自由參訪		
18:30 – 20:30	**Banquet　大會晚宴**		

Day 3 (May 24, Sunday) 第三天（5月24日, 星期日） **Venue /地點：NIU/國立宜蘭大學 行政大樓萬斌廳**			
08:30 – 09:30	**Plenary talk (II)　大會講演(II)（科普類）　Chair: You-Hua Chu** *" The Rosetta Mission - Past, Present, and Future"* Dr. Joel Parker (Southwest Research Institute)		
09:30 – 10:50	**ASROC Awards Presentation Ceremony　頒發第二屆天文學會獎** **Chair: You-Hua Chu**		
09:30 – 09:35	Presentation of the 2nd ***Heaven Quest Award*** and ***Heaven Talk Award*** 頒發天文學會第二屆「天問獎」及「譚天獎」		
09:35 – 09:50	***Heaven Quest Award*** acceptance speech　「天問獎」得獎致辭 Academician Typhoon Lee (ASIAA &ASIES) 李太楓院士(中研院天文所/地球所)		
09:50 – 10:05	***Heaven Talk Award*** acceptance speech　「譚天獎」得獎致辭 Prof. Wei-Hsin Sun (NMNS&NTU)　孫維新館長(科博館/台灣大學)		
10:05 – 10:45	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		
10:45 – 11:05	**Coffee break and poster session P4　茶敘及壁報欣賞 P4**		
11:05 – 12:20	**Scientific oral session S5** **科學論文宣讀 S5**	**Education & Public Outreach session E1** **天文教育及業餘天文活動報告 E1**	
Scientific oral session S5　科學論文宣讀 S5　Chair: Daisuke Kinoshita **Solar system**			
S5.1 **11:05 – 11:20**	The role of the O2/H2 atmosphere of the main rings in the Saturnian system	Wei-Ling Tseng	NTNU
S5.2 **11:20 – 11:35**	The discovery of moving objects in Subaru HSC project	Ying-Tung Chen	ASIAA
S5.3 **11:35 – 11:50**	Asteroid Spin-Rate Study using the Intermediate Palomar Transient Factory	Chan-Kao Chang	NCU
S5.4 **11:50 – 12:05**	The Origin of Bimodal Color Distribution of Centaurs May Relate to the Inclination of the Source Region	Zong-Fu Sie	NCU
S5.5 **12:05 – 12:20**	Modeling Highly Irradiated Gaseous Exoplanets with Stellar Evolution Code MESA	Howard Chen	波士頓大學
Education & Public Outreach session E1　天文教育及業餘天文活動報告 E1 **Chair: Yao-Huan Tseng　Room 102**			
E1.1 **11:05 – 11:20**	Staging astronomy: from theatre shows to planetariums	Hsiang-Fu Huang	University College London
E1.2 **11:20 – 11:35**	臺灣地區高中職學生天文學習態度網路問卷調查	Xin-Yi Wang	TAM
E1.3 **11:35 – 11:50**	Communicating Astronomy with the Public via Social Media	Chia-Ling Hu	TAM
E1.4 **11:50 – 12:05**	Outreach Application of Citizen Science Projects in Astronomy	Mei-Yin Chou	ASIAA
E1.5 **12:05 – 12:20**	天文觀測項目於業餘社群推廣之探究－以疏散星團為實作案例	Tzu-Hua Chiu	NTNU

12:20 – 13:30	**Lunch break and poster session P5　午餐及壁報欣賞 P5**		
13:30 – 16:00	**Scientific oral session S6 科學論文宣讀 S6**	**Education & Public Outreach session E2 天文教育及業餘天文活動報告 E2**	
Scientific oral session S6　科學論文宣讀 S6　Chair: Albert Kong High energy and stars			
S6.1 **13:30 – 13:45**	Origin of energetic phenomena in the superbubble 30 Dor C	Chia-Chun Lu	ASIAA
S6.2 **13:45 – 14:00**	High Energy Emission from Pulsar Magnetospheres	Kouichi Hirotani	ASIAA
S6.3 **14:00 – 14:15**	Short-term variability in low mass X-ray binaries as seen by XMM-Newton	Holger Stiele	NTHU
S6.4 **14:15 – 14:30**	Detections of 7 faint gamma-ray pulsars with the Fermi – LAT	Xian Hou	NTHU
S6.5 **14:30 – 14:45**	Pulsar detection of COSI in Low Earth Orbit	Chao-Hsiugn Tseng	NTHU
S6.6 **14:45 – 15:00**	The unique role of gamma-rays in transitional pulsar systems	Pak Hin T. Tam	廣州中山大學
S6.7 **15:00 – 15:15**	Identification of a proto-brown dwarf binary system	Tien-Hao Hsieh	NTHU
S6.8 **15:15 – 15:30**	In Situ Dust Formation around Isolated Be Stars with Large Infrared Excess	Chien-De Lee	NCU
S6.9 **15:30 – 15:45**	Dynamics of Elliptical Galaxies with Planetary Nebulae in MOdified Newtonian Dynamics	Yong Tian	NCU
S6.10 **15:45 – 16:00**	Shaping Multipolar Pre-Planetary Nebulae by Multi-Epoch Bullets	Po-Sheng Huang	ASIAA
Education & Public Outreach session E2　天文教育及業餘天文活動報告 E2 Chair: Shiang-Yu Wang　Room 101			
E2.1 **14:00 – 16:00**	外星生物是蝦咪碗糕? (Invited)	Yi-Nan Chin	TKU
16:00 –	**Departure　賦歸**		

Poster Presentation

壁報論文目錄

A. Solar System

PS1	**The Activity of Comet 67P/Churyumov-Gerasimenko from late-2014 to early-2015** Zhong-Yi, Lin (NCU), Wing-Huen, Ip (NCU), Jui-Chi, Lee (NCU), the OSIRIS team (MPS)g-Wen Lin (NCU), Wing-Huen Ip (NCU)
PS2	**The Size Frequency of Boulders on Comet 67P/Churyumov -Gerasimenko** Jui-Chi Lee (NCU), Maurizio Pajola (Centro di Ateneo di Studi ed Attivitá Spaziali), Zhong-Yi Lin (NCU), Wing-Huen Ip (NCU)
PS3	**DSMC Simulations of Gas Outflow and Photochemical Processes in the Coma of Comet 67P/Churyumov-Gerasimenko** Ian-Lin Lai (NCU), Cheng-Chin Su (NCTU), Wing-Huen Ip (NCU), Chen-En Wei (NCU), Jong-Shinn Wu (NCTU), Ming-Chung Lo (NCTU), Ying Liao (Physikalisches Institut,University Bern), Nicolas Thomas (Physikalisches Institut,University Bern)
PS4	**Search for the mass ejection activity on fast rotating asteroid using PTF data** Yu-Chi Cheng (NCU), Chan-Kao Chang (NCU), Henry Hsieh (ASIAA), Wing-Huen Ip (NCU), Chow-Choong Ngeow (NCU)
PS5	**Time Variability of Titan's Ionosphere Revisited** Jen-Kai Hsu (NCU), Wing-Huen Ip (NCU), Rebecca Perryman (SWRI), J.H. Waite (SWRI)
PS6	**Search for serendipitous Oort cloud object occultation in X-rays** Jie-Rou Shang (NTHU), Chih-Yuan Liu (NTHU), Hsiang-Kuang Chang (NTHU)
PS7	**The preliminary results of searching a possible unseen planet beyond Neptune** Zong-Fu Sie (NCU), Wing-Huen Ip (NCU)
PS8	**ALMA imaging of the Jovian moon Callisto** Ya-Wen Yo (NTNU), Yi-Jehng Kuan (NTNU), Ming-Chi Chung (NTNU)
PS9	**The contribution of the atomic H produced from the main rings to the Cassini UVIS H Ly-α intensity maps in 2005** Han-Wei Hsiao (NTNU), Wei-Ling Tseng (NTNU)
PS10	**ALMA Observations of Organic Molecules in Comet C/2012 F6 (Lemmon)** Yo-Ling Chuang (NTNU), Yi-Jehng Kuan (NTNU)
PS11	**The long-term orbital evolution of dust particles ejected from the Uranian rings** Cheng Chen (NCU), Wing-Huen Ip (NCU)

B. Star Formation

PS12	**Star-disk interaction of brown dwarfs/white dwarfs as an analog of the Saturnian rings** KUN-CING PAN (NCU), WING-HUEN IP (NCU)
PS13	**Polarized Dust Emission in the Massive Protocluster W3 IRS5** Vivien Chen (NTHU), Chat Hall (CfA), Qizhou Zhang (CfA)
PS14	**Large grains in the protostellar envelope: where do they come from?** Yi Hang Valerie Wong (NCU), Hiroyuki Hirashita (ASIAA)
PS15	**Very Low Luminosity Objects in Taurus Molecular Cloud** Ren-Shiang Sung (NTHU), Shih-Ping Lai (NTHU)
PS16	**Exploring the Outflow Kinematics in the Cluster-Forming Region W3 IRS5** Chang-Chun Chen (NTHU)
PS17	**Numerical simulations of HH211: A reflection-symmetric bi-polar outflow**

	Anthony Moraghan (ASIAA)
PS18	**Exploring Properties of Molecular Outflows form Class 0 Protostars with The Unified Wind Model** Liang-Yao Wang (NTU/ASIAA), Hsien Shang (ASIAA), Tzu-Yang Chiang (ASIAA), Ruben Krasnopolsky (ASIAA)
PS19	**The Proper Motion of the Highly Collimated Protostellar Jet HH211** Kai-Syun Jhan (NTU)
PS20	**Magnetic Field Structure Of The Filamentary Cloud IC5146** Jia-Wei Wang (NTHU), Shih-Ping Lai (NTHU), Chakali Eswaraiah (NCU), D.P. Clemens (Boston University), Wen-Ping Chen (NCU), Anil K. Pandey (Aryabhatta Research Institute of Observational-Sciences)

C. Stars, Star Clusters and Interstellar Dust

PS21	**Discovery of the Youngest T-type Brown Dwarfs** CHEN, Wen-Ping (NCU), CHIANG, Po-Shih (NCU), LALCHAND, Bhavna (NCU), CHEN, Pei-Yi (NCU)
PS22	**Hyperflare activities of M dwarfs in the Kepler data archive** Han-Yuan Chang (張瀚元) (NCU), Chi-Ju Wu (吳季儒) (NCU), Li-Ching Huang (黃立晴) (NCU), Wing-Huen Ip (葉永烜) (NCU)
PS23	**The Parallax Program Using a Selected Open Cluster, NGC 7142** Yi-Hsiang Hsu (NTNU), Hsieh-Hai Fu (NTNU)
PS24	**Molecules in Planetary Nebula NGC 6302 – III** Tatsuhiko Hasegawa (ASIAA), Sun Kwok (HKU)
PS25	**Light-Curve Synthesis of a Semi-Detached Eclipsing Binaries, DD Mon** Yen-Chun, Luo Cho (NTNU), Hsieh-Hai, Fu (NTNU)
PS26	**Physical Properties of G-type Kepler Eclipsing Binaries** Li-Ching Huang (NCU), Wing-Huen Ip (NCU), A-li Luo (NAOC), Han-Yuan Chang (NCU)
PS27	**Superorbital Variation of Catalysmic Variables with Synoptic Surveys** Ting-Chang Yang (NCU), Yi Chou (NCU), Chin-Ping Hu (NCU), Yi-Hao Su (NCU)
PS28	**New Template Light Curves of Cepheid Variables Based on PS1 PAndromeda Data Using PEGASUS Method** I-Ling, Lin (NCU), Chow-Choong, Ngeow (NCU)
PS29	**Refining period of a Mira in M33 with incomplete light curve** Jia-Yu Ou (NCU), Chow-Choong Ngeow (NCU)
PS30	**Interactions between young Galactic supernova remnants and nearby molecular clouds traced by CSO CO (J=2-1)** Po-Sheng Ou (ASIAA)

D. High Energy Astronomy

PS31	**The updated orbital ephemerides of low mass X-ray binary 4U 1323-62 and 4U 1254-69** Po-Sheng Chuang (NCU), Yi Chou (NCU), Chin-Ping Hu (NCU), Ting-Chang Yang (NCU), Yi-Hao Su (NCU), Nai-Hui Liao (NCU), Hung-En Hsieh (NCU), Ching-Ping Lin (NCU), Vaidehi Varma (NCU)
PS32	**The orbital and spin parameters of the partial eclipsing X-ray binary X1822-371** Hung-En Hsieh (NCU), Yi Chou (NCU), Chin-Ping Hu (NCU), Ting-Chang Yang (NCU), Yi-Hao Su (NCU), Vaidehi Varma (NCU), Ching-Ping Lin (NCU), Po-Sheng Chuang (NCU), Nai-Hui

	Liao (NCU)
PS33	**Characterizing Intermittency of Type-C Low-frequency Quasi-periodic Oscillations in XTE J1550-564** Yi-Hao Su (NCU), Yi Chou (NCU), Chin-Ping Hu (NCU), Ting-Chang Yang (NCU), Vaidehi Varma (NCU), Hung-En Hsieh (NCU), Ching-Ping Lin (NCU), Po-Sheng Chuang (NCU), Nai-Hui Liao (NCU)
PS34	**Fermi LAT observation of the Nova Sagittarii 2015 No. 2** K. L. Li (NTHU), Albert K. H. Kong (NTHU), Thomas P. H. Tam (Sun Yat-sen University)
PS35	**The Orbital and Spin parameters of LMC X-4** Ching-Ping Lin (NCU), Yi Chou (NCU), Chin-Ping Hu (NCU), Ting-Chang Yang (NCU), Yi-Hao Su (NCU), Hung-En Hsieh (NCU), Po-Sheng Chuang (NCU), Nai-Hui Liao (NCU), Vaidehi Varma (NCU)
PS36	**Search for Variability of the Optical Counterparts Associated with Gamma-ray Millisecond Pulsar Candidate 2FGL J1120.0-2204** Chin-Ping Hu (NCU), David Chung-Yue Hui (Chungnam National University, Korea), Mike Ting-Chang Yang (NCU), Yi Chou (NCU), Albert Kong (NTHU), Lupin Chun-Che Lin (ASIAA), Wing-Huen Ip (NCU)
PS37	**THE LONG-TERM X-RAY VARIABILITY OF SUPERNOVA 2004AM IN M82** Ruolan Jin (NTHU), Albert Kong (NTHU), Yi-Kuan Chiang (UT Austin), K. L. Li (NTHU)
PS38	**A search for candidates of variable gamma-ray pulsars** Justin C. H. Wu (NTHU), David C. Y. Hui (Chungnam National University, Korea), Albert K. H. Kong (NTHU)
PS39	**Generation of Energetic Neutral Atoms (ENAs) from Planets to Exo-planets** ChingHua Shen (NCU), Wing-Huen Ip (NCU)

E. Extragalactic Studies

PS40	**Relation between spatially resolved Star Formation Rate and Stellar Mass of galaxies with MaNGA** Lin, Jing-Hua (ASIAA & NTU), Lin, LiHwai (ASIAA)
PS41	**Interaction-triggered star formation and its spatial distribution** Chin-Hao Hsu (ASIAA), Lihwai Lin (ASIAA)
PS42	**The color distribution and stellar mass of elliptical galaxies in the Sloan Digital Sky Survey** Chen-Hung Chen (NCU), Chung-Ming Ko (NCU)
PS43	**Dust enrichment history constrained by extinction curves in nearby galaxies** Kuan-Chou Hou (ASIAA/NTU), Hiroyuki Hirashita (ASIAA)
PS44	**The relation between barred spiral galaxies and their environments** Yin-Fang Wang (NCU), Chorng-Yuan Hwang (NCU)
PS45	**Observational properties of non-elliptical brightest cluster galaxies** Yen-Ting Li (NTNU), Lin-Wen, Chen (NTNU)
PS46	**Non-spherical problems in MOdified Newtonian Dynamics** Chung-Ming Ko (NCU)
PS47	**Morphology of Seyfert galaxies** YEN-CHEN CHEN (NCU), Chorng-Yuan Hwang (NCU)
PS48	**High Redshift Red QSOs** Chia-Hsiang Huang (NCU), Chorng-Yuan Hwang (NCU)
PS49	**The Physical Structures of Type Ia Supernova Remnant N103B**

	Chuan-Jui Li (NTU, ASIAA), You-Hua, Chu (ASIAA, UIUC), Robert Gruendl (UIUC)
PS50	**Multi-bands Study of iPTF13dhz - A Type Ia Supernova with strong circumstellar medium interaction** Kuiyun Huang (NTNU/NCU), Yuji Utata (NCU), Wing Ip (NCU), iPTF team (iPTF)
PS51	**An Adaptive Homomorphic Aperture Photometry Algorithm for Merging Galaxies** Jen-Chao Huang (NCU)
PS52	**Detection of Baryonic Acoustic Oscillation Signals with Pan STARRS** Yi-han Wu (NTHU), Tomotsugu Goto (NTHU)
PS53	**Probing the Evolution of Molecualr Gas Abundance with the YTLee Array** Lin, Kai-yang (ASIAA)
PS54	**Investigating the Mass-to-Light Ratio in Galaxies** Ting-Yun Cheng (NTHU), Ing-Guey Jiang (NTHU)

F. Instrumentation

PS55	**The Palomar Transient Factory (PTF) and iPTF: An Introduction and Scientific Activities at the National Central University** Chow-Choong Ngeow (NCU), Chan-Kao (Rex) Chang (NCU), Wing-Huen Ip (NCU)
PS56	**COmpton Spectrometer and Imager(COSI)** Chien-Ying Yang (NTHU), Hsiang-Kuang Chang (NTHU), COSI collaboration (COSI collaboration)
PS57	**Development of Asteroid Photometric Phase Curve Pipeline for Palomar Transient Factory Data** Kinoshita Daisuke (NCU)
PS58	**NCU Summer Boot Camp: Big Data Astronomy and Application** Hsing Wen Lin (NCU), Wing Huen Ip (NCU)
PS59	**TAOS2 Progress and Occultation Simulation** Chung-Kai Huang (NCU/ASIAA), Zhi-Wei Zhang (ASIAA), Shiang-Yu Wang (ASIAA)
PS60	**Studies on Angular and Polarization Correlations of Double-Excitation Resonances of Mg** Cheng-Liang Lu (MKSHS), Hsin-Chang Chi (NDHU), Keh-Ning Huang (NTU)

Heaven Quest and Haven Talk Awardee

「天問獎」與「譚天獎」得獎者介紹

2015 Heaven Quest Awardee: Academician Typhoon Lee

Dr. Lee graduated from the Physics Department of National Tsing Hua University in 1970 and obtained her Ph.D. in Astronomy from the University of Texas at Austin in 1977. After working for the Enrico Fermi Institute for Nuclear Studies, University of Chicago as a Robert McCormick Postdoctoral Fellow (1977-1979), he served as a staff member in the Department of Terrestrial Magnetism, Carneige Institute of Washington (1979-1983). He came back to Taiwan in 1984 and was a Research Fellow at the Academia Sinica Institute of Earth Sciences (ASIES; 1984-2005). Dr. Lee was elected Academician, Academia Sinica in 2000, and is currently a Distinguished Research Fellow of ASIES (2006~present) and Adjunct Distinguished Research Fellow of Academia Sinica Institute of Astronomy & Astrophysics (ASIAA) (2006~present). He served as the Director of the Preparatory Office of ASIAA (1993-1994, 1996-1997), the Deputy Director (1987-1989) and the Director (2000-2004) of the ASIES. Dr. Lee has made great contributions to the development of astronomy in Taiwan, including promoting the establishment of ASIAA and the Institute of Astronomy of National Tsing Hua University. He specializes in isotope geochemistry and nuclear astrophysics. He has led TAOS project and TAOS-2 project of ASIAA, which search for Trans-Neptunian objects (TNOs) through stellar occultations. By studying the TNOs, we can better understand the early history of our solar system. In recent years, he has promoted the NanoSIMS project, a collaboration among ASIAA, ASIES, and AS Research Center for Environmental Changes, to acquire and install the nano secondary ion mass spectrometry for analyzing the isotopic ratios of solar grains in cometary dust particles or meteorites. This new laboratory will combine astrophysical studies of star formation processes with laboratory measurements of samples retrieved from space.

His Honors and Awards include:

- Academician, Academia Sinica (2000)
- Foreign Honorary Member, American Academy of Arts and Sciences (1999)
- President, ASROC (1991-1993)
- Chief editor, Proceedings of the Geological Society of China (1988-1990)
- Outstanding Scholarship Award, Foundation for the Advancement of Outstanding Scholarship (1998~2003)
- Outstanding Researcher Award, National Science Council, R.O.C. (1988~1990)
- Fellow, Meteoritical Society (1988)
- Outstanding Researcher Award, National Science Council, R.O.C. (1985~1987)
- Trumpler Award (best astrophysics Ph.D. thesis N. America), Astronomical Society of the Pacific (1977)

In 2015, the Astronomical Society of the Republic of China presents the 2nd Heaven Quest Award to Academician Typhoon Lee for his distinguished contribution to astronomical research.

第二屆「天問獎」得獎人中央研究院李太楓院士簡介

李院士 1977 年在加州理工的 G. J. Wasserburg 教授門下，取得德州大學奧斯丁校區天文博士。曾於芝加哥大學費米研究所任 R. McCormick 博士後研究員 (1977-1979) ，並於美國華盛頓卡內基研究院地磁部任研究員 (1979-1983) 。1984 年起任職於中央研究院地球科學研究所迄今。現為中央研究院地球科學研究所特聘研究員，亦為中央研究院天文及天文物理研究所合聘之特聘研究員，並曾兼任中央研究院天文及天文物理研究所籌備處主任 (1993-1994、1996-1997) 、中央研究院地球科學研究所副所長 (1987-1989) 及所長 (2000-2004) ，學術專長為同位素地球化學及原子核天文物理。李院士長期致力於推動臺灣的天文發展並有卓越貢獻，包括共同促成成立中央研究院天文及天文物理研究所及母校清華大學天文研究所，推動及共同領導中央研究院天文及天文物理研究所的中美彗星掩星計畫 (TAOS) 及海王星外自動掩星普查計畫 (TAOS-2) ，目標是利用掩星技術蒐尋海王星外天體，藉此進一步瞭解太陽系早期歷史。近年來他推動中央研究院天文及天文物理研究所、地球科學研究所及環境變遷中心合作「奈米級二次離子質譜儀 (NanoSIMS)」，以分析隕石之微小樣本中含有之彗星塵粒的同位素比值，使恆星形成過程的研究能與採集自地球或太空的樣本相結合。

李院士曾獲得的學術榮譽包括：

- 太平洋天文學會莊普樂獎 (1977)
- 國家科學委員會傑出研究獎 (1985-1987，1988-1990)
- 中國地質學會會刊總編輯 (1988-1990)
- 傑出人才基金會傑出研究獎 (1988-2003)
- 國際隕石學會會士 (1988)
- 中華民國天文學會理事長 (1991-1993)
- 美國人文及科學學院海外榮譽院士 (1999)
- 中央研究院院士 (2000)
- 中華民國物理學會會士 (2001)

本會於 2015 年將第二屆「天問獎」頒贈予中央研究院李太楓院士，以表彰他對天文研究之卓越貢獻。

2015 Heaven Talk Awardee: Professor Wei-Hsin Sun

Professor Sun is a Professor of the Department of Physics and Graduate Institute of Astrophysics of the National Taiwan University, and the Direct General of the National Museum of Natural Science.

Prof. Sun obtained his B.S. from the Physics Department of the National Taiwan University in 1979, and PhD from the Astronomy Department of the University of California at Los Angles in 1987. After holding a postdoctoral fellowship at NASA's Goddard Space Flight Center in 1987-1989, he return to Taiwan and took a faculty position in Physics Department of the National Central University in 1989. Since then, he has been a Director and Professor of the Graduate Institute of Astronomy at the National Central University, President the Astronomical Society of Republic of China. In 2007, he was recruited by the National Taiwan University and became Professor of the Department of Physics and Institute of Astrophysics and a Research Fellow of the Leung Center for Cosmology and Particle Astrophysics. In 2011, he was appointed as Director General of the National Museum of Natural Sciences.

Prof. Sun's research areas include active galactic nuclei, QSOs, interacting galaxies, galaxy evolution, and star formation. He worked on the Emission-Line Survey of the Interstellar Medium at the Lulin Observatory, Educational Training Program at Ken-Ting Observatory, BATC Multi-Wavelength Survey, etc. He initiated an observatory at Ali, Tibet in 2007; the observatory was completed and started operation in 2011; its telescope can be remotely controlled from Taiwan.

Prof. Sun's most renowned achievement is in education of astronomy. His TV series "Sail into the Deep Universe" won 1994 Golden Tape Award, 1995 Lee Kuo-Ting Science and Technology TV Program Award, and 2000 Golden Bell Award for the Best Host for Science and Education Programs. His popular science book "Chatting About the Heavens" won 2003 Golden Ding Award, News Bureau, the Executive Yuan of Taiwan, 2004 Golden Bookmark Award for the Best Popular Science Book by Wu Ta-You Foundation. His "Meeting the Starry Sky" lectures have been the most popular course and won "Excellent Teaching Award" frequently at National Central University, National Taiwan University, and wherever he teaches. For the International Year of Astronomy in 2009, he organized "400 Years of Heavenly-Gazing Exhibition" and won "Outstanding Social Service Award" from National Taiwan University in 2010. Prof. Sun has organized numerous summer and winter schools of astronomy at Ken-Ting Observatory, which are popularly attended by high school and college students.

Since 2003, Prof. Sun initiated a popular science lecture series "Prospect" with the support of National Science Council, now the Ministry of Science and Technology. This series is still going strong in 2015! He organized activities to celebrate the International Year of Physics in 2005 and International Year of Astronomy in 2009. He was the host of "Let's Watch Stars" unit of the radio program "Everyday Life" of the Han Sheng Radio Station. He has been regularly invited to various radio and TV programs to talk about astronomy related science topics.

In 2015, the Astronomical Society of the Republic of China presents the 2nd Heaven Talk Award to Professor Wei-Hsin Sun for his outstanding achievements in education and popularization of astronomy.

第二屆「譚天獎」得獎人 孫維新教授簡介

孫維新教授生於台灣台北市，原籍山東。1979 年國立臺灣大學物理學系畢業，1987 年獲美國加州大學洛杉磯分校天文物理學博士。1987 至 1989 年間於美國國家航空暨太空總署戈達德太空飛行中心擔任博士後研究員。1989 年返台任教於國立中央大學物理系。1992 年 8 月國立中央大學天文研究所成立後曾任所長，並曾出任中華民國天文學會理事長、國立中央大學科學教育中心主任。2007 年轉任國立台灣大學物理系暨天文物理研究所教授及梁次震宇宙學與粒子天文物理學研究中心研究員。2011 年 1 月 17 日借調至國立自然科學博物館擔任館長至今。

孫教授的主要研究領域是活躍星系核與類星體、交互作用星系、星系演化與恆星形成。並參與鹿林山星際物質發射線巡天計畫、墾丁天文台教育訓練計畫、BATC 多色巡天計畫與青藏高原天文台科研及教育計畫等研究與教學計畫。於 2007 年在西藏阿里地區開始建立天文台，目前已完成，於 2011 年開始觀測。該天文台可在台灣進行遙控。

孫教授素來以天文教育推廣聞名，他主持的公共電視節目《航向宇宙深處》系列曾獲得金帶獎和李國鼎科技節目獎。他本人則以該節目獲得第 35 屆金鐘獎「教科文節目主持人獎」。所著《孫維新談天》一書獲得第二屆吳大猷科普著作金籤獎、2003 年金鼎獎優良圖書推薦、2010 年科普閱讀年推薦「百大科普好書」。他於 1995 年起在台灣大學、政治大學、台灣聯合大學系統等多所大學授課的「認識星空」通識課程廣受學生好評。任職於中央大學期間於車城後灣的國立海洋生物博物館頂樓建立墾丁天文台，每年高中和大學寒暑假期間辦理多梯次觀測研習營。

2003 年春天起在行政院國家科學委員會的支持下負責辦理「展望」系列科學普及演講，並邀請各界專家演講介紹各領域科學發展。2005 年時配合世界物理年負責主辦「探索物理博覽會」。他也是 2009 全球天文年台灣總召集人。曾擔任漢聲廣播電台「生活掃描」節目中「讓我們看星去」單元的主講人；並固定參與作家張大春主持的 News98 節目《張大春泡新聞》談天文科學等相關知識。

本會於 2015 年將第二屆「譚天獎」頒贈予臺灣大學及國立自然科學博物館孫維新教授，以表彰他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

Dr. Timo Prusti

Dr. Timo Prusti is since 2007 the Gaia Project Scientist at the European Space Agency. He graduated at the University of Helsinki 1987 and defended his Ph.D. 1992 at the University of Groningen. He worked as a postdoc at the Observatory of Arcetri, Florence before joining ESA. In ESA he worked with the Infrared Space Observatory and Herschel before taking up the Gaia duties. His scientific interests are related to young stars especially in close-by clusters and with disks.

Prof. Joel Parker

Dr. Joel Parker is a research astronomer, space mission manager, and a director in the Planetary Science Directorate of Southwest Research Institute (SwRI). He studied astronomy and physics at the University of California at Berkeley and the University of Colorado at Boulder, and has worked at NASA in Houston and Maryland. His astronomy research began with the study of massive stars and how they affect their environment, particularly in the Magellanic Clouds and other nearby galaxies. Since he began working at SwRI in 1996, his research focus moved to solar system topics, including the Kuiper Belt, Pluto, comets, asteroids, and the Moon. Primarily an observational astronomer, he has been PI on projects utilizing ground-based observatories and the Hubble Space Telescope. Dr. Parker is the Deputy PI on the Alice UV spectrograph on the Rosetta mission, is a project manager and science team member on the New Horizons mission, and previously on the Lunar Reconnaissance Orbiter mission and on ultraviolet telescope projects that have flown on the space shuttle. He is the editor of the Kuiper belt electronic newsletter "Distant EKOs", and is a host and producer of the radio science show "How on Earth"..

Abstracts

論文摘要

Plenary Talk I : Gaia Mission and Status

Dr. Timo Prusti (European Space Agency)

Gaia is an European Space Agency cornerstone mission launched 19 December 2013 from French Guyana. Gaia will map the sky down to the 20th magnitude for point sources. Astrometry and photometry is done for all detected objects and spectroscopy down to magnitude limit 16. At the moment Gaia is commissioned and in its operational orbit around the L2 point. The nominal operations are scheduled for 5 years. The scientific yield is expected to contain a billion stars with positions, distances and proper motions based on astrometry. With photometry the stellar properties of this sample can be deduced. Finally from the spectroscopy Gaia allows extraction of some 150 million radial velocities for the brightest stars. This information will allow addressing the main scientific goals of Gaia concerning the structure, history and evolution of our Milky Way Galaxy. In addition to Galactic structure, Gaia will allow addressing various other science areas. For stellar astrophysics Gaia will provide the long awaited distances and census of multiple star systems. Gaia is expected to discover few thousand exo-planets. The main belt asteroid orbits will be improved significantly. Eventually even fundamental physics can be done with tests on general relativity. The presentation will summarize the status of the spacecraft and provide updated scientific performance estimates and anticipated schedule for data releases.

Plenary Talk II : The Rosetta Mission - Past, Present, and Future

Dr. Joel Parker (Southwest Research Institute)

The Rosetta mission is one of the most ambitious space missions ever flown. Launched in 2004, Rosetta finally reached its goal - comet 67P/Churyumov-Gerasimenko - in August 2014 when it became the first spacecraft to rendezvous with a comet. Not only will Rosetta escort and study the comet for more than a year, but its lander, which touched down on the comet in November 2014, has already examined it in greater detail than ever before.

The goals of the Rosetta mission are to understand the origin of comets, the relationship between cometary and interstellar material, and its implications for origin of the solar system. Its scientific objectives to achieve these goals are:

- Global characterization of the nucleus, determination of dynamic properties, surface morphology and composition;
- Chemical, mineralogical and isotopic compositions of volatiles and refractories in a cometary nucleus;
- Physical properties and interrelation of volatiles and refractories in a cometary nucleus;
- Study of the development of cometary activity and the processes in the surface layer of the nucleus and the inner coma (dust/gas interaction).

To meet these scientific objectives, the Rosetta spacecraft carries 15 instrument packages, many of which are comprised of multiple sensors, such as the Rosetta Plasma Consortium (RPC) package, which contains 5 separate instruments. The lander, Philae, carries 10 instruments for in situ surface studies. The remote sensing instruments cover wavelengths from the ultraviolet through the radio, with a mix of imaging and spectroscopy. The in situ instruments on Rosetta measure dust, plasma, and gas chemistry and composition, and on Philae additionally measure direct thermal and mechanical properties, samples, and alpha and X-ray spectrometry.

Early results from the Rosetta mission include:

- The D/H in 67P is 5.3x10-4, over 3 times the Earth value.
- The first measurement of molecular nitrogen at a comet, showing an N2/CO ratio 25 times less than that of the expected protosolar value, indicating ice grain formation temperatures below 30 K.
- No (or very little) ice on the surface.
- The surface is compositionally very homogenous, dominated by dust and carbon-rich molecules.
- However, the spatial production of volatile gases is heterogeneous across the nucleus.
- 67P does not have an appreciable magnetic field.
- Large temperature gradients in the near sub-surface, indicating the widespread presence of a strongly insulating dust layer (several meters thick in some places).
- Electron impact is possibly the primary form of disassociation (as opposed to photo disassociation) of the parent species water and carbon dioxide in the near-nucleus environment.

The Rosetta mission will continue to escort and study 67P through 2015 (perihelion is in August 2015) and possibly though mid-2016. If illumination conditions on Philae improve, it is possible that the lander could also continue in situ measurements.

S1.1: A class of low-mass but extremely star-forming galaxy at z $\sim$ 2

Chen-Fatt, Lim (NTNU), Sébastien Foucaud (Shanghai Jiao Tong University, China), Yasuhiro Hashimoto (NTNU)

Molecular gas forms stars, according to star-formation law. However the star-formation law of young galaxies, especially at high-redshift is still subject of debate. We also have evidences that the star-formation rate density (SFRD) decline steeply from z 2 to the present and that the locus of star-formation migrate from massive and dense sites to low-mass more isolated galaxies today. We have recently developed a method based on broad-band photometry to isolate a class of rare, compact galaxies that display extremely high equivalent width emission lines up to z 2. Those galaxies share similar properties with Blue compact dwarfs (BCDs) in the local Universe, UV-luminous galaxies (UVLGs) at low redshifts and Lyα emitters (LAEs) at high redshifts. They are low stellar mass, low metallicity and living in low density environment, but they display an extremely high SFR. This type of galaxy may simply be the last remnants of a star formation mode which common in the early Universe! We will discuss more detail about the selection and some properties of these young galaxies.

S1.2: z>6.5 QSOs from PS1 optical and WISE mid-infrared surveys

Ekaterina Koptelova (National Tsing Hua University), Tomotsugu Goto (National Tsing Hua University)

Quasars at redshifts z>6.5 are rare and faint objects which are detectable only in the infrared bands. There are only few known quasars at z>6.5 discovered in very local small-area infrared surveys. The new 3Pi PS1 survey has greater capability for high-z QSO searches as it employs infra-red y band and covers 30000 sq. deg. of the sky. Recently Venemans et al. (2015, ApJ 801, L11) reported the first discovery of two new z>6.5 quasars from PS1. In their work, they achieved the spectroscopic success rate of 100% by combining PS1 y-band and WISE mid-IR-band photometry. We examine the PS1-WISE color-cuts used in Venemans et al. (2015) and show that these color-cuts allow only for selection of the brightest quasars. We propose new PS1-WISE selection criteria which are effective also for the less bright high-z quasar candidates.

S1.3: Color Variability of Red QSOs

I-Chenn Chen (National Central University), Chorng-Yuan Hwang (National Central University)

We present color variabilities for 32 red QSOs and 123 normal QSOs using the Pan-STARRS Medium Deep Surveys. We defined the redness of QSOs with the difference between the 3000 and 4000 restframe magnitudes of the QSOs. We found that most of the red QSOs are located at low redshifts and are relatively fainter than normal QSOs; however, there are a few red QSOs which are as bright as typical QSOs and are located at relatively high redshifts. We also found that the faint QSOs at low redshifts generally have great color variabilities, which may even turn the QSOs from " red" to " typical" (or vise versa). The color variabilities of the red QSOs at low redshifts and high redshifts are different, suggesting that there might be at least two different types of red QSOs.

S1.4: Star formation in central region of AGNs

Mengchun Tsai (IANCU), Chorng-Yuan Hwang1 (IANCU)

We investigated the star-forming properties a the central region of the host galaxies of active galactic nuclei. We used x-ray, radio and infrared ray emission to represent the environment around the nuclear. We determined that active galaxies have higher stellar masses within the central region than normal galaxies; but both active and normal galaxies exhibit similar specific star formation rates. We also discovered that the star forming activity is related to the inner structures in the AGNs. The AGNs with inner structures show a positive correlation between the radio activity of the AGNs and the SFRs of the host galaxies, but the sources without inner structures show a negative correlation between the radio power and the SFRs. And the CO(3 - 2)/(1 – 0) ratios show positive correlation with star-forming activity on the inner structures. Both molecular line ratios and star-forming activity decrease as the radius from the nucleus increases.

S1.5: On detecting halo assembly bias with galaxy populations

Yen-Ting Lin (ASIAA), Rachel Mandelbaum (CMU), Yun-Hsin Huang (Chicago), Hung-Jin Huang (CMU), Neal Dalal (Illinois), Benedikt Diemer (Chicago), Hung-Yu Jian (NTU), Andrey Kravtsov (Chicago)

The fact that the clustering and concentration of dark matter halos depend not only on their mass, but also the formation epoch, is a prominent, albeit subtle, feature of the cold dark matter structure formation theory, and is known as assembly bias. At low mass scales ($\sim 10^{12} M_{\odot}$), early-forming halos are predicted to be more strongly clustered than the late-forming ones. In this study we aim to robustly detect the signature of assembly bias observationally, making use of formation time indicators of central galaxies in low mass halos as a proxy for the halo formation history. Weak gravitational lensing is employed to ensure our early- and late-forming halo samples have similar halo masses, and are free of contamination of satellites from more massive halos. For the two formation time indicators used (resolved star formation history and current specific star formation rate), we do not find convincing evidence of assembly bias. We attribute the lack of detection to the possibility that these indicators do not correlate well with the halo formation history, and suggest alternatives that should perform better for future studies.

S1.6: Clustering analysis and large-scale environments of galaxies at $0 < z < 3$

Lihwai Lin (ASIAA)

Galaxies located in different environments exhibit different properties. We use SPLASH (Spitzer Large Area Survey with Hyper-Suprime-Cam) catalog in the COSMOS field to study the environmental effect using two methods: galaxy density and clustering. Over the redshift range $0.3 < z < 3$, the clustering strength of quiescent galaxies exceeds that of star-forming galaxies, implying that quiescent galaxies are preferentially located in more massive halos. When using local density measurement, we found a clear positive quiescent fraction – density relation at $z < 1$, consistent with earlier results. At intermediate redshift, $1 < z < 1.5$, we found the quiescent fraction – density relation to be scale dependent, being positive on small scales but reversed on larger scales, partly explaining the

inconsistency found in the literature. Finally at $1.5 < z < 3$, the quiescent fraction depends weakly on the local density, even though clustering shows that quiescent galaxies are in more massive halos. Our results thus suggest that in the high-redshift Universe, halo mass may be the key in quenching the star formation in galaxies, rather than the conventionally measured galaxy density.

S1.7: Evolution of dust abundance and grain size distribution in galaxies

Hiroyuki Hirashita (ASIAA)

The evolution of dust in galaxies is characterized by two aspects; that is, dust abundance and grain size distribution, both of which are important in determining the radiative properties of galaxies through dust extinction and emission. Recently we have been developing a theoretical framework that treats these two aspects consistently. In this presentation, we introduce our model of dust enrichment in a galaxy with a simplified treatment of grain size distribution. We include in the model dust supply from stellar ejecta, destruction in supernova shocks, dust growth by the accretion of gas-phase metals, grain growth by coagulation and grain disruption by shattering, and consider how these processes work on the small and large grains. Dust enrichment starts with a supply of large grains from stars. At a metallicity level, referred to as the critical metallicity of accretion, the abundance of small grains formed by shattering becomes large enough to increase grain abundance rapidly by accretion. Associated with this epoch, the mass ratio of small grains to large grains reaches a maximum. Afterwards, this ratio converges to the value determined by the balance between shattering and coagulation, and the dust-to-metal ratio is determined by the balance between accretion and shock destruction. Using a Monte Carlo simulation, we demonstrate that the simplicity of our model has an advantage in predicting statistical properties of galaxies. We also show some applications for predicting observational dust properties such as extinction curves.

S2.1: SED Machine: The proper instrument for astronomical objects classification

Hsing Wen Lin (IANCU), Wing Huen Ip (IANCU)

SED Machine is an low resolution spectrograph and imager to efficiently and rapidly classify the astronomical objects. It consists of a rainbow camera for spectrophotometric calibration, and a lenslet array plus 3-prism optics system for integrated field spectra. The first SED Machine is currently mounted at 1.5 m P60 Telescope of Palomar Observatory and the second one in plan is for the Lulin 2m telescope. In this talk, we will introduce the hardware design, the data reduction process and the performer of SED Machine.

S2.2: Nikon glass development

Minako Azumi (Nikon)

Large optical system is required for high sensitive astronomical observation equipment. Nikon has developed the most suitable material for large optical system. On this presentation we will present for the following materials.

- Large size i-line glass
- Large size high homogeneity synthetic silica glass
- Large size calcium fluoride（under development）

S2.3: OIR projects in ASIAA

Shaing-Yu Wang (ASIAA)

Optical and infrared astronomy is one of the major field that ASIAA has been developing in the past decade. With the collaboration with advanced telescopes, these project also provide the Taiwanese community the chance to access the telescopes and also large survey data set. In the talk, the information about the telescope resources and survey data sets will be provided in details to encourage the usage of the resources from the young generation.

S2.4: The Role of the Magnetic Field in Star Formation

Koch Patrick (ASIAA), SMA Polarization Legacy Team

Magnetic fields are thought to be relevant for star formation. Measuring the field strengths is, thus, paramount to make quantitative assessments of the role of the magnetic field. Observationally, it has been difficult to measure the field strength. Commonly used techniques provide either only one single averaged field strength for an entire observed region, or they provide only single isolated values, as e.g., in the case of Zeeman observations. We will introduce SMA dust polarization observations which have served as a testbed to develop a new method to measure the field strength. This new technique precisely addresses earlier shortcomings in yielding a field strength at every position of detected polarization. With the recent dedicated SMA polarization legacy program, we have further significantly increased the sample of high-resolution magnetic field observations. In combination with CSO data, we will present sample trends based on 50 sources that clearly reveal generic magnetic field features and quantify the magnetic field force versus gravity. In particular, we identify magnetic field morphologies that allow for collapse, and others where the magnetic field is resisting gravity leading to a largely reduced star-formation efficiency. We conclude by providing the statistical evidence - based on almost 4000 independent measurements in our sample - that the prevailing magnetic field orientation in star-forming regions is one that prefers the magnetic field to be roughly perpendicular to a source major axis (Koch et al., 2014, ApJ, 797, 99).

S2.5: Magnetic field mapping in star-forming regions: NGC1893 and Carina nebula

Eswaraiah Chakali (IANCU, Taiwan), Wen-Ping Chen (IANCU, Taiwan)

We present results based on optical and NIR-polarimetric observations, towards two star-forming regions NGC 1893 and Carina nebula, to diagnose the relative importance of magnetic fields in comparison to thermal pressure. Massive stars in star-forming regions significantly influence their surroundings

and lead to form a variety of structures such as bright-rimmed clouds, pillars, cometary globules, bubble like structure etc. On the other-hand, magnetic fields are also believed to play an important and perhaps crucial role not only in the formation of these structures but also in their further evolution processes. NGC1893 hosts five OB-type stars, two cometary globules (Sim 129 and Sim130) and a semi-circular bubble-like structure. While the magnetic fields are found to be oriented almost perpendicular to the long axis of the cometary globule Sim129, they tend to align with the long axis of Sim 130. Our results suggest that in one case (Sim 129) fields are important and in the other case (Sim 130) thermal pressure is dominant. We also present the magnetic field morphology towards Carina nebulae which host 200 OB-type stars, more than 600 massive stars, three Wolf-Rayet stars and several IRS sources reinforcing the fact that Carina nebulae is a very active and violent star-forming region. Our preliminary analysis suggests that magnetic fields are squeezed by the radiation pressure and they aligned with the tail of the pillars located in the vicinity of Eta Carina.

S2.6: Signs of Magnetic Braking in a Class 0 Protostar B335

Hsi-Wei Yen (ASIAA), Shigehisa Takakuwa (ASIAA), Patrick M. Koch (ASIAA), Yusuke Aso (U. of Tokyo), Shin Koyamatsu (U. of Tokyo, NAOJ), Ruben Krasnopolsky (ASIAA), Nagayoshi Ohashi (ASIAA, NAOJ)

Stars form in magnetized dense cores in molecular clouds through gravitational collapse. Theoretical studies suggest that the magnetic field can slow down the collapsing material, remove its angular momentum, and suppress the formation of large-scale (>10 AU) disks. Such effects are not well understood and constrained observationally. In this presentation, I will introduce our observational results of a Class 0 protostar, B335, obtained using SMT, SMA, and ALMA. With these observations, we study gas motions on scales from 0.1 pc to inner 100 AU in B335 to investigate the effects of the magnetic field. We find that the angular momentum of the collapsing material is likely removed as it travels from thousands of AU to inner 100 AU scales, and no signature of a Keplerian disk is observed on a 10 AU scale. These results are consistent with the theoretical expectation, and suggest that magnetic braking is likely effective in B335.

S2.7: Magnetic Field Structure in the Flattened Envelope and Jet in the Young Protostellar System HH 211

Chin-Fei Lee (ASIAA)

HH 211 is a young Class 0 protostellar system with a flattened envelope, a possible rotating disk, and a collimated jet. We have mapped it with the Submillimeter Array in the 341.6 GHz continuum and SiO J = 8-7 at 0.6" resolution. The continuum traces the thermal dust emission in the flattened envelope and the possible disk. Linear polarization is detected in the continuum in the flattened envelope. The field lines implied from the polarization have different orientations, but they are not incompatible with current gravitational collapse models, which predict a different orientation depending on the region/distance. Also, we might have detected for the first time polarized SiO line emission in the jet due to the Goldreich-Kylafis effect. Observations at higher sensitivity are needed to determine the field morphology in the jet.

S2.8: The structural transition of the NGC 6251 jet

Tseng, Chih-Yin (ASIAA / NTU)

We investigated the structure of NGC 6251 jet from milliarcsecond to arcsecond scales, utilizing the images taken with European VLBI Network, Very Large Array, and Very Long Baseline Array. We discover that the jet maintains a parabolic streamline over a range in size scale equal to 10^5 times the Schwarzschild radius. The jet then transitions into a conical stream farther downstream. Following the similar discovery of M 87 jet, this indicates that the magnetohydrodynamic jet is primarily subjected to the confinement by the external gas within the Bondi radius of the central supermassive black hole. Afterward the jet then freely expands with a conical shape. Our result suggests a norm of a collimation process of active galactic nuclei jets inside the gravitational influence of the supermassive black hole.

S3.1: Searching for Possible Members of Nearby Moving Groups in the Kepler Field

Chang Yao Chen (Dept. of Physics, National Central University, Taiwan), Wen Ping Chen (Institute of Astronomy, National Central University, Taiwan)

Most if not all stars are formed in clustered environments in molecular clouds. Star clusters eventually dissolve and supply the disk stellar population. Stellar moving groups are living fossils of how the disintegration process takes place. So far, there are eight known nearby, young moving groups with ages between ∼10 and ∼ 100 Myr within 100 pc, most of which are scattered in the southern sky, generally with asymmetric 3-dimensional sizes. It is not clear at the moment whether the spatial distribution of member stars results from Galactic tidal distortion or incomplete data due to detection bias. Our pilot project to search for possible new members in the Beta Pictoris moving group (BPMG) in the Kepler Field, a 105 square degree region in the northern sky, using UCAC4 proper motions and computed photometric distances, leads to identification of 750 BPMG candidates. While most have no radial velocity measurements, 31 candidates show LAMOST measurements consistent with membership. Additional observations, i.e., at different epochs, are being carried out to exclude variation caused by binarity. In addition, three candidates have no radial velocity data but are ROSAT X-ray sources indicative of possible stellar youth. Here we also report on the search now to include the AB Doradus, TW Hydrae, and Epsilon Chamaeleontis moving groups, also in the Kepler Field. In particular, known members of the Epsilon Cha group are concentrated in a region far from the Kepler Field, so the outcome of our search serves as a false positive assessment.

S3.2: Photometry and Polarization of the UXor Type Young Star GM Cep

Po-Chieh Huang (Graduate Institute of Astronomy, National Central University, Taiwan), Chang-Yao Chen (Department of Physics, National Central University, Taiwan), Chia-Ling Hu (Taipei Astronomical Museum, Taiwan), Chien-de Lee (Graduate Institute of Astronomy, National Central University, Taiwan), Chi-Sheng Lin (Lulin Observatory, National Central University, Taiwan), Hsiang-Yao Hsiao (Lulin Observatory, National Central University, Taiwan), Otabek Burhonov (Maidanak Astronomical Observatory, Ulugh Beg Astronomical Institute (UBAI), Uzbekistan Academy of Sciences, Uzbekistan), Wen-Ping Chen (Graduate Institute of Astronomy, National Central University, Taiwan)

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 (4 Myr) open cluster Trumper 37 at 900 pc, showing prominent infrared access, H-alpha emission, and flare activity. Here we present intense multi-color photometric monitoring from 2009 to 2015, 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. We present evidence in the last few years of possible radial drift of the clump toward the star, stretching longer along the orbit and thinner in the line of sight. GM Cep is moderately polarized, from 4% to 9% in g, r, and i bands. We present evidence that the level of polarization is anti-correlated with the brightness in the bright state, during which the dust clump back-scatters stellar light, and reaches maximal values when the clump is at the greatest elongation, in consistent with the Rayleigh sky model.

S3.3: Influence of Interstellar FUV Radiation on the Abundance Ratio of ^{13}CO to C^{18}O in L 1551

Sheng-Jun Lin (NTHU), Yoshito Shimajiri (CEA Saclay), Chihomi Hara (The University of Tokyo), Shih-Ping Lai (NTHU), Fumitaka Nakamura (NAOJ), Koji Sugitani (Nagoya City University), Ryohei Kawabe (NAOJ)

To investigate the relationship between the far-ultraviolet (FUV) radiation and the abundance ratio of ^{13}CO to C^{18}O, we observed L 1551 in ^{12}CO (J=1 – 0), ^{13}CO (J=1 – 0) and C^{18}O (J=1 – 0) using the Nobeyama Radio Observatory 45 m telescope with an angular resolution of $\sim$22″ (corresponding to 0.017 pc at a distance of 160 pc). L 1551 is chosen because it is relatively isolated in the Taurus-Auriga molecular cloud complex, providing an ideal environment for studying the variation of abundance ratios due to the penetration of the FUV photons. The region we observed in L 1551 contains two young small clusters, L 1551 IRS5/NE and HL Tau group, and a starless core, L 1551 MC. The distribution of ^{12}CO emission traces the outflows coming from two Class I protostars IRS 5 and NE. The ^{13}CO and C^{18}O are detected throughout the whole region with enhancement around the outflows and depletion in the outflow cavities. The $X_{^{13}\mathrm{CO}}/X_{\mathrm{C}^{18}\mathrm{O}}$ value is found in the range of 3.2 – 36.2 with a mean value of 7.6. Comparing to the visual extinction map derived from the *Herschel* observations, we found that the abundance ratio reaches its maximum at low A_V (i.e., $A_\mathrm{V} \lesssim 3$ mag), and decreases to typical solar system value of 5.5 inside L 1551 MC. The high $X_{^{13}\mathrm{CO}}/X_{\mathrm{C}^{18}\mathrm{O}}$ value at the low A_V value in L 1551 is most likely due to the selective FUV photodissociation of C^{18}O. This is in contrast with Orion-A where its internal OB stars keep the abundance ratios at a high level greater than $\sim$10.

S3.4: On the Circumbinary Ring, Circumstellar Disks, and Accretion Flows in Binary System

Ya-Wen Tang (ASIAA)

Recent exo-planetary surveys reveal that planets can orbit and survive around binary stars. This suggests that some fraction of young binary systems which possess massive circumbinary disks (CB) may be in the midst of planet formation. However, there are very few CB disks detected. In this talk, I will present our studies toward two of the CB disks, including UY Aur and GG Tau systems. The observational results from the IRAM PdBI, the SMA and ALMA will be presented and discussed.

S4.1: A new distance measure using the correlation between CO luminosity and its line width

Tomo Goto (NTHU), Sune Toft (Dark Cosmology Centre)

Does the dark energy vary over cosmic time? To answer this question, we need to map the expansion of the Universe over a large span of the cosmic time. Type Ia supernovae have been used to measure distances to z∼1.7, but beyond this, no reliable distance measure has been established. We propose a new distance measure using sub-millimeter (submm) galaxies to determine distances out to z∼6. Using a large sample of submm galaxies compiled from the literature, we show there exists a significant correlation between the CO luminosity ($L'CO$) and the CO line width (FWHM) of submm galaxies. We use this correlation to measure intrinsic luminosity of submm galaxies, based on the observed FWHM. Through comparison with their observed brightness, we measure their luminosity distance, and construct the Hubble diagram to z∼6. Submm galaxies are detected all across the history of the Universe, including some at z>6. With the advent of ALMA, it is expected that large numbers of distant submm galaxies will be discovered in the near future. This method is suitable for such an era, providing a new opportunity to constrain the earliest cosmic expansion.

S4.2: Deblending Foreground CO Emission in a CII Intensity Mapping Experiment

Yun-Ting Cheng (AISAA,NTU), Tzu-Ching Chang (ASIAA)

Epoch of Reionization (EoR) is the period during which the bulk of neutral hydrogen in the Universe was ionized by the first generation of stars and galaxies. Intensity mapping provides a powerful method to probe the large scale structure during EoR without resolving individual galaxies. Several emission lines have been proposed to probe the EoR in the intensity mapping regime, including HI, CII, CO, and Lyα. The ongoing project, Time-Pilot, aims at CII fine structure line intensity mapping during EoR. However, the CII signal would be contaminated by the CO lines from low redshift galaxies. Therefore, separating the different J emission lines from lower redshifts is an important issue in a CII Intensity Mapping experiment. Here we build a model to forecast the CII and foreground CO emission power spectra, and investigate the optimal method to separate low-z CO lines from the high-z CII signals.

S4.3: Cross-correlation of WISE galaxies and Planck temperature sky maps

Dani C.Y. Chao (National Tsing Hua University), Tomotsugo Goto (National Tsing Hua University)

The Integrated Sachs-Wolfe effect promises a way to study Dark Energy: Dark Energy causes the decay of gravitational potential wells while photons passing through, thus the red-shifting of photons can not compensate the blue-shifting of them, which results in a correlation between hotspots in the CMB temperature anisotropies and the overdensities. The λCDM model predicts that the correlation is tiny, 3% of the primordial CMB temperature fluctuations. In this ISW cross-correlation analysis, we use a sample of galaxies from the Wide-field Infrared Survey Explorer (WISE) with the CMB temperature data from the latest Planck data release. We provide a better method to select galaxies from the WISE survey to measure the correlation of the overdensities and the CMB temperature anisotropies. Previous studies had discrepancy between their measurements and the prediction from λCDM model. With our enhanced sample of galaxies, we show a result with a higher significance.

S4.4: Determination of 21 com Brightness Fluctuations at $z \sim 0.8$ in Autocorrelation.

TO, CHUN-HAO (Asiaa)

Mapping 21 cm emission from neutral hydrogen in the intensity mapping regime provides an efficient method to probe the large scale structure of the universe. We calculate the auto-power spectrum of 21 cm intensity fluctuations at redshift $z \sim 0.8$ with data acquired from the Green Bank Telescope. The main challenge is that the galactic and extragalactic foreground emissions exceed the expected signals by 3-4 orders of magnitude. We perform the singular-value decomposition(SVD) to separate the foregrounds from the signals by assuming that foregrounds are spectrally smooth. In addition, because it is possible that the 21cm intensity can be contaminated by the polarized foregrounds through system leakage, we adopt the Muller matrix polarization calibration formalism to conquer this problem.

S4.5: Impact of Gravitational Slingshot of Dark Matter on Galactic Halo Profiles

Yao-Yu Lin (National Taiwan University), Yi-Shiou Duh (National Taiwan University), Lance Labun (UT Austin), Pisin Chen (National Taiwan University)

We study the impact of gravitational slingshot on the distribution of cold dark matter in early and modern era galaxies. Multiple gravitational encounters of a lower mass dark matter particle with massive baryonic astrophysical bodies would lead to an average energy gain for the dark matter, similar to second order Fermi acceleration. We calculate the average energy gain and model the integrated effect on the dark matter profile. We find that such slingshot effect was most effective in the early history of galaxies where first generation stars were massive, which smeared the dark matter distribution at the galactic center and flattened it from an initial cusp profile. On the other hand, slingshot is less effective after the high mass first generation stars and stellar remnants are no longer present. Our finding may help to resolve the cusp-core problem, and we discuss implications for the existing observation-simulation discrepancies and phenomena related to galaxy mergers.

S4.6: The Inner Mass Distribution of the Gravitational Lens SDP.81 from ALMA Observations

Kenneth Wong (ASIAA), Sherry Suyu (ASIAA), Satoki Matsushita (ASIAA)

The central image of a strongly lensed background source places constraints on the foreground lens galaxy's inner mass profile slope, core radius and mass of its nuclear supermassive black hole. Using high-resolution long-baseline Atacama Large Millimeter/submillimeter Array (ALMA) observations and archival *Hubble Space Telescope* (*HST*) imaging, we model the gravitational lens H-ATLAS J090311.6+003906 (also known as SDP.81) and search for the demagnified central image. There is central continuum emission from the lens galaxy's active galactic nucleus (AGN) but no evidence of the central lensed image in any molecular line. We use the CO J=5-4 map to determine the flux limit of the central image excluding the AGN continuum. We predict the flux density of the central image and use the limits from the ALMA data to constrain the inner mass distribution of the lens. For the core radius of $0.15''$ measured from *HST* photometry of the lens galaxy assuming that the central flux is completely attributed to the AGN, we find that a black hole mass of $\log(M_{BH}/M_{\odot}) \gtrsim 8.4$ is preferred. Deeper observations with a detection of the central image will significantly improve the constraints of the inner mass distribution of the lens galaxy.

S5.1: The of the O2/H2 atmosphere of the main rings in the Saturnian system

Wei-Ling Tseng (NTNU), Wing-Huen Ip (NCU)

The Cassini spacecraft, which has explored the Saturnian system since Saturn Orbital Insertion (SOI) in 2004, has already confirmed the presence of an O2 atmosphere over the main rings. During the Cassini Grand Finale mission, it focuses on the temporal variability in composition and spatial distribution in Saturn's atmosphere, ionosphere and magnetosphere, which are affected by seasonal and solar forcing. More information will be revealed to define the coupling between the main rings and the Saturnian system. In order to complement these efforts, we will describe the role of the O2/H2 atmosphere of the main rings in the coupling dynamics between Saturn's atmosphere, ionosphere, and magnetosphere, including investigating the causes of: 1) the time variability and radial dependence of the plasma density inside 4 Rs; and 2) the latitudinal dependence of Saturn's ionospheric electron and H3+ density.

S5.2: The discovery of moving objects in Subaru HSC project

Ying-Tung Chen (AISAA), Shiang-Yu Wang (ASIAA), Hsing-Wen Lin (NCU), Fumi Yoshida (NAOJ), Matthew Lehner (ASIAA)

Hyper Suprime-Cam (HSC) is a current Strategic Survey Program (SSP) of 8-m Subaru telescope. This project is approved about 300 nights over 5 years. HSC Solar System project is the additional science from major HSC project (cosmology and galaxy evolution). Team members use the data with appropriate survey cadence to search small moving object, e.g. asteroid, centaur and trans-Neptunian object. Although it is very difficult to improve orbit accuracy for candidates using same size telescope, HSC project is still a very good survey to reveal size distribution, spatial distribution even color

population for km-size Solar System objects. Subaru 2014A/B are the semesters with relative worse weather at Mauna Kea, only 57% of assigned nights (12/21) could open dome to observe. Due to the unexpected bad cadence, Solar System team diverts to search overlap regions. So far, we have discovered 281 asteroids in 10 square degree, and expect more than 500 asteroids should be found in first year SSP data.

S5.3: Asteroid Spin-Rate Study using the Intermediate Palomar Transient Factory

Chan-Kao Chang (NCU), Wing-Huen Ip (NCU), Hsing-Wen Lin (NCU), Yu-Chi Cheng (NCU)

Two dedicated asteroid rotation-period surveys have been carried out using data taken on January 6-9 and February 20-23 of 2014 by the Intermediate Palomar Transient Factory (iPTF) in the R band with 20-min cadence. The total survey area covered 174 deg2 in the ecliptic plane. Reliable rotation periods for 1,438 asteroids are obtained from a larger data set of 6,551 mostly main-belt asteroids, each with 10 detections. Analysis of 1751, PTF based, reliable rotation periods clearly shows the " spin barrier" at 2 hours for " rubble-pile" asteroids. We also found a new large-sized super-fast rotator, 2005 UW163 (Chang et al. 2014b), and other five candidates as well. The spin-rate distribution of asteroids of 3 < D < 15 km might have dependence on semi-major axis, which seems to be a step function with a number decrease in f = 6 rev/day in inner main belt and becomes more like a quasi-Maxwellian with a peak at 2 < f < 5 rev/day in outer part. Moreover, the number decrease in f = 6 rev/day is more significant for asteroids of D 3 km. The K-S test suggests a possible difference in the spin-rate distributions of C- and S-type asteroids. We also find that C-type asteroids have a smaller spin-rate limit than the S-type, which agrees with the general sense that the C-type has lower bulk density than the S-type.

S5.4: The Origin of Bimodal Color Distribution of Centaurs May Relate to the Inclination of the Source Region

Zong-Fu Sie (Graduate Institute of Astronomy, NCU), Hsing-wen Lin (Graduate Institute of Astronomy, NCU), Wing-Huen Ip (Graduate Institute of Astronomy, NCU)

Bimodal color distribution is a puzzle of Centaurs in the past decade. Two kinds of hypothesis have been proposed to explain this color distribution: 1. a primordial origin or, 2. evolutionary process. To answer the question, we collected the color information of all known Centaurs and found out that the blue (B-R<1.4) Centaurs and the red (B-R>1.4) Centaurs tend to high and low inclination distribution, respectively (significance level <5%). Thus, we investigate that the bimodal color distribution of Centaurs whether related to the inclination of source regions or not. We perform numerical simulations to explore the dynamical evolution of artificial Centaurs which are generated from the CFEPS-L7 model and the observed Centaurs. Our results show the trend of inclination distribution of Centaurs is similar to their source region. Therefore, we suggest that most of blue Centaurs come from high-i population and red Centaurs come from a low-i population.

S5.5: Modeling Highly Irradiated Gaseous Exoplanets with Stellar Evolution Code MESA

Howard Chen (Boston University), Leslie A. Rogers (California Institute of Technology)

The discovery of over 4,000 exoplanet candidates has unmasked the strangeness of planetary systems in the solar neighborhood. For instance, most of the confirmed planets reside in orbital periods of less than 100 days around their respective host stars, which places them well within the orbit of Mercury. In this talk, I present a prescription to expand the capabilities of the stellar evolution code Modules for Experimental Stellar Astrophysics (MESA) to model gaseous planets in highly irradiated environments. I will illustrate how we modified MESA to include planet core luminosity, heavy element enrichment, and mass loss due to hydrodynamic winds. Using these dynamical models, we then constructed mass-radius relationships of planets from 1 to 20 $M_{\oplus}$ and investigated how mass-loss impacts their composition and evolution history. We anticipate that this versatile, user-friendly code will see widespread applications in complementing future exoplanetary surveys such as *K2*, *TESS* and *PLATO*.

E1.1: Staging astronomy: from theatre shows to planetariums

Hsiang-Fu Huang (University College London)

Modern planetariums using projectors were first invented and developed in Germany in the early twentieth century. However, the displays of astronomy on stage predate the invention of projectors. Popular astronomy lectures in theatres was a phenomenon in Britain in the late eighteenth and early nineteenth centuries. These shows were a distinct type of performance combining scientific instruction, religious sentiments, and sensational entertainment. They were the forerunners of modern planetariums and the influence of these shows remains in today's popular astronomy. My presentation will divide into two parts: First, I will summarize my doctoral dissertation on popular astronomy lectures in early nineteenth-century Britain. My dissertation focuses on popular lecturers who were not scientific elites and delivered discourses inside theatres. Second, I will introduce my postdoctoral research project, which aims to examine the relation between popular astronomy and performance. My research will fill the gap of our understanding between present-day planetariums and astronomical theatre shows in the past.

天文學登場：從劇院秀到星象館 現代天文館普遍使用的光學投影星象儀問世至今未滿百年。在此之前，天文學早已粉墨登場。我的博士論文主題是十九世紀時(1820 - 1860)在英國的大眾天文演講，其中不少案例的場所在劇院。這些在舞台上的大眾天文演講熔科學知識、宗教情懷、感官娛樂於一爐，曾在十九世紀初的英國社會風行一時。它們被歷史學家視為現代星象館的前身。十九世紀的大眾天文秀對今日的天文科普有何影響？我將簡介我的論文及未來的計畫，亦期望本研究能有助於闡示「科學」與「表演」間的關係。

E1.2: 臺灣地區高中職學生天文學習態度網路問卷調查

王心怡 (臺北市立天文科學教育館), 王志明 (臺北市立天文科學教育館), 洪景川 (臺北市立天文科學教育館)

本研究旨在探討臺灣地區公私立高中職學生之天文學習態度，利用自編之「臺北市立天文科學教育館高中職學生天文學習態度調查表」進行網路問卷無記名調查。調查內容包含(一)學習前的動機、興趣與信心；（二）學習中的感受與行為反應；（三）學習後的行為選擇，共計3階段6個不同面向，合計回收559份有效問卷。其中男生有221位(39.5%)，女生有338位(60.5%)；就讀年級分布為：一年級246人（44%），二年級213人（38.1%），三年級100人（17.9%）。上網填寫本問卷者以高中生居多，計535人（95.7%），高職生樣本僅24人（4.3%）。 問卷分析結果可歸納如下：（1）高中職學生對天文學習的動機，以擴展知識、增加思考能力及與世界接軌佔多數，但對於能否幫助升學則持不確定態度。（2）高中職學生對觀星或拍攝星體興趣濃厚，並表示想透過參加天文社團或課程學習，且參與意願會受同儕影響。（3）高中職學生喜愛天文，並有信心經由努力將它學好，但僅43%同意對學校教授的天文課程主題感到熟悉。（4）在感受部分，高中職學生同意學習天文是一件快樂的事，可用更多元的方式看待自然界的現象，但卻有77%學生認為學習天文沒有成就感。（5）行為反應方面，高中職學生雖然認同學習天文有用處，但會找感興趣的天文主題或規畫特殊天象觀察行程者比例低，表熱衷而主動學習者還是少數。（6）行為選擇方面，62%的高中職學生同意上網是獲得天文知識的方法之一，而會去閱讀天文期刊或書籍的人卻僅27%。 由上可知，高中職學生對天文學習持正向態度，尤其對觀星或拍攝星體興趣濃厚，雖然天文不僅止於天文攝影，但這是引起學習興趣的重要原因，辦理高中職學生活動時可列入考量。而學生雖然表示喜愛天文，卻仍以學校課業為重而無法專注於此，花時間自我學習有困難性，再加上學校天文課程也不足，讓學生學習時沒有成就感。另外，高中職學生藉由上網獲得天文知識，這種網路依賴現象既是危機也是轉機，製作優質的網頁或資料庫，也能幫助更多學生學習天文及推廣天文。

E1.3: Communicating Astronomy with the Public via Social Media

Seline Chia-Ling Hu (Taipei Astronomical Museum), Chi-Feng Lin (Taipei Astronomical Museum, National Taiwan Normal University), Chih-Kang Wu (Taipei Astronomical Museum), Pei-Jing Zhan (Taipei Astronomical Museum), Kai-Li Liu (Taipei Astronomical Museum), Dian-Yan Wu (Taipei Astronomical Museum), Ying-Xiu Zhan (Taipei Astronomical Museum)

Social Media are becoming an alternative and mainstream means to communicate astronomy with the public. As conventional outreach requires journalists in mass media as information gatekeepers, unconventional outreach empowers every individual becoming an opinion leader and a gatekeeper in his/her own community. Social Media are free and extremely popular networks, and have the potential to reach much more audiences than traditional media. Here we present our initiatives to communicate astronomy with the public via YouTube - Astronomical Video Channel - since September 2014. There are many great astronomy outreaching videos produced by various projects, space agencies, and etc. However, most of them are in English, thus the language sets a barrier for the public in Taiwan. Therefore, we provide the Traditional Chinese translated subtitles for the videos. The channel has 24 videos and attracts 1,116 subscribers and 101,717 views to date. Through the analysis of performance, engagement, top videos, and demographics, we could get a better understanding of our target audience. For example, the views of Rosetta cartoons make up 76% of total views of the channel. Hence we could follow our audiences and provide the videos that fit the needs according to the evaluation and analysis in the future.

E1.4: Outreach Application of Citizen Science Projects in Astronomy

Mei-Yin Chou (ASIAA)

I will introduce Zooniverse, one of the citizen science web portal projects. 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. Since ASIAA has translated six astronomy projects in Zooniverse into Traditional Chinese, I will introduce these projects and how they can be used in outreach activities.

E1.5: 天文觀測項目於業餘社群推廣之探究－以疏散星團為實作案例

吳志剛 (臺北市立天文科學教育館), 邱子華 (國立臺灣師範大學、國語實驗國民小學)

本報告旨在探討臺北市立天文科學教育館首次透過館內活動方式，培育業餘天文社群進行進階觀測與研究之可行性、成果及影響，並對未來之瞻望提出建議。 本次試作首先對現有廣大業餘人力背景與所從事之推廣工作內容進行統計分析，由臺北市立天文科學教育館數位學習小組舉辦「天文觀測與研究實作」活動，以大臺北地區業餘天文社群成員為對象，透過對選定疏散星團研究的實作方式，由臺北天文館提供原始觀測資料與研究方法及天文學背景知識等，使參與者在活動過程中對天文學本質有更深層的瞭解，建立對研究方法的初步認識，並自行完成選定之疏散星團之分析研究。

S6.1: Origin of energetic phenomena in the superbubble 30 Dor C

Chia-Chun Lu (ASIAA), You-Hua Chu (ASIAA)

30 Dor C is a superbubble around the OB association LH 90 in the Large Magellanic Cloud (LMC). It stands out among all known superbubbles because it is the only one hosting nonthermal X-ray and TeV gamma-ray emissions. 30 Dor C is thus a prime site to study the most energetic phenomena in the interstellar medium. The nonthermal X-ray and TeV emissions indicate the presence of cosmic rays with energies of a few tens TeV freshly generated by strong shocks in the tenuous interior of the superbubble. To investigate the origin of this energetic phenomena in 30 Dor C, we examine multi-wavelengh data (H-alpha, [SII], [OIII], and neutral hydrogen line emissions) to study the gas dynamics in the 30 Dor C region. The results will be presented.

S6.2: High Energy Emission from Pulsar Magnetospheres

Kouichi Hirotani (ASIAA)

We investigate the particle accelerator that arises in a rotating neutron-star magnetosphere. By simultaneously solving the Poisson equation for the electro-static potential, the Boltzmann equations for relativistic electrons and positrons, and the radiative transfer equation, we demonstrate that the electric field is substantially screened along the magnetic field lines by pairs that are created and separated within the accelerator. As a result, the magnetic-field-aligned electric field is localized in

higher altitudes near the light cylinder and efficiently accelerates the positrons created in the lower altitudes outward but does not accelerate the electrons inward. The resulting photon flux becomes predominantly outward, leading to typical double-peak light curves, which are commonly observed from many high-energy pulsars. That is, we no longer have to assume outward-dominated X-ray/ gamma-ray fluxes or the emissivity distribution by hand; all these quantities can be solved from the basic equations under appropriate boundary conditions, if we specify the neutron-star rotation period, period derivative, magnetic inclination angle, and the surface temperature.

S6.3: Short-term variability in low mass X-ray binaries as seen by XMM-Newton

Holger Stiele (National Tsing Hua University), Wenfei Yu (Shanghai Astronomical Observatory), Albert Kong (National Tsing Hua University)

Black hole and neutron star X-ray binaries show variability on time-scales ranging from milliseconds to years. In the last two decades a detailed phenomenological picture of short-term variability in low-mass X-ray binaries has emerged mainly based on RXTE observations that cover energies above 3 keV. This picture comprises periodic or quasi-periodic variability, seen as spikes or humps in power density spectra, that are superposed on broad noise components. The overall shape of the noise components as well as the occurrence of quasi-periodic oscillations is known to vary with the state of the X-ray binary. We are accomplishing a comprehensive study of archival XMM-Newton observations in timing or burst mode of more than ten black hole and more than thirty neutron star low-mass X-ray binaries to investigate the variability properties of these sources at softer energies where the thermal disc component starts to emerge. Here we present some results of this study, which will comprise a summary of the power density spectra and related time lags for different black hole X-ray binaries; a discussion of the energy dependence of the power spectral state that we found in the "plateau" state of GRS 1915+105; a discussion of the energy dependence of the overall power spectral shape and of the characteristic frequency and amplitude of the band-limited noise component and of a thorough study of covariance spectra on different time scales for a sample of black hole X-ray binaries. We will discuss the implications of these findings for the picture of the accretion geometry in black hole X-ray binaries.

S6.4: Detections of 7 faint gamma-ray pulsars with the Fermi – LAT

Xian Hou (CENBG, France)

GeV gamma-ray pulsations from over 160 pulsars have been detected with the Fermi Large Area Telescope (LAT), enabling improved understandings of the emission regions within the neutron star magnetosphere, and the contributions of pulsars to high energy electrons and diffuse gamma rays in the Milky Way. The first gamma-ray pulsars to be detected were the most intense and/or those with narrow pulses. As the Fermi mission progresses, progressively fainter objects can be studied. We present six new gamma-ray pulsars with an eclectic mix of properties. They are detected using rotation ephemeris derived from radio observations to phase-fold gamma rays recorded by the Fermi-LAT. They are all faint in one way or another (lower spin-down power, broader pulse, more distant, in high background regions). They illustrate the biases existing in the current gamma-ray pulsar sample

and mark the transition from the early part (bright pulsars) to the later part (faint pulsars) of the Fermi mission. We discuss also steps to be taken to mitigate the bias.

S6.5: Pulsar detection of COSI in Low Earth Orbit

Chao-Hsiung,Tseng (National Tsing Hua University), Hsiung-Kuang Chang (National Tsing Hua University), Steven. E. Boggs (University of California, Berkeley), Andreas. Zoglauer (University of California, Berkeley), Jeng-Lun Chiu (University of California, Berkeley), Carolyn. A. Kierans (University of California, Berkeley), Alex. Lowell (University of California, Berkeley), John. Tomsick (University of California, Berkeley), Chien-Ying Yang (National Tsing Hua University)

The Compton Spectrometer and Imager (COSI), is a balloon-borne soft gamma-ray telescope (0.2-10 MeV) designed to study astrophysical sources. COSI consists of 12 High-Purity-Germanium (HPGe) strip detectors in 2x2x3 array configuration, which provides good tracking capability on each photon interaction to reconstruct Compton events. COSI already have three balloon flights in the past decade, which provide us a bunch of useful experiences to develop future satellite missions. In this talk, I will present simulation results of COSI performance for pulsar detection in Low Earth Orbit. This work is based on Monte Carlo simulation and using the techniques of event and image reconstruction to approach optimized significance of detection.

S6.6: The unique role of gamma-rays in transitional pulsar systems

P. H. Thomas Tam (Institute of Astronomy and Space Science, Sun Yat-Sen University (Guangzhou))

The role of gamma-ray emission in transitional pulsars is unique. I will briefly describe the gamma-ray emission properties in both the LMXB state and radio pulsar state, starting with the discovery of gamma-ray emission from the prototype transitional pulsar PSR J1023+0038. Through its continuous all-sky survey, the Fermi Gamma-ray Space Telescope provides an unbiased monitoring of all known (and unknown) transitional pulsars at essentially all times, which in turn helps us to constrain the state-change times, as happened in July 2013 for PSR J1023+0038 changing from a radio pulsar state to an LMXB state, when the gamma-ray flux increased by about an order of magnitude. After several years of studies, the origin of gamma-rays is still not well understood.

S6.7: Identification of a proto-brown dwarf binary system

Tien-Hao Hsieh (National Tsing Hua University), Shih-Ping Lai (National Tsing Hua University), Arnaud Belloche (Max Planck Institute for Radio Astronomy (MPIfR)), Friedrich Wyrowski (Max Planck Institute for Radio Astronomy (MPIfR))

We have studied the molecular outflows driven by a potential proto-brown dwarf candidate IRAS 16253-2429 (hereafter IRAS 16253) with CO (2—1) using SMA and IRAM 30m telescope and CO (6—5) using APEX. Our SMA observations suggest that IRAS 16253 is hosting a binary system. The low mass its envelope implies that the central objects may eventually accrete only 0.14 Msun of material, which makes IRAS 16253 a potential proto brown dwarf system; one or two brown dwarfs

may form depending on the current mass of the protostars and the future accretion process. The Position-Velocity diagrams of the outflows show sinusoidal structures which may be related to the outflow wiggling from the binary rotation. This allowed us to estimate the orbital period of the binary system. On the basis of Kepler' s third law, we suggest that IRAS 16253 is very likely to contain at least one proto brown dwarf if the binary separation is less than 0.5 arcsec. The large-scale outflows are further mapped with IRAM 30m telescope and APEX Champ+. We found that CO (6—5) traces high-excited gas around the precessing H2 jets and CO (2—1) likely probes the cold swept-up gas or entrained gas with cone-like structure.

S6.8: In Situ Dust Formation around Isolated Be Stars with Large Infrared Excess

Chien-De Lee (Graduate Institute of Astronomy, National Central University), Wen-Ping Chen (Graduate Institute of Astronomy, National Central University), Chakali Eswaraiah (Graduate Institute of Astronomy, National Central University), Anil Pandey (Aryabhatta Research Institute of Observational Sciences), Sheng-Yuan Liu (Institute of Astronomy and Astrophysics, Academia Sinica)

We present Be stars that show prominent infrared excess emission, yet are away from any star-forming regions. All these stars show forbidden lines in the spectra and are among the strongest Balmer emitters. Their infrared excess, with near-infrared colors $J - H$ and $H - K_s$ both greater than 0.7 mag, and extending to mid- or even far-infrared wavelengths, cannot be explained by free-free emission alone, and must be accounted for by dust thermal emission. Isolation from star-forming regions or young stellar populations excludes the possibility of the pre-main sequence status of these Be stars, so the grains must be condensed in situ, likely in expanding envelopes, as a consequence of binary mass exchanges, colliding stellar winds, or fast stellar rotation. Despite an abundance of dust in the environments, these stars generally suffer relatively little extinction, suggesting a non-spherical inside-out gas flow. Our targets have comparable levels of near-infrared excess, but much less excess at far-infrared or longer wavelengths, than pre-main sequence Herbig Ae/Be stars, which share many similar observational properties of our targets. The freshly made grains are small in size, and distributed in the vicinity of the star, hence lacking detectable cold dust, in contrast to the case of Herbig Ae/Be stars, which inherit dust grains grown since in parental molecular clouds, spatially distributed in a much extended volume. The multi-band polarimetric observation were performed for HD 45677 and HD 50138. The intrinsic polarization in each star, after the interstellar component is removed, exhibits a wavelength dependence indicative of the presence of small grains in the circumstellar disk. This class of isolated B-type emission line stars with large infrared excess serves as an additional source for cosmic dust to the usual evolved, post-main sequence stars.

S6.9: Dynamics of Elliptical Galaxies with Planetary Nebulae in MOdified Newtonian Dynamics

Yong Tian (中央大學天文所), *Chung-Ming Ko* (中央大學天文所)

The dynamics of an elliptical galaxy outside several effective radii is difficult to be probed by stars. Instead, planetary nebulae (PNe) can be used as a good tracer of the dynamics at large distances from the galactic center. Romanowsky et al. (2003) reported the dynamics of three luminous elliptical galaxies

(NGC821, NGC3379, NGC4494) all of which can be explained by Newtonian dynamics without dark matter up to 6 effective radii. Milgrom & Sanders (2003) showed that this result can be understood in the framework of MOND (MOdified Newtonian dynamics). We revisit this problem with data available in the past decade. In this contribution, we combine PNe data (up to 6-8 effective radii) and stellar data (from SAURON) of 7 elliptical galaxies, and conclude that the dynamics of these galaxies can be explained well by MOND.

S6.10: Shaping Multipolar Pre-Planetary Nebulae by Multi-Epoch Bullets

Po-Sheng Huang (ASIAA), Chin-Fei Lee (ASIAA), Anthony Moraghan (ASIAA)

We propose a multi-epoch ejection model of bullets for reproducing the collimated lobes of multipolar pre-planetary nebulae (PPNs). In order to investigate the physical properties of the bullets, we used the ZEUS-3D hydrodynamics code to simulate the shaping process and compared the results to the eastern lobes of the multipolar PPN, CRL 618. We assumed that bullets ejected at different episodes are cylinders with a radius of 100 AU and a length of 100 AU. Five bullets were ejected to produce the major eastern lobes of CRL 618. The launch sequence of the bullets are derived from the ages of these lobes. Each bullet has an initial velocity of 165-350 km s^{-1} and a mass of $\sim(1.7 - 3.6)\times10^{-3}$ $M_{\odot}$. The total mass of the five bullets is $\sim1.2\times10^{-2}$ $M_{\odot}$. One possibility to launch the bullets is a nova outburst which is triggered by the accretion of hydrogen gas onto a white dwarf in a close binary system. Our conclusions are the following. (1) In order to collimate the outflow lobes, a dense core is needed, which in turn requires a high mass loss of the asymptotic giant branch (AGB) wind, i.e., a superwind at the end of the AGB phase. (2) In our simulated CO intensity maps, the velocity of outflows increases linearly with distance along the outflow lobe axis, also consistent with the CO observations of CRL 618. (3) If the circumstellar envelope near the central star has a torus-like density distribution, we can reproduce the U-shaped CO cavity walls as seen in the low-velocity CO maps of CRL 618.

PS01: The Activity of Comet 67P/Churyumov-Gerasimenko from late-2014 to early-2015

Zhong-Yi, Lin (IANCU), Wing-Huen, Ip (IANCU), Jui-Chi, Lee (IANCU), the OSIRIS team (MPS)

The ESA Rosetta mission is currently in orbit around comet 67P/Churyumov- Gerasimenko, and is living up expectations in terms of its revolutionary contribution to cometary science, and by extension our understanding of how our solar system formed. The mission is the first to follow a comet as it orbits the Sun, and also successfully landed a small probe on the surface in November 2014. At pre-landing phase, Rosetta did its best to investigate the detailed surface structures, activity and physical properties of comet 67P by onboard all Rosetta's instruments including the science imaging system, OSIRIS (Optical, Spectroscopic, and Infrared Remote Imaging System), which consists of a narrow-angle and wide-angle camera (NAC and WAC) for the landing preparation. We will present the activity shown in the form of jets of comet 67P at pre-landing phase and describe how activity evolves during the pre- and post-landing phases.

PS02: The Size Frequency of Boulders on Comet 67P/Churyumov-Gerasimenko

Jui-Chi Lee (Department of Earth Science, National Central University, Chung-Li 32054, Taiwan), Maurizio Pajola (Centro di Ateneo di Studi ed Attivitá Spaziali), Zhong-Yi Lin (Institute of Astronomy, National Central University, Chung-Li 32054, Taiwan), Wing-Huen Ip (Institute of Astronomy, National Central University, Chung-Li 32054, Taiwan)

After a journey of 10 years and five months through deep spaces, the ESA Rosetta spacecraft has finally arrived at its destination, comet 67P/Churyumov-Gerasimenko (67P), on 6 August 2014. As earlier images had already shown, comet 67P has two distinct lobes separated by a narrow "neck", resembling the "head" (smaller lobe) and "body" (larger lobe) of a duck. After rendezvous with the comet 67P, the detailed surface structures, activity and physical properties of comet 67P have been investigated by onboard Rosetta's science imaging system, OSIRIS (Optical, Spectroscopic, and Infrared Remote Imaging System), which consists of a narrow-angle and wide-angle camera (NAC and WAC). One of the various morphological features characterizing the surface of comet 67P is to investigate the size frequency of boulders distribution that can provide clues to understand the nucleus inner structure and geological formation. Two of the OSIRIS NAC images taken in 6th August (2.03m per pixel) were used to identify the boulders that size is larger than eight meters. The other images obtained on 16th, 19th and 22nd September as relatively high resolution images (0.49m per pixel) were used for counting the smaller boulders. We will present the results of the statistics of the boulders and size frequency distribution, comparing the power law index in different resolution images. In addition, we also compare power law index between the "head", "neck" and "body" in order to know the cometary structure.

PS03: DSMC Simulations of Gas Outflow and Photochemical Processes in the Coma of Comet 67P/Churyumov-Gerasimenko

Ian-Lin Lai (Institute of Space Science, National Central University), Cheng-Chin Su (Department of Mechanical Engineering, National Chiao Tung University), Wing-Huen Ip (Institute of Space Science, Na-

tional Central University), Chen-En Wei (Graduate Institute of Astronomy, National Central University), Jong-Shinn Wu (Department of Mechanical Engineering, National Chiao Tung University), Ming-Chung Lo (Department of Mechanical Engineering, National Chiao Tung University), Ying Liao (Physikalisches Institut,University Bern), Nicolas Thomas (Physikalisches Institut,University Bern)

The expansion of sublimating gas from cometary nucleus surface is a complex physical process. It involves the diurnal temperature effect of the outgassing rate, the gas drag to the dust, the irregular shape of the nucleus at different scale lengths, transition from the collisional flow regime to the free-molecular flow regime, and the direct gas flow over or into regions in the shadow. Most of these effects which have been discussed before can now be tested by imaging observations and in-situ measurements at comet 67P/Churyumov-Gerasimenko (67P/C-G). We produce the surface temperature distribution and its diurnal variation by a geometrical thermal model of comet 67P/C-G. And we use a parallel 3D Direct Simulation Monte Carlo (DSMC) code, named PDSC++ [1, 2], from Wu's group at NCTU to calculate the gas flow near the cometary nucleus. In the presentation, we will show the results and basic characteristics of the gas coma pattern of comet 67P by including non-uniform gas composition (i.e., H2O-rich vs. CO2/CO) from different regions (i.e., neck vs. head/body). In addition, preliminary results on the photochemical effects of a distributed source will be described.

PS04: Search for the mass ejection activity on fast rotating asteroid using PTF data

Yu-Chi Cheng (Institute of Astronomy, National Central University), Chan-Kao Chang (Institute of Astronomy, National Central University), Henry Hsieh (Institute of Astronomy and Astrophysics, Academic Sinica), Wing-Huen Ip (Institute of Astronomy, National Central University), Chow-Choong Ngeow (Institute of Astronomy, National Central University)

Super-fast rotating asteroid may be a possible source of inter-planetary dust. When the centrifugal force due to the fast spinning is greater than the surface gravity, the surface material could be spin off from the asteroid and therefore carry away its angular momentum to let it slow down. The iPTF solar system project provided a good asteroid light-curve database include super-fast (period < 2.2 hour) and fast (period between 2.2 and 3 hour) rotating asteroids. We analyzed the images of 1 confirmed super-fast rotator, 5 candidates of super-fast rotators, plus 63 fast rotators obtained by iPTF in the dedicated high cadence light-curve observations in 2013 and 2014, to look for the signature of activity (e.g. weak coma structure). These images are co-added to reach a 30-min integration time to enhance the signal-to-noise ratio that improves the possibility to detect weak dust emission which is invisible in a single exposure. However, there is no such weak coma activity to be detected in this work. The upper limit of dust production rate had given for the future study.

PS05: Time Variability of Titan's Ionosphere Revisited

Jen-Kai Hsu (Graduate Institute of Space Science, National Central University, Taoyuan County, Taiwan), Wing-Huen Ip (Graduate Institute of Astronomy, National Central University, Taoyuan County, Taiwan), Rebecca 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)

Since the Saturn Orbital Insertion in 2004, the Ion Neutral Mass Spectrometer (INMS) experiment aboard the Cassini-Huygens spacecraft has acquired an extensive data set. The decadal coverage of the measurements during numerous close encounters with Titan allows the study of spatial and temporal variations of Titan's nitrogen-rich atmosphere above 1000-km altitude. Titan's ionosphere is quite different to that of Earth's ionosphere. Due to Titan's thick (hundreds of kilometers) and dense atmosphere, the measurable ion density of Titan's nightside ionosphere extends well beyond the terminator. The diurnal variation of the ion density profiles and compositional changes are the result of photoionization and magnetospheric electron ionization (important at the night side). The different time evolutions of the light and heavy species from day to night could be indicative of the effects of flow dynamics and ion-molecule chemistry. From the observations, we can determine the ion content in Titan's night-side and the asymmetry between the dawn and dusk ion density profiles. We have also found in the long term data base the signature of the equatorial expansion of Titan's atmosphere during solar maximum. In addition the global distributions of the major compound N2 and minor species like CH4 and H2 all exhibit significant changes over a solar cycle as the closest approach points of Cassini moved from the northern hemisphere to the southern hemisphere. In this work, we will first compare the diurnal variations between different ion species and simulate the ion densities to study the possible contributing factors. Then we will compare the results of our analysis to those reported by other groups to construct a comprehensive model of Titan's neutral atmosphere and ionosphere under different solar conditions.

P06: Search for serendipitous Oort cloud object occultation in X-rays

Jie-Rou Shang (NTHU), Chih-Yuan Liu (NTHU), Hsiang-Kuang Chang (NTHU)

Serendipitous occultation search is a way to study small objects in the outer Solar system like trans-Neptunian objects (TNOs) by extracting and analyzing the diffraction pattern in the occultation lights. There are already some reported detections in both optical and X-ray bands in this kind of search. Except for KBOs, this method also has the potential to extend the search to a distance as far away as the Oort cloud region (beyond a few thousands AU). As the distance is larger, a shorter wavelength is needed to have a smaller Fresnel scale, with which occultation may be more easily detected. Here we introduce the serendipitous occultation method we used in searching Oort cloud objects occultation, and present the results of using Rossi X-ray Timing Explorer/Proportional Counter Array data of Sco X-1 taken from 1996 February to 2011 October.

PS07: The preliminary results of searching a possible unseen planet beyond Neptune

Zong-Fu Sie (Graduate Institute of Astronomy, NCU), Wing-Huen Ip (Graduate Institute of Astronomy, NCU)

Trujillo and Sheppard (2014) found out that all trans-Neptunian objects with q>40 AU and a>150 AU have a similar argument of perihelion around 0° (called ω-clustering). They proposed the hypothesis that involves with Kozai mechanism to explain the phenomenon, and they claimed possible existence of an unseen planet (hereafter Planet X) with a mass of 2 -15 Earth mass and a semi-major axis of 200- 300 AU. Here we use analytical theory of Kozai mechanism by Innanen et al (1997) to

constrain the parameters, such as mass、semi-major axis、eccentricity and inclination, of Planet X, if it exist.

PS08: ALMA imaging of the Jovian moon Callisto

Ya-Wen Yo (National Taiwan Normal University, Department of Earth Sciences), Yi-Jehng Kuan (National Taiwan Normal University, Department of Earth Sciences), Ming-Chi Chung (National Taiwan Normal University, Department of Earth Sciences)

The Galilean satellite Callisto (Jupiter IV) has an icy crust on its surface and a very thin atmosphere, $< 10^{-}10$ bar, dominated by CO_2. Callisto has a silicate core and may also have a subsurface ocean. Callisto is deep inside the magnetic field of Jupiter. The heavily cratered Callisto surface implies there are no dynamic topographic activities on Callisto compared with the two other Galilean moons Io and Europa, and also indicates the surface is very old, in fact, the oldest in the Solar System. Recently water plumes have been discovered by Herschel around Saturnian moon Enceladus, Jovian moon Europa, and asteroid Ceres. We therefore took the initiative using our existing ALMA (Atacama Large Millimeter/ Submillimeter Array) data to look for signs of potential gas outburst from the subsurface of Callisto. With an angular resolution of better than 0." 6 in Band 6, our ALMA observations were able to spatially resolve Callisto. Continuum imaging of Callisto reveals non-uniform brightness distribution of Callisto. In addition, SEDs with different continuum slopes are disclosed in various quadrants of Callisto disk. No clear signature of gas outbursts were found on Callisto unfortunately.

PS09: The contribution of the atomic H produced from the main rings to the Cassini UVIS H Ly-α intensity maps in 2005

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

The Voyager observations showed a very broad H cloud in the Saturnian magnetosphere with an azimuthal asymmetry (Broadfoot et al., 1981; Shemansky & Hall, 1992). In addition to the local-time asymmetry, the Cassini data indicated the H cloud density increased with decreasing distance to Saturn' s upper atmosphere with a peak at Saturn (Shemansky et al., 2009). Shemansky et al. (2009) also suggested that the H atoms could flow outward from Saturn due to electron-impact dissociation of H2. However, Titan is found to be an important source of H in the outer magnetosphere and accumulative effect of solar radiation pressure on Titan' s H torus could account for the local-time asymmetry (Ip, 1996; Tseng et al., 2013). In addition, Tseng et al. (2013) showed that the morphology of the H cloud formed from photodissociation of the H2 cloud around the main rings is very similar to what was shown in the Cassini UVIS H Ly-a intensity map in 2005 (Melin et al., 2009), but with a much lower intensity. Therefore, we will revisit the H cloud formed from the main rings by investigating other possible sources such as the H directly from ice decomposition by energetic background radiation absorption and the interaction mechanism of the H with the icy dust grains. Finally, we will develop a radiative transfer model for an optical-thick H cloud which may account for the asymmetry above and below the ring plane showed in the UVIS map.

PS10: ALMA Observations of Organic Molecules in Comet C/2012 F6 (Lemmon)

Yo-Ling Chuang (Department of Earth Sciences, National Taiwan Normal University), Yi-Jehng Kuan (Department of Earth Sciences, National Taiwan Normal University)

Believed to be major carriers of vital organic molecules, comets are though to be significant for seeding the early Earth. Knowing the complexity of cometary molecular inventory is thus fundamental for astrobiology. In this meeting, we will present the results obtained from our ALMA (Atacama Large Millimeter/submillimeter Array) observations of Comet C/2012 F6 (Lemmon). An isovelocity pattern typical to a rotating solid-body plane is apparent in the moment-1 HCN velocity map. We find outflowing HCN gas from the cometary nucleus expanded fast with time, while rapid temporal variation of the velocity field reflected by HCN emission is apparent in the inner coma. HNCO, c-C_3H_2 and vinyl cyanide are tentatively detected. The spatial distribution of HNCO appears to be localized and inhomogeneous in the cometary nucleus if HNCO is a primary species. Methanol gas is not only concentrated on the cometary nucleus but also extended to the north of the comet. c- C_3H_2 is likely associated with the cometary nucleus; and C_2H_3CN, with the dust tail. The mighty ALMA, with its extraordinary ability of imaging, certainly turns every ordinary comet into a Hale-Bopp, the brightest comet of the 20th century.

PS11: The long-term orbital evolution of dust particles ejected from the Uranian rings

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

After the Saturnian rings, the ring system of Uranus is the most massive one among the planetary rings. The Uranian rings composed of micron- to boulder-sized particles are likely the product of catastrophic breakup of some small satellites. The narrow structures of the main rings are the result of the gravitational confinement effect of the so-called shepherding satellites. Bombardment by interplanetary meteoroids will produce a population of stray dust grains which orbital motion would be subject to the perturbation effect of the solar radiation pressure. Because of the peculiar orientation of the rotation axis of Uranus, the pointing direction of the solar radiation pressure force could have different orientation with respect to the ring plane as Uranus revolve around the sun with an orbital period of 84 years. In this study we present preliminary results on the long-term dynamical evolution of the ring dust particles after ejection from the ring system. One important goal is to estimate the influx of the ring material to the upper atmosphere of Uranus.

PS12: Star-disk interaction of brown dwarfs/white dwarfs as an analog of the Saturnian rings

KUN-CING PAN (Institute of Space Science National Central University), WING-HUEN IP (Institute of Astronomy National Central University)

Some brown dwarfs emit intense radio waves and the generation mechanism has been suggested to be related to the electrodynamical process similar to the Io-Jupiter interaction. In the case of the Io-Jupiter interaction, the unipolar inducation effect of Io' s ionosphere produces strong field-aligned

current system connecting to the Jovian atmosphere. The auroral hot spots created by the energetic charged particles accelerated in this current circuit can be found at the footpoints of the magnetic field flux tube of Io. A consequence of the auroral hot spot activity is the emission of coherent microwaves by the electron cyclotron maser (ECM) mechanism. This is the basis of an explanation for the detection of periodic radio emission from a number of brown dwarfs. The existence of disk systems around several brown dwarfs implies that electrodynamical transport of charged small dust grains from the inner Saturnian rings to the planet itself might also occur. It is well-known that the sharp boundary between the B ring and C ring of Saturn is determined by the critical radial distance of orbital instability of charged nano-grains and the Saturnian ionosphere is subject to strong electron depletion effect because of the continuous injection of water molecules of ring origin. In this study, we will compare the physical parameters (i.e., spin rates, planetary masses, magnetic field strength) of Saturn and brown dwarfs/white dwarfs to explore the possibility of such field-aligned mass transport in these star-disk systems.

PS13: Polarized Dust Emission in the Massive Protocluster W3 IRS5

Vivien Chen (National Tsing Hua University), Chat Hall (Harvard-Smithsonian Center for Astrophysics), Qizhou Zhang (Harvard-Smithsonian Center for Astrophysics)

Polarized dust emission is often observed in star-forming cores to trace the morphology of magnetic fields. As part of the polarization legacy project with the Submillimeter Array, we have mapped the polarized dust emission in the nearby (1.95 kpc) massive protocluster W3 IRS5, where a small group of hyper-compact HII regions is forming in a compact core of size 0.02 pc. Our 345 GHz observations achieved an angular resolution of $2.5''$ and resolved the polarized dust emission into an hour-glass morphology, indicating a pinched magnetic field geometry. Two pairs of outflows have been identified and appear nearly perpendicular with each other. We will discuss the plausible scenario for the outflows, core rotation, and magnetic field morphology, as well as their implications to massive cluster formation.

PS14: Large grains in the protostellar envelope: where do they come from?

Yi Hang Valerie Wong (National Central University), Hiroyuki Hirashita (Academia Sinica)

Grain growth during star formation affects the physical and chemical processes in the evolution of star-forming clouds. We investigate the origin of the mm-sized grains recently observed in Class I protostellar envelopes. We use the coagulation model developed in our previous paper and find that a hydrogen number density of as high as 10^9 cm^{-3}, instead of the typical density 10^5 cm^{-3}, is necessary for the formation of mm-sized grains. To test the possibility of such large grains being transported to the envelope from the inner, denser parts of the protostar to the envelope, we consider the motion of a mm-sized grain in a protostellar outflow, showing that the grains are indeed transported to the envelope. By investigating the shattering effect on the mm-sized grain, we ensure that it is not significantly fragmented after being injected in the envelope. We conclude that the mm-sized grains observed in the protostellar envelopes are formed in the inner part of the star-forming regions, and transported to the envelopes, and that they survive in the envelopes.

PS15: Very Low Luminosity Objects in Taurus Molecular Cloud

Ren-Shiang Sung (NTHU), Shih-Ping Lai (NTHU)

Very Low Luminosity Objects (VeLLOs) are the faintest protostars with intrinsic luminosity $L_{int} \leq 0.1\ L_{\odot}$. Their low luminosities hints that they could be either very young, very low-mass, or even very young and low-mass protostars (i.e., proto brown dwarfs). Thus, identifying VeLLOs and investigating their properties are crucial for fully understanding of the earliest stage of star formation. The goal of this paper is to uncover VeLLOs in the Taurus molecular cloud and confirm that they are true Young Stellar Objects (YSOs). We use the catalogue from Taurus Spitzer Legacy Project and apply the selection criteria developed by Dunham et al. (2008) which are based on the Spectral Energy Distributions (SEDs) of typical Class 0 and early Class I protostars. New criteria for bolometric temperature and extinction are included to make up the lack of complete coverage of submm/mm maps in Taurus. As a result, we select 10 VeLLO candidates. In order to verify our VeLLO candidates are real YSOs, we observe ^{13}CO (J=2-1), C^{18}O (J=1-0), N_2D^+ (J=2-1), N_2D^+ (J=3-2), and N_2H^+ (J=1-0) with Arizona Radio Observatory (ARO). We detect N_2H^+ and N_2D^+ (J=2-1) in four VeLLO candidates and ^{13}CO and C^{18}O in all 10 VeLLO candidates (except SL05). We have also obtained SMA CO (J=2-1) maps toward the four VeLLOs with N_2H^+ and N_2D^+ detections to investigate their outflow properties. Based on the result of the N_2D^+/N_2H^+ column density ratio, two VeLLO candidates could be very young protostars and the other eight are more likely to be very low-mass protostars.

PS16: Exploring the Outflow Kinematics in the Cluster-Forming Region W3 IRS5

Chang-Chun Chen (National Tsing Hua University)

Outflows are important in the star formation because they can help to remove excessive angular momentum from systems. They are ubiquitous in massive star-forming regions but suffer from source confusion and require high angular resolutions to study their kinematics and morphology. In particular, massive protostars are associated with extremely high velocity(EHV) components which are believed to be closely connected with ejecta from the central protostars. Through the Sub-millimeter Array (SMA), we have observed the outflows in a massive protostar, W3 IRS5 ($d = 1.83$ kpc, $L \sim 10^5 L_{\odot}$), with an angular resolution of $2''$ which allows us to well separate it from its neighboring HII regions W3A and W3B. In our new observation, we have resolved morphology of two pairs of CO (2-3) outflows in W3 IRS5 along north-south and east-west respectively. We have also resolved this two-pairs structure in SiO (8-7) outflows.

PS17: Numerical simulations of HH211: A reflection-symmetric bi-polar outflow

Anthony Moraghan (ASIAA)

Protostellar jets and outflows are an essential component in the star formation process. They regulate the rotating collapse of a star forming cloud into a young star by removing excess angular momentum from the system. This occurs as the removal of excess accretion material which is collimated and accelerated away at supersonic velocities from the central source by the bipolar jets. The jets then entrain ambient cloud material forming the bipolar outflows. Shocked emission produced by these

bipolar outflows are observed as the Herbig Haro (HH) objects. By studying these large scale extended structures we learn about the small scale region around the heavily obscured protostar. HH211 is an interesting bi-polar outflow. Recent SMA observations have shown it to possess a refection-symmetric wiggle. An explanation for this is that the jet source is part of a protobinary system. Here we are testing this assumption through 3D hydrodynamic simulations of HH211 using the PLUTO code with a molecular chemistry and cooling module. The module allows us to plot synthetic CO emission channel maps and position-velocity diagrams for direct comparison with observations. This enables us to test the observational assumptions, and put constraints of the physical parameters of the HH211 source.

PS18: Exploring Properties of Molecular Outflows form Class 0 Protostars with The Unified Wind Model

Liang-Yao Wang (NTU/ASIAA), Hsien Shang (ASIAA), Tzu-Yang Chiang (ASIAA), Ruben Krasnopolsky (ASIAA)

We report our recent progress on exploring properties of molecular outflows from Class 0 protostars using magmetohydrodynamic simulations. The numerical setup of the simulation in this work is based on the unified wind model proposed in Shang et al. (2006). Efforts has been made in two directions: (A) We explore how the two important factors in the wind model, namely, the gas sound speed and the toroidal magnetic field strength of the wind can effect the outflow morphology. And (B) we have modelled the line emission from CO molecule under simplified conditions and post-processed the simulation results to generate synthetic channel maps, PV diagrams, and spectra. We aim to obtain a good comparison between model and observations which would help us understand/constrain the physical properties of the molecular outflows.

PS19: The Proper Motion of the Highly Collimated Protostellar Jet HH211

Kai-Syun Jhan (National Taiwan University)

HH211 is a highly collimated jet with knotty structures powered by a nearby young Class 0 protostar. We have mapped it in several epochs in $\sim$340 GHz continuum, SiO(J= 8-7), and CO(J=3-2) with the Submillimeter Array (SMA). SiO and CO can both trace the internal shock in the jet, and their maps show knot positions clearly on each side of the protostar. The morphology of the jet is slightly different between different emissions. However, it is almost the same in all epochs for the same emission, especially for the bending structure. The bending structure is due to the reflection-symmetric wiggle, and more than one cycle of wiggle can be seen on both sides of the jet. Proper motion of the jet is measured by comparing the peak position of the knots in different epochs. They are estimated to be $\sim$0".095$\pm$0".034 per year and $\sim$ 0".087$\pm$0".018 per year in SiO and CO emission respectively, resulting in a tangential velocity of $\sim 125 pm 45$ km s^{-1} and $\sim 115 \pm 25$ km s^{-1} for the jet. The velocity of each knot is roughly constant and independent of the distance from the central source. It implies that the acceleration of these knots is almost zero. A velocity gradient along the jet axis is smaller in latter epoch in the knots. This variety of gradients in knots may illustrate how shocks propagate with time because knots likely trace unresolved internal shocks.

PS20: Magnetic Field Structure Of The Filamentary Cloud IC5146

Jia-Wei Wang (National Tsing Hua University), Shih-Ping Lai (National Tsing Hua University), Chakali Eswaraiah (National Central University), D.P. Clemens (Boston University), Wen-Ping Chen (National Central University), Anil K. Pandey (Aryabhatta Research Institute of Observational-Sciences)

To understand the physical conditions for filament formation, the magnetic field measurements would provide crucial information. Here we present our optical and infrared polarization observations toward IC5146 taken with AIMPOL (India), TRIPOL (Taiwan) and Mimir (US). IC5146 is one of the filamentary clouds observed in Herschel Gould Belt Survey, and Arzoumanian et al. (2011) claimed that the complex network of filaments discovered within the cloud favors the scenario that the filaments network are generated by large scale MHD turbulence and fragment into prestellar cores by gravitational instability. Our results reveal that the large scale structure of magnetic field is well perpendicular to the main filament, but more or less parallel to the sub-filaments, which are structure extended out from the main filaments. We have also conducted CO observations which show that the material in the sub-filament is flowing to the main-filament along the magnetic field; this result suggests the gas is possibly confined by magnetic field. In addition, the magnetic field strength map derived from the Chandrasekhar-Fermi method indicates a smooth magnetic enhancement with a scaling factor of 0.5, which suggest the gas is supported by the magnetic field while it is collapsing. Furthermore, the magnetic strength and density reveals that the cloud is evolving from magnetically subcritical in diffuse region to supercritical in dense region, emphasizing the importance of the question how the filament can remove the magnetic flux. Our results suggest that magnetic fields are one of the key factor during the filament formation and fragmentation processes.

PS21: Discovery of the Youngest T-type Brown Dwarfs

CHEN, Wen-Ping (NCU), CHIANG, Po-Shih (NCU), LALCHAND, Bhavna (NCU), CHEN, Pei-Yi (NCU)

We present a list of T dwarf candidates in the dark cloud L 1688 in the ρ Oph star-forming region. These candidates are selected with infrared colors sensitive to T dwarf characteristics of methane absorption and of cool atmospheres. The T dwarfs are the coldest class of brown dwarfs, with masses between those of hydrogen core fusion stars and of planets. Because of their intrinsic faintness, almost all known T dwarfs are in the field, with only a couple of controversial cases in even the nearest star-forming regions. We diagnose the 1.6-μm methane feature with on-off imaging using an H-band and an intermediate-band methane filter, calibrated to a set of known brown dwarfs of M, L, and T types in the field. Another methane feature at 3.3 μm is traced with the Spitzer/Infrared Array Camera (IRAC) [3.6] - [4.5] color. For cool atmospheres, the H - [4.5] and K - [4.5] colors are utilized. With an additional criterion of mid-infrared brightness to eliminate extragalactic interlopers, a total of 28 T dwarf candidates have been identified. A comprehensive assessment was conducted to estimate the level of contamination of our sample by young stellar variability, by extragalactic sources sharing the same color behaviour, or by foreground T dwarfs. Though extragalactic sources are estimated to contribute up to about half of the false positives, our candidates show close spatial association with the dark cloud, rather than randomly distributed as a background population would have been. Furthermore, even though our candidates are not selected a priori by a color-magnitude relation, they mostly follow the 1 Myr isochrones, ascertaining their youth. Our selection methodology provides

guidance to search for T dwarfs in other star-forming regions. Our candidate list, when comparing with those in the literature, which often rely on a single criterion on cool temperature or methane, is more conservative but should be more secure for follow-up spectroscopic confirmation of a T dwarf sample at the early evolutionary stage. At least two candidates have been confirmed to be bona fide T dwarfs by spectra taken with Gemini South/FLAMINGO2 and VLT/SIFONI, signifying the discovery of these elusive objects in the making.

PS22: Hyperflare activities of M dwarfs in the Kepler data archive

Han-Yuan Chang (張瀚元)(National Central University, Institute of Astronomy), Chi-Ju Wu (吳季儒)(National Central University, Institute of Space Science), Li-Ching Huang (黃立晴)(National Central University, Institute of Astronomy), Wing-Huen Ip (葉永烜)(National Central University, Institute of Astronomy)

Since the Kepler telescope launched in 2009, it continuously observed over 160000 stars until the end of mission in 2013. Compared with G dwarfs like our sun, the habitable zones of M dwarfs are much closer to the host star. Therefore, the magnetic activities of host stars may affect the habitability of their exoplanets. Flares are one of such energetic processes, which can be identified from light curves. In this study, we will make use of the public data archive of the NASA Kepler mission. The selection criterion of M dwarfs is based on Teff < 3600 K and log (g) > 4. We check flux variations caused by flare activities of host stars in their light curves. According to this condition, 456 M dwarfs can be identified. Out of them, 87 M dwarfs show signs of flare activity, 3 M dwarfs have extreme flare activities with energies above 10^{35} erg.

PS23: The Parallax Program Using a Selected Open Cluster, NGC 7142

Yi-Hsiang Hsu (NTNU), Hsieh-Hai Fu (NTNU)

The parallaxes of stars are very important information, but the parallax program of NTNU is just begun. The proper motion of stars is not only dominated by stars' spatial motion, and is also influenced by the Earth' s motion, known as annual parallax. Parallax factors of a star are relation to the apparent motion of the Sun and the original position of star. The difference of coordinates among different periods should be the proper motion multiply by the time period plus annual parallax by the factor of solar longitude. In this research, an open cluster, NGC 7142 is used for the parallax program. The images of Palomar Observatory Sky Survey (POSS I, POSS II) and images observed by NTNU, are used to parallax program.

PS24: Molecules in Planetary Nebula NGC 6302 - III

Tatsuhiko Hasegawa (ASIAA), Sun Kwok (Hong Kong University)

Many molecules have been detected in the bright planetary nebula NGC 6302. Detected molecules include NH3, H2O, OH, HCN, CN, HCO+, SO, CCH, CO(16-15), 13CO, C18O. Chemical models have been developed to replicate the observations of the molecular abundances and physical conditions.

PS25: Light-Curve Synthesis of a Semi-Detached Eclipsing Binaries, DD Mon

Yen-Chun, Luo Cho (National Taiwan Normal University), Hsieh-Hai, Fu (National Taiwan Normal University)

The light-curve of eclipsing binaries systems, DD Mon, is synthesized by Roche model with the photometric data taken from All Sky Automated Survey (ASAS). Assuming that the systems have circular orbits with synchronous rotation, and simulate the stars shape changes at different phase in terms of calculate system' s Roche surface potential and Lagrangian point. The calculation of light transmitted toward the observer use the integration of flux which considering the limb-darkening effect from those parts of the stellar surface which are visible to the observer on Earth. The parameters used in this model such as orbital inclination, linear limb-darkening coefficients, radii of the two components, mass ratio and temperatures were obtained from Gazeas(2010).

PS26: Physical Properties of G-type Kepler Eclipsing Binaries

Li-Ching Huang (Institute of Astronomy, National Central University, Taiwan), Wing-Huen Ip (Institute of Astronomy, National Central University, Taiwan), A-li Luo (National Astronomical Observatories, Chinese Academy of Sciences, China), Han-Yuan Chang (Institute of Astronomy, National Central University, Taiwan)

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 corresponding probability of flare occurrences. Of the eclipsing G-type binaries detected by Kepler, about 4.07% have 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 the orbital period, the type of the secondary star, and the distance between the two stars in the binary system. LAMOST has 83 good spectra of Kepler G-type eclipsing binaries until 2014. There are also several(5) binary systems show flare events in the Kepler light curves. Those spectra might help us to understand the spectral type and size 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) system.

PS27: Superorbital Variation of Catalysmic Variables with Synoptic Surveys

Ting-Chang Yang (National Central University), Yi Chou (National Central University), Chin-Ping Hu (National Central University), Yi-Hao Su (National Central University)

We studied the long-term variations of galactic cataclysmic variables with the synoptic survey projects. Data from Palomar Transient Factory (PTF) and Catalina Realtime Transient Survey (CRTS) were used for our analysis. First order calibration applied on the light curves of different system. After the periodicity analysis, there are several sources found to possess long-term periodicities. Several

possible mechanisms proposed for the phenomena, such as the properties of the accretion disk, triple star system, the magnetic field change of the companion stars, etc. We will discuss the possible scenarios in this poster.

PS28: New Template Light Curves of Cepheid Variables Based on PS1 PAndromeda Data Using PEGASUS Method

I-Ling, Lin (Graduate Institute of Astronomy, National Central University, Jhongli City, Taiwan), Chow-Choong, Ngeow (Graduate Institute of Astronomy, National Central University, Jhongli City, Taiwan)

Cepheids are standard candles that can be used to derive distances to nearby galaxies based on their well-calibrated period-luminosity relations. Accurate mean magnitudes derived from observed light curves are needed in the distance scale applications. The photometric characteristics of Cepheids are still not well defined in grizy photometric system. Therefore, we carried out a project to develop template light curves in r and i bands based on a large set of Cepheids with known periods and well-sampled light curves from Pan-STARR1 (PS1) PAndrameda catalog (Kodric et al., 2012 [AJ 145:106]). We fit these light curves using the very popular Fourier decomposition technique. However, problems occurred on our template light curves through the classical fitting method. Thus we imposed a new approach called PEGASUS (PEriodic GAussian Uniform and Smooth, Inno et al., 2015 [A&A, 576A:30]) on the same data set for the development of template light curves. We present our new template light curves performed by PEGASUS method and discuss comparisons of Fourier decomposition to PEGASUS fits.

PS29: Refining period of a Mira in M33 with incomplete light curve.

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

Mira is a type of red giant pulsating star with period longer than 100 days. [HBS2006] 40671 is a confirmed 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 have 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.Since this Mira has an amplitude of 7 magnitude in R-band, then at distance of M33 some part of its light curve will fall below the detection limit of PTF at 21 magnitude. This post challenges to find the period of this particular Mira. We hence test various period search methods in case of incomplete light curves. We found some interesting results which will be reported at the 2015 ASROC Meeting.

PS30: Interactions between young Galactic supernova remnants and nearby molecular clouds traced by CSO CO (J=2-1)

Po-Sheng Ou (Academic Sinica)

Interactions between young Galactic supernova remnants (SNRs) and nearby molecular clouds (MCs) give us clues about the shock regions after supernova explosions. We pinpoint the interactions of these

three SNRs : G39.2-0.3 (3C396), G41.1-0.3 (3C397) and G349.7+0.2. To analyze the environment around the SNRs, CO (J=2-1) data are obtained from the observation with Caltech Submillimeter Observatory (CSO) Fast Fourier Transform Spectrometer (FFTS1). We compare CO (J=2-1) data with X-ray images from Chandra and infrared images from Spitzer including IRAC and MIPS data. Our results present morphological consistency between the SNRs and MCs, and we identify the regions of interactions. CO (J=2-1) line broadening can also be evidence for the SNR-MC interactions, but only G349.7+0.2 shows obvious broadening. Additionally, we confirm that some infrared features mentioned in Reach et al. (2006) occur in the interaction regions. Furthermore, we are investigating the PAH features to know its survivability in the shocked environment.

PS31: The updated orbital ephemerides of low mass X-ray binary 4U 1323-62 and 4U 1254-69

Po-Sheng Chuang (National Central University), Yi Chou (National Central University), Chin-Ping Hu (National Central University), Ting-Chang Yang (National Central University), Yi-Hao Su (National Central University), Nai-Hui Liao (National Central University), Hung-En Hsieh (National Central University), Ching-Ping Lin (National Central University), Vaidehi Varma (National Central University)

4U 1323-62 and 4U 1254-69 are low mass X-ray binary exhibiting periodic X-ray dips, which are due to absorption by bulge of outer accretion disk. The purpose of this study is to update their orbital ephemerides using archived X-ray data of the time span about 26 years. We present our results from analyzing the light curves collected by ASCA, BeppoSAX, Chandra, EXOSAT, RXTE, Suzaku and XMM-Newton. We used method proposed by Hu et al. (2008) to estimate dip center time and adopted Observed - Calculate method to measure the orbital periods and their derivatives. The orbital periods are refined as 2.94191579(35) hr for 4U 1323-62 and 3.9333372(15) hr for 4U 1254-69. No significant orbital period derivatives is detected for both sources with 2σ upper limits of $\dot{P}_{orb}/P_{orb} = 8.6 \times 10^{-8} yr^{-1}$ and $3.8 \times 10^{-7} yr^{-1}$ for 4U 1323-62 and 4U 1254-69, respectively.

PS32: The orbital and spin parameters of the partial eclipsing X-ray binary X1822-371

Hung-En Hsieh (Graduate Institute of Astronomy, National Central University), Yi Chou (Graduate Institute of Astronomy, National Central University), Chin-Ping Hu (Graduate Institute of Astronomy, National Central University), Ting-Chang Yang (Graduate Institute of Astronomy, National Central University), Yi-Hao Su (Graduate Institute of Astronomy, National Central University), Vaidehi Varma (Graduate Institute of Astronomy, National Central University), Ching-Ping Lin (Graduate Institute of Astronomy, National Central University), Po-Sheng Chuang (Graduate Institute of Astronomy, National Central University), Nai-Hui Liao (Graduate Institute of Astronomy, National Central University)

X1822-371 is a low mass X-ray binary with accretion disk corona exhibiting partial eclipses and pulsations in the X-ray band. We update its orbital ephemeris by combining the new RXTE observations and historical records, with total time span of 34 years. There were 11 RXTE observations in 2011 but the eclipsing profile can be seen in only 4 of them. The eclipsing center times were obtained by fitting the profile with the same model as previous studies. Combined with the historical eclipsing center

times reported by Iaria et al (2011), the O-C analysis was processed. A quadratic model was applied to fit the O-C results and obtained the mean orbital period derivative of $\dot{P}_{orb} = 1.464(41) \times 10^{-10} s/s$, which is slightly smaller than previous records. In addition to the orbital modulation from the partial eclipsing profile, we also determined the spin and orbital parameters by orbital Doppler Effect and the pulse arrival time delay technique. We found that the times when the neutron star located at the superior conjunction (i.e. $T_{\frac{\pi}{2}}$) significantly deviate from the corresponding eclipsing center times, which indicates asymmetry X-ray emissions from disk corona. Finally we compared the orbital and spin parameters obtained by these three analysis methods.

PS33: Characterizing Intermittency of Type-C Low-frequency Quasi-periodic Oscillations in XTE J1550-564

Yi-Hao Su (Graduate Institute of Astronomy, National Central University), Yi Chou (Graduate Institute of Astronomy, National Central University), Chin-Ping Hu (Graduate Institute of Astronomy, National Central University), Ting-Chang Yang (Graduate Institute of Astronomy, National Central University), Vaidehi Varma (Graduate Institute of Astronomy, National Central University), Hung-En Hsieh (Graduate Institute of Astronomy, National Central University), Ching-Ping Lin (Graduate Institute of Astronomy, National Central University), Po-Sheng Chuang (Graduate Institute of Astronomy, National Central University), Nai-Hui Liao (Graduate Institute of Astronomy, National Central University)

We present the systematically time-frequency analysis of type-C low-frequency quasi-periodic oscillations (LFQPOs) in the black hole X-ray binary XTE J1550-564 during its 1998 outburst. We utilized Lomb-Scargle spectrograms, autocorrelation functions, and Hilbert-Huang transform to characterize the intermittency of these LFQPOs. Our preliminary results show that their peak frequencies and coherent times are related, the higher the frequency, the shorter the oscillation lifetime. This property is consistent with the Lense-Thirring precession model. The model predicts the relation between the LFQPO's frequency, modeled by the Lense-Thirring precession frequency of a hot flow around a black hole, and the oscillation lifetime, modeled by the viscous time-scale at the outer edge of the hot flow, as the flow moves toward the black hole.

PS34: Fermi LAT observation of the Nova Sagittarii 2015 No. 2

K. L. Li (National Tsing Hua University), Albert K. H. Kong (National Tsing Hua University), Thomas P. H. Tam (Sun Yat-sen University)

The recent naked eye visible (about 4th V magnitude at peak) Nova Sagittarii 2015 No. 2 (Nova Sgr 2015-2, hereafter) has been drawing attention from the astronomical community since the discovery on 16 March 2015, not only because of the fabulous optical brightness that is beneficial for various nova studies, but more importantly the unusual second peak seen two weeks after the discovery as well as the rare Fermi/LAT MeV/GeV gamma-ray detection (before which only four novae showed high-energy radiations at this level for the last six years of the Fermi mission). In this poster, we present gamma-ray spectral and variability studies of Nova Sgr 2015-2 using the Fermi/LAT data from 100 MeV to 300 GeV. This work advances the understanding of this new gamma-ray source

class, which helps to reveal the physical origin of the short-lived (10 days) gamma-ray flares from the white dwarf binaries.

PS35: The Orbital and Spin parameters of LMC X-4

Ching-Ping Lin (National Central University), Yi Chou (National Central University), Chin-Ping Hu (National Central University), Ting-Chang Yang (National Central University), Yi-Hao Su (National Central University), Hung-En Hsieh (National Central University), Po-Sheng Chuang (National Central University), Nai-Hui Liao (National Central University), Vaidehi Varma (National Central University)

LMC X-4 is an eclipsing high mass X-ray binary of a period of 1.4 days. It is composed of an early type star and a neutron star of a spin period of 13.5 s as accretor. We used the archived data collected by Proportional Counter Array on Rossi X-ray Timing Explorer to estimate the orbital and spin parameters for LMC X-4. The detected pulse frequencies from power spectra for small time segments were fitted with a circular orbital Doppler shift model. We obtained the neutron star spin frequencies of 0.074020(11), 0.0740648(51) and 0.074097(12) Hz for 1996, 1998 and 1999 data sets, respectively. A significant spin frequency derivative of $(7.20 \pm 0.59) \times 10^{-13}\ Hz \cdot s^{-1}$ was detected from the linear fitting for the spin frequencies of the three data sets. More precise orbital and spin parameters were evaluated by pulse arrival time delay technique. We refined the neutron star spin frequencies as 0.0740189(40), 0.07405809(39) and 0.07409406(25) Hz for 1996, 1998 and 1999 data sets, respectively. Combined with the historical recorded of the epoch of 900 mean orbital longitude and spin frequencies, and those we obtained in this study, we will further update the orbital ephemeris as well as the spin frequency derivative of LMC X-4.

PS36: Search for Variability of the Optical Counterparts Associated with Gamma-ray Millisecond Pulsar Candidate 2FGL J1120.0-2204

Chin-Ping Hu (Graduate Institute of Astronomy, National Central University), David Chung-Yue Hui (Department of Astronomy and Space Science, Chungnam National University, Korea), Mike Ting-Chang Yang (Graduate Institute of Astronomy, National Central University), Yi Chou (Graduate Institute of Astronomy, National Central University), Albert Kong (Graduate Institute of Astronomy, National Tsing-Hua University), Lupin Chun-Che Lin (Institute of Astronomy and Astrophysics, Academia Sinica), Wing-Huen Ip (Graduate Institute of Astronomy, National Central University)

A number of unidentified gamma-ray sources are reported as possibly candidates of black widow or redback pulsars, which are missing links between accreting X-ray millisecond pulsars and isolated millisecond pulsars. Here we present an optical observation of the field containing one promising millisecond pulsar candidate, 2FGL J1120.0-2204. From Swift observation, two possible X-ray counterparts, J1120_X1 and J1120_X2, were detected. We searched for the periodicity of J1120_X2, which shows a spectral energy distribution (SED) similar to a K type star, using Lulin One-meter Telescope and no significant variability was detected. On the other hand, we unexpectedly detected an unknown variable star 2MASS J 11201034-2201340, which is associate with a faint X-ray source outside the error ellipse of 2FGL J1120.0-2204, with a period of $\sim$ 3.5 hours. From a broad-band SED, as well as the color comparing to J1120_X2, we noticed that 2MASS J11201034-2201340 resembles a K

type star. Therefore, it is unlikely to be a pulsating variable considering its period and color. We look forward to the upcoming release of XMM-Newton data in June to deeply study the X-ray behaviors of all the X-ray sources in this field.

PS37: THE LONG-TERM X-RAY VARIABILITY OF SUPERNOVA 2004AM IN M82

Ruolan Jin (National Tsing Hua University, Taiwan), Albert Kong (National Tsing Hua University, Taiwan), Yi-Kuan Chiang (The University of Texas at Austin, USA), K. L. Li (National Tsing Hua University, Taiwan)

Theoretically, it is possible for an accretion powered wide-orbit high mass X-ray binary (HMXB) with a neutron star (NS) to evolve to a double NS system. Such a binary will experience two SN explosions. Before and during the second explosion it could produce observable X-ray emission. By using our proposed Chandra observations and the archival data of M82, we found a pre-explosion X-ray source CXOU J095546.7 +694038 with roughly constant luminosity of $\sim 10^{38}$ ergs s^{-1} , which coincides with the position of the superonova 2004 am (SN 2004am). The long-term X-ray light-curve of this source shows the X-ray luminosity increased from $\sim 5\times10^{38}$ ergs s^{-1} to $\sim 8\times10^{38}$ ergs s^{-1} after the SN explosion in late 2003 and is decreasing to $\sim 6\times10^{38}$ ergs s^{-1} in recent years. This result strengthens the possibility of finding the first candidate of a stellar companion SN explosion in an accreting-powered binary system but weakens the line of sight coincidence of two irrelevant SN and X-ray binary scenario. Apart from SN 2004am, we also check the variability of other X-ray sources in M82 from the Chandra data in recent years.

PS38: A search for candidates of variable gamma-ray pulsars

Justin C. H. Wu (Institute of Astronomy and Department of Physics, National Tsing Hua University, Hsinchu 30013, Taiwan), David C. Y. Hui (Department of Astronomy and Space Science, Chungnam National University, Daejeon, Republic of Korea), Albert K. H. Kong (Institute of Astronomy and Department of Physics, National Tsing Hua University, Hsinchu 30013, Taiwan)

We present the preliminary results of a search for candidates of gamma-ray variable pulsar by using 6 years (2008 2014) of data from the Large Area Telescope (LAT) on board the Fermi Gamma-Ray Space Telescope. We chose 23 pulsars having glitch events and analyzed the light curves whose energy range is from 100MeV to 300GeV with a likelihood analysis to search for variation of flux before and after a glitch.

PS39: Generation of Energetic Neutral Atoms (ENAs) from Planets to Exo-planets

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

The ENCA detector for energetic neutral atoms is an important element of the MIMI experiment onboard the Cassini spacecraft (Krimigis et al., 2004). The energy range is between 5 keV to 220 keV with many energy steps. An important discovery of ENCA concerns the appearance of source regions of hydrogen ENAs rotating around Saturn outside the orbit of Enceladus (Paranicas et al., 2005). The luminosity of the ENA flux tends to brighten up in the mid-night to dawn sector which might

be associated with the injection events of energetic charged particles which have higher occurrence frequency in this region. In this study, we examine the time evolution of a cloud of energetic ions in drift motion relative to the rotating magnetosphere. Besides the dispersal of the energetic ions as a function of their energies, the charge exchange interaction with the neutral cloud of Enceladus origin will be simulated. And we could further extend the discussion from the Saturn to those Exo-planets with similar phenomena. References: Krimigis, S.M., Mitchell, D.G., Hamilton, D.C., Livi, S. et al., (2004) Magnetospheric Imaging Instrument on the Cassini Mission to Saturn/Titan, Space Sci. Rev., 114, 233. Paranicas, C.P., Mitchell, D.G., Brandt, P.C., Krimigis, S.M., and Mauk, B.H. (2005) Periodic intensity variations in global ENA images of Saturn, Geophys. Res. Lett. 32,(21) L21101.

PS40: Relation between spatially resolved Star Formation Rate and Stellar Mass of galaxies with MaNGA

Lin, Jing-Hua (ASIAA & NTU), Lin, LiHwai (ASIAA)

We present studies on the surface density of star formation and stellar mass with MaNGA data. With the aid of IFU, spatially resolved SFR can be obtained from H-alpha emission line intensity map, whereas stellar mass comes from optical and near-infrared photometry. We classify galaxies into star-forming main sequence and passive population according to their location in the integrated SFR and M* plane. Our preliminary results show there also exists positive correlation between SFR and stellar mass on kiloparsec scales, implying this could be a more fundamental relation. Generally, if a galaxy is defined as star-forming/passive, it would form a star-forming/passive sequence in the resolved SFR-M* plane. Furthermore, we also discover rare cases which display an anti-correlation between SFR and M* roughly in the region between bulge and disk components, showing a signal of phase transition; this suspect is also supported by the fact that these galaxies are located in the green valley from the global aspect.

PS41: Interaction-triggered star formation and its spatial distribution

Chin-Hao Hsu (ASIAA), Lihwai Lin (ASIAA)

We use integral field spectroscopic data from CALIFA and MaNGA surveys to derive the spatially resolved star formation rates (SFRs) of 10-20 wet mergers from their H-alpha intensity. Control sample is carefully selected by taking into account their stellar mass and morphology. To investigate whether the star formation activities can be affected by the merger process, we compare the specific star formation rate (sSFR) distributions, as well as the spatial distribution of star formation by Gini and M20 coefficients, between mergers and control samples. We find that mergers on average possess higher sSFR, and have a higher Gini value than normal galaxies, implying that star formation is indeed triggered at certain position due to galaxy interaction. In addition, we calculate the average sSFR at different distance around the galaxy nucleus and compared it with the control samples. The enhancement of sSFR is strongest nearby the nucleus and becomes weaker as the distance from the nucleus increases. Our preliminary results support the scenario that mergers can lead to a central starburst.

PS42: The color distribution and stellar mass of elliptical galaxies in the Sloan Digital Sky Survey

Chen-Hung Chen (Department of Physics, National Central University, Jhongli, Taiwan), Chung-Ming Ko (Institute of Astronomy, Department of Physics and Center of Complex Systems, National Central University, Jhongli, Taiwan)

Recent studies showed that the color distribution and mass of an elliptical galaxy may be related. In this contribution, we study the size of elliptical galaxies in different wavelengths as a measure of their color distribution, which we call it size-wavelength relation (SWR). We estimate the stellar mass (SM) of an elliptical galaxy via its dynamical mass in the framework of MOdified Newtonian Dynamics (MOND), which is an alternative to dark matter paradigm. We select elliptical galaxies with measured velocity dispersion and effective radius between redshift 0.05 and 0.5 from the main galaxy sample and the luminous red galaxy sample in the Sloan Digital Sky Survey. We group elliptical galaxies according to their SWR and seek if a link exists between SWR and SM.

PS43: Dust enrichment history constrained by extinction curves in nearby galaxies

Kuan-Chou Hou (ASIAA/NTU), Hiroyuki Hirashita (ASIAA)

Dust enrichment is one of the most important aspects in galaxy evolution. In this presentation, we investigate whether we could explain the dust properties, especially the extinction curve, in nearby galaxies or not, using the dust enrichment models developed in our previous work. In the model we treat the evolution of dust abundance for small (< 0.03 μm) and large (> 0.03 μm) grains separately by considering the dust production in stellar ejecta, destruction in supernova shocks, dust growth by accretion and coagulation, and dust disruption by shattering. The Milky Way extinction curve is reproduced in reasonable ranges for the timescale of the above processes, which shows that our models are successful in reproducing the Milky Way dust extinction properties. However, the same models fail to reproduce the LMC/SMC extinction curves. This implies that either of the above processes works with much different efficiency in these low-metallicity galaxies. We finally discuss some possibilities of reproducing the LMC/SMC extinction curves, in order to provide a hint for dust enrichment at low metallicity.

PS44: The relation between barred spiral galaxies and their environments

Yin-Fang Wang (IANCU), Chorng-Yuan Hwang (IANCU)

We studied the effects of environment on barred spiral galaxies. We selected 184131 galaxies from Sloan Digital Sky Survey DR12 with redshifts between 0.001 and 0.2. We consider a galaxy as a barred spiral galaxy if the source has a barred spiral vote fraction greater than 0.5 in Galaxy Zoo. Our result shows that there is a positive correlation between the fractions of barred spirals and the numbers of their neighbor galaxies. We discuss our results on the implication of barred spiral galaxy evolution.

PS45: Observational properties of non-elliptical brightest cluster galaxies

Yen-Ting Li (Department of Physics, National Taiwan Normal University), Lin-Wen, Chen (Department of Earth Sciences, National Taiwan Normal University)

The morphology of the brightest cluster galaxies (BCG) may not be limited to elliptical or cD type. With the advanced sensitive large survey *Sloan* digital sky survey data release 10 (SDSS DR10), we selected galaxy samples from Tempel et al. (2014) galaxy clusters/groups catalogues, and find that the morphologies of about 35% of BCG are likely classified as irregulars or even spirals. While the spiral BCG (spBCG) are as massive as elliptical galaxies and their luminosities are between elliptical BCG and normal elliptical galaxies, the general properties of spiral galaxies, such as bimodal distribution in color $g-i$, as well as more active star formation and $\sim$1 Gyr younger average stellar age in comparison to ellipticals, remain in spBCG. Notably there are also non-negligible differences in star formation rate and color between normal spirals and spBCG. Furthermore, the spBCG host clusters are in general poorer and less massive than those of elliptical BCG. If the spBCG are subdivided into red sequence and blue cloud populations, the two populations are corresponding to Sab and mixed Sab/Scd, respectively. Surprisingly, in contrast to field spirals, the fraction of active star forming spBCG is higher in the red sequence population than that of the blue cloud. Our results suggest that, unlike classical disk-less giant ellipticals, spBCG assemble their mass through accretion or multiple minor merging events, they could therefore represent a different type of BCG from the classical BCG, although some of the detected spBCG being simply the elliptical BCG progenitors cannot not be ruled out.

PS46: Non-spherical problems in MOdified Newtonian Dynamics

Chung-Ming Ko (Institute of Astronomy, National Central University, Taiwan)

In Newtonian gravity, the potential of a mass distribution can be expressed as a linear superposition of point mass potentials. This cannot be done in MOND (MOdified Newtonian Dynamics) as it satisfies a nonlinear Poisson equation. Except for highly symmetric systems such as spherically symmetric systems, no general solution has been found. Very few solution methods or numerical schemes have been proposed. This contribution presents an analytical attempt to solve the MONDian potential of systems slightly deviated from spherical symmetry.

PS47: Morphology of Seyfert galaxies

YEN-CHEN CHEN (National Central University), Chorng-Yuan Hwang (National Central University)

We probed the relation between properties of Seyfert galaxies and morphology of their host galaxies. We select Seyfert galaxies from the V ron Catalog(13th). We only selected the Seyfert galaxies with redshifts less 0.5. We used the "*FracDev*" parameter from SDSS galaxy fitting to represent the bulge fractions of the Seyfert host galaxies. We found that the host galaxies of Seyfert 1 and Seyfert 2 are dominated by large bulge fractions, and Seyfert 2 galaxies are more likely to located in disk galaxies whereas most of the Seyfert 1 are located in bulge-dominant galaxies. These results can not be explained by the traditional unification model of Seyfert galaxies. Also, we found that the mean

values of nitrogen luminosity of Seyfert 1 and Seyfert 2 vary with bulge to disk ratios. This result suggests that AGN might evolve with their black hole.

PS48: High Redshift Red QSOs

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

Quasi-stellar objects (QSOs) are very bright and distant objects. It is generally considered as the brightest Active Galactic Nuclei (AGNs). Traditional QSOs were found to be relatively blue; recently, people discovered a new type of red QSOs, which show much redder colors than traditional QSOs. To investigate the origin of the red QSOs, we tried to select red QSOs at high red shifts and studied their properties using SDSS spectral and photometric information. We show our preliminary results in the poster and discuss their implication on the origin of the red colors of the red QSOs.

PS49: The Physical Structures of Type Ia Supernova Remnant N103B

Chuan-Jui Li (NTU, ASIAA), You-Hua, Chu (ASIAA, UIUC), Robert Gruendl (UIUC)

N103B is a Type Ia supernova remnant (SNR) projected in the outskirt of the superbubble around the rich cluster NGC 1850 in the Large Magellanic Cloud (LMC). We have obtained high-resolution Hα and continuum-band images of N103B with the ***Hubble Space Telescope*** (***HST***) and high-dispersion optical spectra with 4m and 1.5m telescopes at Cerro Tololo Inter-American Observatory. The ***HST*** Hα image exhibits a complex system of nebular knots inside an incomplete filamentary elliptical shell. The Hα shell is open to the east where X-ray and radio emission extends further out. The nebular knots are dense, with rms electron densities determined from the Hα surface brightness $\leq$ (2250 $\pm$ 300) cm^{-3}, and electron densities determined from the [S II] λ6716/6731 ratio reaching 5300 cm^{-3}. Such high densities are more commonly seen in stellar ejecta than in diffuse interstellar medium. The high-dispersion spectra reveal three kinematic components in N103B: (1) a narrow component with [N II]6583/Hα $\sim$ 0.14 originating from the ionized interstellar gas associated with the superbubble of NGC 1850 in the background, (2) a broader Hα component with no [N II] counterpart originating from the SNR's collisionless shock into a neutral ambient medium, and (3) a broad component, ΔV $\sim$ 500 km s^{-1}, in both Hα and [N II] lines originating from shocked material in the nebular knots. The [NII]/Hα of this shocked material suggests that its nitrogen abundance is enhanced, consistent with an origin of processed stellar material. We will discuss implications of the pre-SN ejecta on the nature of the progenitor of this Type Ia SN.

PS50: Multi-bands Study of iPTF13dhz - A Type Ia Supernova with strong circumstellar medium interaction

Kuiyun Huang (NTNU/NCU), Yuji Utata (NCU), Wing Ip (NCU), iPTF team (iPTF)

SNIa-CSM is a rare subclass of SNIa shows evidence of strong interaction with their H-rich circumstellar medium. Board, long-lived LCs and brighter peak magnitude makes SNIa-CSM are usually contaminated by SNIIn and only 16 objects have been found so far. iPTF13dhz was discovered by

the iPTF survey. Spectra show iPTF13dhz has similar properties with SN2005gj, a typical SNIa-CSM then be classified as a SNIa-CSM. In this poster, we will present iPTF13dhz photometric evolution from optical (iPTF, Lulin) to NIR (CFHT) and investigate iPTF13dhz photometric properties with SN2005gi as well.

PS51: An Adaptive Homomorphic Aperture Photometry Algorithm for Merging Galaxies

Jen-Chao Huang (IANCU)

We present a new automatic adaptive aperture photometry algorithm for measuring the total magnitudes of merging galaxies with irregular shapes. We use morphological pattern recognition routines with Dilation image operation to obtain an aperture that is quasi-homomorphism to the shape of the irregular source. We apply our technique to the merging galaxies in images of the Canada-France-Hawaii Telescope (CFHT) and the Sloan Digital Sky Survey (SDSS). We discuss the implication of our measurements.

PS52: Detection of Baryonic Acoustic Oscillation Signals with Pan STARRS

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

Baryonic Acoustic Oscillations (BAOs) originate from the perturbation in the matter distribution because cosmic acoustic waves have propagated in the hot baryon-photon-coupled plasma in the early Universe. These waves have affected the distribution of galaxies since the recombination. We tried to study the anisotropy of large-scale galactic clusters at a different range of redshift from Pan-STARRS observatory. Moreover, we estimated the length scales of the cosmic acoustic waves by detecting the signals of BAOs. The galactic samples were selected through calculating the distributive functions of stars and galaxies; hence, they were distinguished from the star samples according to their stellar magnitudes. We evaluated the BAO peak by using the selected galaxy samples under an angular correlation function. Furthermore, we also compared the intensity of the signals of BAOs with the previous results. Thus, we could learn the peak intensity and relative signals, and these may reveal the evolution of the Universe in different epochs.

PS53: Probing the Evolution of Molecular Gas Abundance with the YTLee Array

Lin, Kai-yang (ASIAA)

Molecular gas is thought to be the fuel of star formation in the universe. While the cosmic star formation rate density is reasonably well constrained out to $z\sim6$, the abundance of this fuel is only well determined at $z\sim0.5$ (from the CO luminosity function). With ALMA coming online, more galaxies in the high-z universe will be studied to understand the interplay between star formation and molecular gas. However, the majority of the high-z galaxies will still be individually undetectable even by ALMA. An alternative is to measure the aggregate signal from many galaxies in a large volume ($\sim$10Mpc), which can be done by a modest experiment. The spatial variation of this signal, quantified by its power spectrum, will be an important constraint to the modeling of galaxy evolution. In this presentation, I

will describe our pathfinding study of measuring the aggregate CO emission using a new experiment to be placed on the Yuan-Tseh Lee Array after the conclusion of the AMiBA project.

PS54: Investigating the Mass-to-Light Ratio in Galaxies

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

It is known that dark matter dominates the mass distribution in galactic scales, so that the structure and evolution of galaxies are mainly determined by this unseen component, i.e. dark matter. For convenience, the mass-to-light ratio is usually assumed to be a constant near central regions of galaxies for the co-evolution problem of galactic centers and supermassive-black-holes in previous work. Combining the surface brightness profiles we determined from HST images and the data of velocities from literature, we provide a better determination on the mass-to-light ratio, which is allowed to vary as a function of space in this work here. This result shall improve the understanding of the role of dark matter in the co-evolution processes of galactic centers and supermassive-black-holes.

PS55: The Palomar Transient Factory (PTF) and iPTF: An Introduction and Scientific Activities at the National Central University

Chow-Choong Ngeow (IANCU), Chan-Kao (Rex) Chang (IANCU), Wing-Huen Ip (IANCU)

The Palomar Transient Factory (PTF, 2009-2012) and its successor, the intermediate Palomar Transient Factory (iPTF, 2013-2016), are dedicated wide-field synoptic sky survey projects that utilizes the fully robotic 48-inch Schmidt telescope (also known as the P48 Telescope) located at the Palomar Observatory (CA, USA). A wide-field mosaic camera, consists of twelve 2K x 4K CCDs (however, one of the CCD is out-of-function), is equipped on P48 for the surveys carried out by both PTF and iPTF. These CCDs have a pixel scale of 1.01 arc-second per pixel, together with wide-field capability of P48 Telescope, providing a total field-of-view of about 7.26 degree-squared for a single PTF/iPTF image. Nominal exposure time for PTF/iPTF images is 60 seconds, with majority of them observed in R-band, as well as in the g-band and H-alpha filters, that can reach to a depth of 20.5 mag (in R-band with a 3-sigma detection). PTF and iPTF data was reduced and processed independently with a transient detection pipeline (aimed for quick discovery of transients) and a dedicated automatic data reduction and calibration pipeline hosted at the Infrared Processing and Analysis Center (IPAC). The main goals for PTF and iPTF include the detections of transients (such as supernovae) in the local Universe and pursue for new discoveries with dedicated and well-designed experiments, hence the cadence carried out in PTF and iPTF varies from 90 seconds to few days. Time-series data from PTF and iPTF not only has been used for the search of transients, but also in the studies of other time-domain phenomena such as variable stars and asteroids. Further details of PTF and iPTF can be found in the following URL – http://www.ptf.caltech.edu. California Institution of Technology is the P.I. institution of both PTF and iPTF. Since 2012, the Graduate Institution of Astronomy at National Central University (IANCU) has joined and participated in PTF and iPTF under the TANGO Project (P.I.: W.-H. Ip; TANGO Project is a joint effort by NCU and NTHU). Our scientific interests within the PTF/iPTF Consortium include studies of asteroids and variable stars. In this Poster, we highlight

several scientific results based on the PTF/iPTF data that have been published elsewhere: (a) we investigated the distribution of rotation periods for asteroids found in PTF/iPTF data, and discovered a new super fast rotation asteroid; (b) using the H-alpha data from PTF/iPTF, we have searched and identified several new Be star candidates in an open cluster NGC 663; and (c) we have found two ultra-long period Cepheids in M31 for potential application in distance scale work. Examples on other on-going PTF/iPTF related research activities at IANCU include (but not limited to): an investigation of long term behavior of selected cataclysmic variables, the search of ultra-long period Cepheids in M33, the search of Be stars in 100 open clusters, and fast transients. We thank the support from MOST under contract 101-2112-M-008-017-MY3 and 101-2119-M-008-007-MY3.

PS56: COmpton Spectrometer and Imager(COSI)

Chien-Ying Yang (National Tsing Hua University), Hsiang-Kuang Chang (National Tsing Hua University), COSI collaboration (COSI collaboration)

The COmpton Spectrometer and Imager (COSI), known as the Nuclear Compton Telescope (NCT) before, 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.

PS57: Development of Asteroid Photometric Phase Curve Pipeline for Palomar Transient Factory Data

Kinoshita Daisuke (National Central University)

Usually, angular sizes of asteroids are much smaller than the effective spatial resolution of ground-based observations, and, therefore, majority of asteroid data we have are disk-integrated photometric measurements. For those data, fine details and topographic information on asteroid surfaces are averaged out. Still, we can learn a lot from disk-integrated photometry of asteroids to infer physical properties and chemical compositions of asteroid surface. Particularly, photometric phase curves of asteroids, which are constructed from individual photometric measurements at different solar phase angles, provide important information, such as surface roughness, geometric albedo, taxonomic classification, and existence / non-existence of regolith layer on the surface. Palomar Transient Factory is a project lead by California Institute of Technology, and it utilizes 48-inch Schmidt telescope and a wide field camera to carry out multiple-visit cyclical sky surveys. Many nights of telescope time is used for supernovae cadence survey, and the data produced by supernovae survey is ideal for asteroid phase curve studies because of $\sim$ 5-day re-visit timescale. I have successfully developed a fully automated computer code to search the data archive, find available photometric measurements, construct a phase curve, and derive phase curve parameters for a given asteroid name. Typically, it takes a few minutes

to generate a phase curve of an asteroid. I report the design and implementation of the asteroid phase curve pipeline for Palomar Transient Factory data. I also show some science cases for the application of the pipeline, including the statistical properties of members of young asteroid families, taxonomic classification of pairs of asteroids with extremely similar orbital elements, and surface properties of spacecraft accessible small ΔV asteroids.

PS58: NCU Summer Boot Camp: Big Data Astronomy and Application

Hsing Wen Lin (IANCU), Wing Huen Ip (IANCU)

Institute of Astronomy, NCU plan to hold a summer boot camp about "Big Data Astronomy and Application" for undergraduate students. In this boot camp, we will introduce idea of big data, the current astronomical "big data" projects — Pan-STARRS 1 and PTF (Palomar Transient Factory), and tools/methods to process the big data.

PS59: TAOS2 Progress and Occultation Simulation

Chung-Kai Huang (National Central University/ASIAA), Zhi-Wei Zhang (ASIAA), Shiang-Yu Wang (ASIAA)

TAOS2 (Transneptunian Automated Occultation Survey) aims to measure the small size objects located in and beyond the Kuiper Belt. It is impossible to detect these objects directly with existing telescopes, but when these objects pass in front of bright stars and block the star light—called occultation, it can be detected indirectly. To detect the events efficiently, a new technology is needed for high speed photometry with low readout noise. Here, we present the testing report for the new CMOS sensor—CIS107—which has low readout noise(5e) and allow programmable window readout for small area. We also present the simulations for the different occultation parameters. The result shows the TAOS2 can detect the event which is caused by the diameter 0.5km KBOs at 43AU.

PS60: Studies on Angular and Polarization Correlations of Double-Excitation Resonances of Mg

Cheng-Liang Lu (Kaohsiung municipal Kaohsiung senior high school), Hsin-Chang Chi (Department of Physics, National Dong Hwa University), Keh-Ning Huang (Department of Physics, National Taiwan University)

Angular distribution and spin polarization of photoelectrons from magnesium atom are investigated by using the multiconfiguration relativistic random-phase approximation. Photoionization parameters for all five Rydberg series of doubly-excitation resonances were presented and we developed the "channel-analysis method" to clarify the high-energy portion of the Rydberg series, in which peaks corresponding to double excitations can be identified unambiguously. Meanwhile, quantum defects of Rydberg series could be verified independently.

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