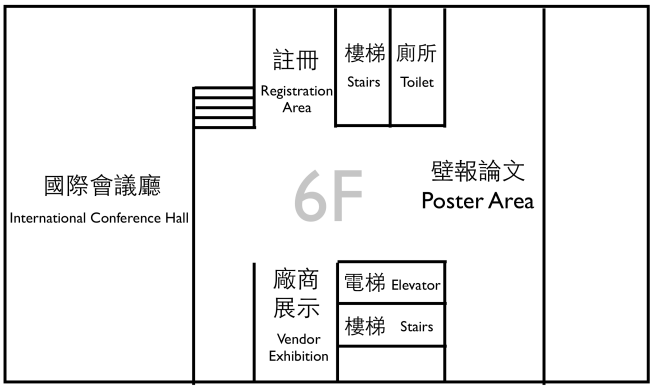
Table of Contents/目錄

General Information
會議資訊

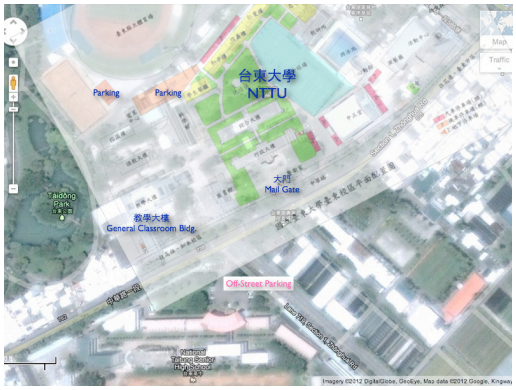
1. 年會會場 / Meeting Venue

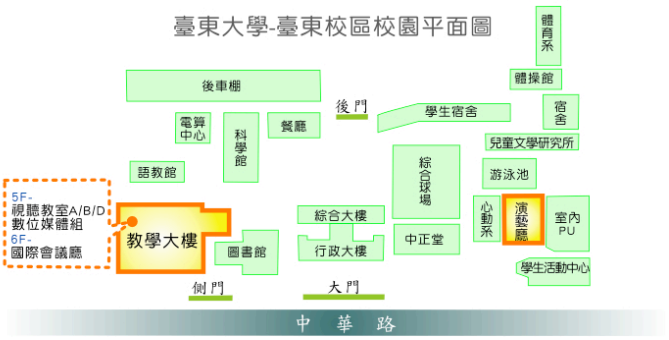
a. 國立台東大學 台東校區 教學大樓；
National Taitung University (NTTU), Taitung Campus, General Classroom Building
◎主會場: 六樓 國際會議廳 ; Main Venue: 6F International Conference Hall



◎天文教育及業餘天文活動報告（Session E01）: 4F T409
◎午餐用餐區（Lunch Area）: 4F T407, T408, T490, T411

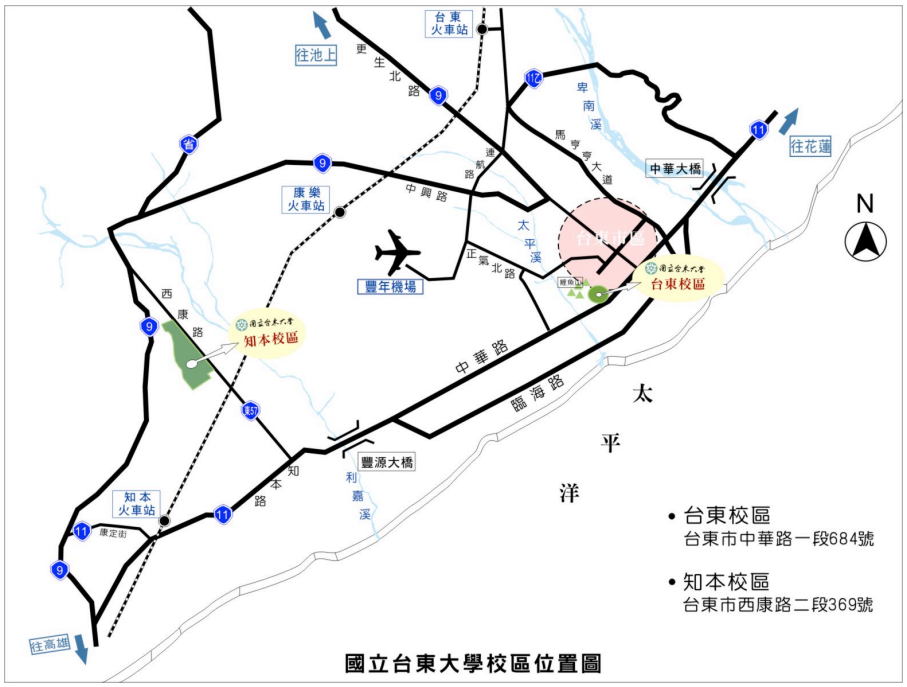
b. 國立台東大學 台東校區 教學大樓與停車場位置
Location of the General Classroom Building and Parking Areas in NTTU Taitung Campus





c. 國立台東大學位置
Location of the NTTU

臺東市中華路一段684號
No. 684, Sec. 1, Chunghua Rd., Taitung



國立台東大學校區位置圖

2. 接駁巴士 / Shuttle Transportation

05/25 12:40 台東火車站 (Taitung Train Station) – 台東市區旅館 (Hotels)
05/25 13:30 台東市區旅館 (Hotels) – 台東大學 (NTTU)
05/26 13:20 台東大學 (NTTU) – 參訪行程 (Tour) [A/B] – 大會晚宴 (Banquet)
05/27 12:30 台東大學 (NTTU) – 台東火車站 (Taitung Train Station)
05/27 14:10 台東大學 (NTTU) – 台東火車站 (Taitung Train Station)

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

帳號 username : wireless
密碼 password : 請見以下網址(每天更換) Please check the following webpage (updated daily)
http://210.240.172.22/passw.txt

4. 會員大會 / General Assembly

a) 理事長會務報告
b) 臺北市立天文館期刊編輯獎頒獎
(Journal of Taipei Astronomical Museum Editorial Award)
得獎人 (Awardee) : 王嘉瑋 (Jia-Wei Wang)
得獎論文: "尋找決定原恆星盤演化過程的物理條件
"Searching for the Physical Conditions that Determine the Disk Evolution"
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)
e) 公佈學會會徽設計比賽投票結果
(Announcement of the voting results of ASROC logo design contest)

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
三葉精緻餐廳 台東市中山路152號 (電話: 089-325261)

b) 觀星活動 Stargazing
東部地區巡防局海洋驛站 台東市南海路191號 (電話: 089-359392)
(http://www.facebook.com/pages/東部地區巡防局海洋驛站/182933991791596)

6. 器材與書籍展示 / Vendors

a) 信達光電科技有限公司 / **Sky-watcher**
臺北市新生北路三段63-1 電話: (02) 2585-1550
http://www.skywatcher.com.tw
Sky-Watche/Celestron望遠鏡總代理 - 1988年發源於台灣，信達光電科技一直以研發、生產和銷售高品質、高精度的天文望遠鏡和各種光電產品為主要業務。

b) 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. 住宿旅館地理位置 / Location of Hotels

蘋果商務旅店	台東縣台東市中華路一段857號	089-318928
樂知(原明玉)旅店	台東縣台東市復興路145號及福建路252號	089-322100
新宿時尚商務旅館	台東縣台東市福建路243號	089-311777
台東縣公教會館	台東縣台東市南京路19號	089-310142
台東旅行家商務會館	台東縣台東市安慶街42號	089-326456
台東縣原住民文化會館	台東市中山路10號	089-340605
康橋商旅-台東館	台東市中興路一段209巷16號	089-229226

Program
會議議程

Day 1 (May 25, Friday) 第一天（**5**月**25**日**,** 星期五） Venue /地點：國立臺東大學				
13:30 – 14:30	Registration 註冊報到			
14:30 – 14:45	Opening remarks 大會開幕致詞 Welcome remark by President Jin-Yuan Liu (NTTU) 來賓致詞: 劉金源校長（國立台東大學）	*Chair: Yi-Jehng Kuan*		
14:45 – 15:55	Scientific oral session S1 科學論文宣讀 S1 **Project Reports (70 min)**	*Chair: Albert Kong*		
S01	The Greenland Telescope (GLT) Project: A Challenging to Image the Supermassive Black Hole Shadow	Masanori Nakamura	ASIAA	15 min
S02	ALMA Early Science Observations and Proposal Calls	Chin-Fei Lee	ASIAA	15
S03	The Taiwan Extragalactic Astronomical Data Center	Sebastien Foucaud	NTNU	15
S04	The Current Status of the Taiwan Automated Telescope Network Project and Results of the Delta Scuti stars V830 Her and HD 163032	Javier Fernandez Fernandez	NTHU	10
S05	Flower Power: Exploring the Universe with Subaru SuMIRe Project	Yen-Ting Lin	ASIAA	15
15:55 – 16:30	Coffee break and poster installation 茶敘及壁報張貼			
16:30 – 17:45	Scientific oral session S2 科學論文宣讀 S2 **Galaxies (75 min)**	*Chair: Chorng-Yuan Hwang*		
S06	Group Finding in Pan-STARRS1 Medium-Deep Fields	Hung-Yu Jian	NTU	15 min
S07	Cluster Environmental Effects on Galaxy Activity in the Shapley Supercluster	Pei-Li Ho	NTNU / CWB	10
S08	Star Formation in Central Region of Galaxies	Mengchun Tsai	NCU	10
S09	Environment of Submillimeter Galaxies	Kuan-chou Hou	NTNU	10
S10	The AGN Influence during the (ultra)Luminous Infrared Galaxy Phase in Galaxy Evolution	Ming-Yi Lin	NTNU	10
S11	UKIDSS-UDS: UV-Luminosity Density at 1<z<3	Jimmy Lo	NTNU	10
S12	The Contribution from Circumstellar Dust to the Integrated Spectral Energy Distribution of the Large Magellanic Cloud	Mei-Chun Lin	NTU / ASIAA	10
17:45 – 18:00	Coffee break and poster session P1 茶敘及壁報欣賞 P1			
18:00 – 19:05	Scientific oral session S3 科學論文宣讀 S3 **Solar System (65 min)**	*Chair: Wen-Ping Chen*		
S13	Solar System 48Ca, 50Ti and 138La Isotopic Variations: Mixing between Grains Condensed from the Ejecta of n–rich SNe-Ia and O/Ne Zone of SNe-II	Hsin-Wei Chen	IESAS	15 min

S14	A Study of the Diffraction by Trans-Neptunian Objects of Irregular Shape	Sun-Kun King	ASIAA	15
S15	Search for Sub-Kilometer Trans-Neptunian Objects by Using Corot Asteroseismology Level-1 Data	Chih-Yuan Liu	ObsPM / NTHU	10
S16	HAYABUSA Earth Impactor as an Index of Meteorite-Asteroid Association	Shinsuke Abe	NCU	15
S17	Color Determination of Asteroids in Cometary Orbits (ACOs)	Y. C. Cheng	NCU	10
19:05 – 21:00	Welcome reception and poster session P2 歡迎茶會及壁報欣賞 P2			

Day 2 (May 26, Saturday)	第二天（**5**月**26**日**,** 星期□） Venue：國立臺東大學			
09:00 – 10:00	**Plenary talk (I) 大會講演 (I) (科研類)** *Chair: Sheng-Yuan Liu* Messengers from the Early Solar System - The Similarity & Diversity of Comets / Dr. Michael Mumma (NASA/GSFC)			
10:00 – 10:45	Scientific oral session S4 科學論文宣讀 S4 *Chair: Lin-Wen Chen* **Stars & ISM (45 min)**			
S18	Chemical Fingerprinting of Stellar Populations in the Milky Way Halo	Mei-Yin Chou	ASIAA	15 min
S19	A Study of the Embedded Star Cluster in G173.58 Molecular Cloud	Chi-Hung Yan	NTNU / ASIAA	10
S20	Searching for T Dwarfs in the Rho Ophiuchi Star-Forming Region	Poshih Chiang	NCU	10
S21	Generating Extinction Maps with High Dynamical Range	Cosmos C. Yeh	ASIAA	10
10:45 – 11:20	Coffee break, group photo and poster session P3 茶敘、與會來賓團體照及壁報欣賞 P3			
11: 20 – 12:35	Scientific oral session S5 科學論文宣讀 S5 *Chair: Shih-Ping Lai* **Star Formation & Evolved Stars (75 min)**			
S22	Spatio-Kinematic Structure at the Base of the Protostellar Jet from L1448C(N)	Naomi Hirano	ASIAA	15 min
S23	Molecular Jet of IRAS 04166+2706	Liang-Yao Wang	NTU / ASIAA	10
S24	Magnetic Field Structure of the Outflows in NGC1333 IRAS4A Protostellar Core	Tao-Chung Ching	NTHU	10
S25	Star Formation Activity in Bright-Rimmed Clouds	Neelam Panwar	NCU	15
S26	What can ALMA Reveal in the Close Environment of Asymptotic Giant Branch Stars?	Ronny Zhao-Geisler	NTNU	15
S27	VLA1623B: A First Core Candidate?: DCO+ and N2D+ Observations with ALMA	Nadia M. Murillo	NTHU	10

12:35 – 13:30	Lunch break and poster session P4 午餐及壁報欣賞 P4
13:30 – 17:30	分組討論/自由參訪
18:00 – 19:45	Banquet 大會晚宴
20:00 – 22:00	大眾觀星與天文教育推廣 *Chair:曾耀寰*

Day 3 (May 27, Sunday) 第三天（**5**月**27**日**,** 星期日）

Venue: 國立臺東大學

09:00 – 10:00	**Plenary talk (II) 大會講演 (II) (科普類)** *Chair: Wei-Hsin Sun* Mayan Apocalypse in 2012? A Critical View from the Mesoamerican Astronomy and Culture / Dr. Jesús Galindo Trejo (UNAM)			
10:00 – 10:45	General assembly, best poster awards & presentation 會員大會、頒發最佳壁報論文獎及得獎論文口頭報告			
10:45 – 11:00	Coffee break and poster session P5 茶敘及壁報欣賞 P5			
11:00 – 12:40	Scientific oral session S6 科學論文宣讀 S6	Education & Public Outreach session E1 天文教育及業餘天文活動報告 E1		

Scientific oral session S6 科學論文宣讀 S6 *Chair: I-Ching Yang*

High Energy Astrophysics & GRB (100 min)

S28	Magnetic Field Amplification by Turbulence in a Relativistic Shock Propagating through an Inhomogeneous Medium	Yosuke Mizuno	NTHU	15 min
S29	Pulsar Outer-Magnetospheric Accelerators: Very High Energy Emissions from the Crab Pulsar	Kouichi Hirotani	ASIAA / TIARA	15
S30	Launching and Quenching of Black Hole Relativistic Jets at Low Accretion Rate	Hung-Yi Pu	NTHU	10
S31	Retrograde Wind Accretion	Joan Wang	NTHU	15
S32	Current Status of the Nuclear Compton Telescope (NCT)	Jeng-Lun Chiu	NTHU	15
S33	A Summary of Gamma-Ray Burst Study in Taiwan	Kuiyun Huang	ASIAA	15
S34	Status report of UFFO Project	Ming-Huey A. Huang	NUU / LeCosPA / NTU	15

Education & Public Outreach session E1 天文教育及業餘天文活動報告 E1 *Chair: 張桂蘭*

Astronomy Education & History 天文教育與天文史 (100 min)

Invited talk: 2011年諾貝爾物理獎—千年的追尋 *(introduced by Yi-Jehng Kuan)*		Chorng-Yuan Hwang 黃崇源	NCU	30 min
E01	The Universe in a Cockpit: Popular Astronomy Lectures and Displays in Nineteenth Century Britain	Hsiang-Fu Huang 黃相輔	UCL	15

E02	『星。雲。行動』計畫簡介：融入高中課綱以天文為主題之跨科教學模組研發	Ruo-Lan Jin 金若蘭	TFGH	15
E03	The Dream of Searching the Bright -- Pan-STARRS Asteroid Search Campaign	BingXun Wu 吳秉勳	THWH	10
E04	Classroom Efficacy for Astronomy Education: The Reflection of "ROoT Project" in Taipei City	Lih-lin Leou 柳麗玲	THES	10
E05	The Application of Amateur Astrophotography to Full Dome Star Shows Using Digital Planetarium in a Science Museum	Jim Ching-Chuan Hung 洪景川	TAM	10
E06	臺北天文館之數位星象節目製作	Chia-Lin Hu 胡佳伶	TAM	10
12:40 – 12:50	Closing remarks 大會閉幕致詞			
12:50 –	Lunch • Departure 午餐 賦歸			

ASIAA	Academia Sinica Institute of Astronomy & Astrophysics
CWB	Central Weather Bureau
IESAS	Institute of Earth Sciences, Academia Sinica
NCU	National Central University
NTHU	National Tsing-Hua University
NTNU	National Taiwan Normal University
NTU	National Taiwan University
NUU	National United University
obsPM	Observatoire de Paris-Meudon
TAM	Taipei Astronomical Museum
TIARA	Theoretical Institute for Advanced Research in Astrophysics
TFGH	Taipei First Girls' High School
THES	Taipei Hutian Elementary School
THWH	Taichung Municipal Hui-Wen High School
UCL	University College London

Poster Presentation
壁報論文目錄

編號 /Number	名稱/Title	通訊作者/Author	機關/Affilication
P01	Theoretical Transition Probabilities and Oscillator Strengths of ZnI and GaII	Chi, Hsin-Chang	NDHU Physics
P02	Numerical modeling of iron core formation in slowly accreting planetary embryos	Lin, Ja-Ren	Taipei Municipal JinHua Junior High School
P03	SPARX: Simulation Platform for Astrophysical Radiative Xfer	Hsieh, I-Ta	ASIAA
P04	Reconnection in magnetospheric launching of protostellar outflows	Cemeljic, Miljenko	ASIAA/TIARA
P05	Formation of An Extended Halo of Hot Oxygen Atoms on Mars	Liao, Ying	IANCU
P06	Lightcurve Observation of Asteroid (3200) Phaethon	Abe, Shinsuke	IANCU
P07	The Exosphere and Solar Wind Interaction of Ceres	Ip, Wing-Huen	IoSS NCU
P08	The Variation of Rotation Temperature of Methanol in Comet 103P/Hartley 2	Chuang, Yo-Ling	NTNU
P09	The Optical Observations of Near Earth Asteroids	林建賢	澳門科技大學太空科學研究所
P10	The population of Sedna-like objects	Chen, Ying-Tung	IANCU
P11	Color Properties of Brightest Cluster Galaxies with PanSTARRS Medium Deep Survey Photometry	Chen, Chin-Wei	ASIAA
P12	VARIABILITY OF AGNs RECORDED WITH THE PAN-STARRS MEDIUM DEEP SURVEY	Chen, I-Chenn	IANCU
P13	PanSTARRS1 KP2: Outer Solar System progress report	Lin, Hsing-Wen	IANCU
P14	Pan-STARRS Data, Data Server, and Integrated Data Query Tool	Guo, Jhen-Kuei	IANCU
P15	To Identify the Lowest Mass Members in Praesepe (M44) by the Pan-STARRS	Wang, Ping-Fang	NCU
P16	M31 Eclipising Binaries with Pan-STARRS	李見修	IANCU
P17	MERGING GALAXY SYSTEMS AT y BAND	Lin, Yi-Fan	NCU
P18	Effects of H2 coating of grans on depletion	Hasegawa, Tatsuhiko	ASIAA
P19	Probing the Earliest Stage of Protostellar Evolution -- Barnard 1-bN and Barnard 1-bS	Huang, Yun-Hsin	NTU Physics/ASIAA
P20	Molecular Hydrogen in the diffuse interstellar medium of the Large Magellanic Cloud	Yang, Yao-Lun	ASIAA/NTU
P21	Impact of grain size distributions on the dust enrichment in high-redshift quasars	Kuo, Tzu-Ming	NTU Physics/ASIAA
P22	Single-Dish Observations of the Class I Young Stellar Objects IRS 44 and 46	Wang, Wen-Wei	NTU
P23	A Multiband Optical Polarimetric Study of Classical Be Stars with Exceptionally Large Near-Infrared Excess	李建德	IANCU

P24	Amplitudes ratio between VI band for pulsating stars and applications	Chang, Ding-Cheng	NCU Physics
P25	Characterization of the embedded open cluster G144.904+0.434 between Cam OB1-A and Cam OB1-B	林建爭	IANCU
P26	Magnetic Field Structure inferred by Near Infrared Polarization in the Carina Nebula and RCW 57	蘇柏合	IANCU
P27	Probing Extended Green Objects with CH3CN	洪子瑜	NCTU
P28	Statistical Properties of “Extended Green Objects” From Bolocam Galactic Plane Survery	Duan, Hao-Yuan	NTHU
P29	Exploring Magnetic Field Structure of Star-Forming Cores at Different Angular Scales	許立承	NTHU
P30	Validation of Very Low Luminosity Object Candidates in Taurus	Sung, Ren-Shiang	NTHU
P31	Spectroscopic Variability of Active T Tauri Stars	Chou, Mei-Yin	ASIAA
P32	Study the outflows and jets in VeLLOs	Hsieh, Tien-Hao	NTHU
P33	Probing turbulence power spectrum in molecular clouds	Li, Shiou-Fong	NTHU
P34	The Wiggling Structure in Quadrupolar Outflow of NGC 1333 IRAS 2A	Tsai, Arthur	NTHU
P35	Probing the magnetic field structure in the filamentary cloud IC5146	Wang, Jia-Wei	NTHU
P36	THE MEMBERSHIP DETERMINATION IN THE OPEN CLUSTERS FROM RELATIVE PROPER MOTION DATA	Hsieh, Hsiang-Yu	NTNU
P37	The Information Of Milky Way From 2MASS Whole Sky Star Counts: The Bimodal Color Distributions	Chang, Chan-Kao	IANCU
P38	Comparing RAVE data to the Besan\\c con Galactic Model	Ritter, Andreas	NCU
P39	Identification of Open Cluster Members by UCAC2 Proper Motion Catalog	黃鍾凱	IANCU
P40	Measuring galaxy environment with spectroscopic and photometric redshifts	Lai, Chuan-Chin	NTU
P41	Properties of galaxies in groups up to z=2 from the UKIDSS-Ultra Deep Survey	蕭赫	NTNU
P42	Unusual Luminous Transient in the Subaru Deep Field	Tsai, Patrick P.	IANCU
P43	A High Definition View of Nearby Galaxies with ALMA, Chandra, and HST	Kong, Albert	NTHU
P44	The Correlation between Dust Absorption and UV Spectral Slope of Galaxies from the GOODS-North	Lei, Si-Heng	NTU/ASIAA
P45	Acceleration parameter of MOND from Sloan Lens ACS survey	Peng, Ting-Hung	IANCU

P47	Interpretation of gravitational redshift measurement in clustes of galaxies by MOND	莊佳蓉	IANCU
P48	The MIR Properties of the Optical Selected Red QSOs	Tsai, An-Li	IANCU
P49	The ellipticity of elliptical galaxies with absolutely magnitude < -20 in different surface density field	陳振予	IANCU
P50	The X-ray source population in M101	Li, Kwan Lok	NTHU
P51	Spectral State of ULXs in Different Type of Galaxies	Lin, Chun-Cheng	NTHU
P52	First Taiwan Meteor Network - Lulin & NCU Meteor System	Wu, BingXun	IANCU
P53	The SED Machine: For PTF Science and Beyond	Ngeow, Chow-Choong	NCU
P54	Simulating Images for the SED Machine - A Transient Classification Instrument	Rudy, Alexander	Fulbright Taiwan/ NCU
P55	The Fermi-Asian-Network (FAN)	Tam, Pak Hin Thomas	NTHU
P56	ALMA Cycle 1 Capabilities	Zhao-Geisler, Ronny	NTNU
P57	The Taiwan Extragalactic Astronomical Data Center	陳寬	NTNU
P58	Performance of Fully Depleted CCD Imager NCUcam-1	Daisuke, Kinoshita	NCU
P59	X-ray studies of the Black Widow Pulsar	Huang, Regina	NTHU
P60	Superorbital Phase-Resolved Analysis of Spectra and Orbital Profile of SMC X-1	Hu, Chin-Ping	IANCU
P61	Gamma-rays from magnetar	Wu, Jason	NTHU

ASIAA	**Academia Sinica Institute of Astronomy and Astrophysics**
IANCU	Institute of Astronomy, National Central University
IoSS NCU	Institute of Space Science, National Central University
NCTU	National Chiao Tung University
NCU	National Central University
NDHU	National Dong-Hwa University
NTHU	National Tsing Hua University
NTNU	National Taiwan Normal University
NTU	National Taiwan University
TIARA	Theoretical Institute of Advanced Research in Astronomy

Invited Speakers
大會邀請演講講者

Dr. Michael J. Mumma

Michael J. Mumma is a planetary scientist at NASA's Goddard Space Flight Center, where he is founding Director of the Goddard Center for Astrobiology, and a Senior Scientist in the Solar System Exploration Division. He is also Professor of Astronomy, University of Maryland (College Park). His work is largely directed towards understanding aspects of life's origin and its distribution in the cosmos - in the first case, by evaluating the role of comets in delivering water and pre-biotic organic compounds to the young Earth and, in the second, by searching for possible biomarker gases on other planets. He leads the Team that detected recent release of methane on Mars, and that now is searching for related trace gases to test whether their origin was biotic, abiotic, or both. His Team has extended the use of adaptive optics at the world's major observatories in Hawaii and Chile to the critical wavelength region where these gases may be detected, mapping regions of their release on Mars with unprecedented spatial resolution. An elected Fellow of the American Physical Society, Dr. Mumma was thrice recognized with NASA's (rarely awarded) Medal for Exceptional Scientific Achievement, in 1988, in 1997, and again in 2009. He received the John C. Lindsay Memorial Prize for Science at Goddard Space Flight Center in 2009 for his discovery of Mars as an active planet. In 1999, the International Astronomical Union named asteroid 8340 "Michael J. Mumma".

Prof. Jesús Galindo Trejo

Prof. Jesús Galindo Trejo Bachelor in Physics and Mathematics in the Escuela Superior de Física y Matemáticas of the Instituto Politécnico Nacional in Mexico. He did postgraduate studies in the Faculty of Sciences at the National Autonomous University of Mexico (UNAM), obtained the doctorate in Theoretical Astrophysics at the Ruhr Universitaet Bochum in the Federal Republic of Germany. He was a titular researcher at the Instituto de Astronomía of the UNAM during more than 20 years in the fields of plasmas astrophysics and solar physics. Nowadays he is a titular researcher in the Instituto de Investigaciones Estéticas of the UNAM. His full-time labor of research centers principally on the archaeoastronomy of Prehispanic Mexico. He participates actively, since more than 20 years, in the interdisciplinary project *The Pre-Hispanic Mural Painting in Mexico* with seat at the Instituto de Investigaciones Estéticas. Another interest in his research is the so called Cultural Astronomy that deals with the influence and participation of the Astronomy in the development of ancient and present cultures. He is affiliated to the Researchers' National System of Mexico. He is a member of the International Astronomical Union. He has carried out archaeoastronomical research in Malinalco, in Tenochtitlan's Main Temple of the Aztecs, in Teotihuacan, in Oaxaca, in the Huaxteca and in some sites of the Mayan Region.

Abstracts
論文摘要

Plenary Talk I: Messengers from the Early Solar System - The Similarity and Diversity of Comets

Michael J. Mumma (Department of Astronomy, University of Maryland and NASA-Goddard Space Flight Center, Solar System Exploration Division)

Viewed from a cosmic perspective, Earth is a dry planet yet its oceans are enriched in deuterium by a large factor relative to nebular hydrogen. Can comets have delivered Earth's water? The question of exogenous delivery of water and organics to Earth and other young planets is of critical importance for understanding the origin of Earth's water, and for assessing the possible existence of exo-planets similar to Earth.

Strong gradients in temperature and chemistry in the proto-planetary disk, coupled with dynamical models, imply that comets from the Oort Cloud and Kuiper Disk reservoirs should have diverse composition. The primary volatiles in comets (ices native to the nucleus) provide the preferred metric, and taxonomies based on them are now beginning to emerge [1, 2, 3]. The measurement of cosmic parameters such as the nuclear spin temperatures for H_2O, NH_3, and CH_4, and of enrichment factors for isotopologues (D/H in water and hydrogen cyanide, $^{14}N/^{15}N$ in CN and HCN) provide additional important tests for the origin of cometary material. I will provide an overview of these aspects, and their implications for the origin of Earth's water and prebiotic organics.

[1] Mumma & Charnley (2011), Ann. Rev. Astron. Astrophys. 49: 471-524.
[2] DiSanti & Mumma (2008), Space Sci. Rev. 138, 127-145.
[3] Crovisier et al. (2009) Earth, Moon, Planets 105, 267-272.

Plenary Talk II: Maya Apocalypse in 2012? : A Critical View from the Mesoamerican Astronomy and Culture

Jesús Galindo Trejo (UNAM)

In recent months the idea has spread which, according to some Maya prophecies, will happen in December 2012 a global cataclysm with serious consequences for humanity. This talk presents the views of science on such a claim. It explains the Maya system of time reckoning and why 2012 may be designated as a special year. Shown are the archaeological remains that led to that interpretation. It discusses the impossibility of an accurate astronomical prediction on a planetary cataclysm. From the mural painting recently discovered in the city of Mayapan, there is the possibility that pre-Columbian Mayas were able to record the transit of Venus across the solar disk. On June 5, 2012 will occur the next event of this type so it is proposed that the Maya priest-astronomers may have set their own calendrical system so that on the day of this transit an important calendrical cycle would be completed

S01: The Greenland Telescope (GLT) Project: A Challenging to Image the Supermassive Black Hole Shadow

Masanori Nakamura, Inoue, Makoto (ASIAA), and the GLT Team*

The primary goal of the Greenland telescope (GLT) project is to obtain a direct imaging of the shadow of the supermassive black hole (SMBH) at the center of M87 with the Very Long Baseline Interferometry (VLBI) at submillimeter. A successful imaging of the BH shadow will not only be important for a direct proof of the existence of the BH, but will also be crucial for providing a unique window for testing Einstein's theory of general relativity under strong gravitational field and for studying the jet and BH physics. In order to achieve high enough angular resolution and sensitivity to resolve the shadow of the M87 BH at submillimeter, connections between the GLT and other major sensitive submm telescopes including ALMA and the SMA will be necessary and critical. We have decided to choose Greenland to locate our newly acquired ALMA-NA prototype antenna because Greenland is not only one of the places that have the highest atmospheric transparency at submillimeter on the earth, but also contributes to excellent baseline pairs for observing M87 when connecting with other existing submm telescopes. To face the challenge of operating the telescope at Greenland, we are currently retrofitting the ALMA-NA prototype antenna (renamed to GLT) in order to make the mechanical and electronic systems strong enough to survive the exceedingly low temperature environment. We plan to ship the antenna to Greenland in 2014 after retrofitting and testing, and start operating at the summit site by 2016.

S02: ALMA Early Science Observations and Proposal Calls

Chin-Fei Lee (ASIAA)

Since 2005 ASIAA has participated in the Atacama Large Millimeter/Submillimeter Array (ALMA) project, the largest ground based astronomical project ever carried out. The array is currently under construction in the Chajnantor area in the Atacama desert in northern Chile and is expected to be completed next year in 2013. ALMA will cover the wavelength range from 0.3 mm to 9 mm with an angular resolution of up to 4 milli-arcsec, giving 10 times sharper images than the Hubble Space Telescope. It will be enormously sensitive, and more than 10,000 times faster than any existing instrument at millimeter and submillimeter bands, allowing us to study a broad range of exciting sciences in astronomy. The ALMA is now in its Early Science observation mode in Cycle 0. The Joint ALMA Observatory (JAO) expects to start the next cycle of Early Science observations (Cycle 1) in January 2013. A Call for Proposals for Early Science Cycle 1 will be issued at the end of May 2012, with an anticipated deadline for proposal submission in mid-July. Cycle 1 operations will be conducted on a best efforts basis, similar to the current Cycle 0 observations. The ALMA Regional Centers (ARC) form the interface between the ALMA observatory and the user community from the proposal preparation stage to actual distribution of data and subsequent analysis. As such, the ARCs provide critical services to both the ALMA operations in Chile and to the user community. The Taiwan ARC node has been setup for the local users of ALMA in Taiwan. On behalf of the ARC node, I will briefly introduce the ARC node and its services, as well as the ALMA Early Science Observations and Proposal Calls.

S03: The Taiwan Extragalactic Astronomical Data Center

Sébastien Foucaud (National Taiwan Normal University), Yasuhiro Hashimoto (National Taiwan Normal University), and TWEA-DC team*

The next generation of telescopes and instruments are producing data at a pace that beats all projections, and astronomers today are left in the face of an avalanche of data like never before. In order to cope with this problem, Data Centers were created in various locations and the concept of Virtual Observatories elaborated. The Taiwan Extragalactic Astronomical Data Center plan to join in global efforts by proposing 1Pb of data storage dedicated to extragalactic astronomy by 2015. In continuation with individual efforts in Taiwan over the past few years, this is the first stepping-stone towards the building of a National Virtual Observatory.

Making advantage of our own fast indexing algorithm (BLINK), based on a octahedral meshing of the sky coupled with a very fast kd-tree and a clever parallelization amongst available resources, TWEA-DC is proposing a service of " on-the-fly" matching facility, between on-site catalogs and user-based catalogs. We are also planning to offer access to raw and reducible data available from archives worldwide, allowing a friendly access to this goldmine of under-exploited information. Finally, we are developing our own specific on-line analysis tools, such as an automated photometric redshifts and SED fitting code, an automated groups and clusters finder, and a multiple-objects an arc finder.

I will present the latest status of the project and do a demonstration of our database and our indexation algorithm.

S04: The Current Status of the Taiwan Automated Telescope Network Project and Results of the δ Scuti stars V830 Her and HD 163032

Javier Fernández Fernández and Dean-Yi Chou and Li-Han Wang (National Tsing Hua University, Hsinchu, Taiwan (R.O.C.)), Ming-Tung Sun (Chang-Chung University, Kwei-San, Taiwan (R.O.C)), Alexander Serebryanskiy and Dmitry Strelnikov and Shuhrat Ehgamberdiev (Ulugh Beg Astronomical Institute, Tashkent, Uzbekistan.), Antonio Jiménez (Instituto de Astrofísica de Canarias, La Laguna, Tenerife, Spain)*

The Taiwan Automated Telescope (TAT) network is a global ground-based fully-automated telescope network, dedicated to multicolor observations of stellar pulsations. So far three telescopes have been installed: at Teide Observatory (Tenerife, Spain), at Maidanak Observatory (Uzbekistan), and at Li-Jiang Observatory (Yunnan, China). Here we present results of mode detection on the low amplitude δ Scuti stars V830 Her and HD 163032 using white-light data taken with the TAT at Maidanak in 2009-2011 and at Teide in 2008-2010, totally 21260 exposures. Nine pulsation modes are convincingly detected for V830 and three modes for HD 163032. The temporal variations of mode parameters are discussed.

S05: Flower Power: exploring the Universe with Subaru SuMIRe project

Yen-Ting Lin (ASIAA)*

Utilizing the unique combination of wide-field imaging and spectroscopy provided by the next generation instruments of the Subaru telescope, Hyper-SuprimeCam and Prime Focus Spectrograph, the SuMIRE ("Subaru Measurement of Images and Redshifts") project aims to study the nature of dark matter and dark energy, the evolution and formation of galaxy populations, and the formation of Milky Way. This ambitious project is undertaken by a big international collaboration, and many astronomers in Taiwanese are heavily involved in it. I will report the current status of the project, and highlight some of the science cases.

S06: Group Finding in Pan-STARRS1 Medium-Deep Field

Hung-Yu Jian (National Taiwan University), Lihwai Lin (Institute of Astronomy and Astrophysics, Academia Sinica), Sebastien Foucaud (Department of Earth Sciences, National Taiwan Normal University), Chin-Wei Chen (Institute of Astronomy and Astrophysics, Academia Sinica), Hau-Yu Liu (National Taiwan University and Institute of Astronomy and Astrophysics, Academia Sinica), Tzihong Chiueh (National Taiwan University)*

Pan-STARRS1 (PS1) is a wide-field multi-band (grizy) photometric survey. In the science programs of PS1, the Medium Deep Survey (MDS), which consists of 10 fields with a FOV of $\sim 7\ deg^2$ in each one (a total of $\sim 70\ deg^2$), interests people in Key-Project 12 (Large scale structure) more, due to its depth allowing us to study LSS at high redshift. Our group is in KP12, and our main science goal is to construct a group (or cluster) catalog, and to study properties of galaxy and cluster and their evolution up to $z \sim 1$. By making use of Probability Fiend-of-Friend (pFOF), an algorithm capable of finding groups from a photometric survey data, a catalog of groups and clusters in PS1 MDS data can be constructed. MD04 is selected for the first study from MDS data because it overlaps with COSMOS, and we can optimize pFOF grouping using ZCOSMOS groups and cross matching between pFOF and x-ray groups to assess pFOF performance.

S07: Cluster environmental effects on galaxy activity in the Shapley Supercluster

Pei-Li Ho (Department of Earth Sciences, National Taiwan Normal University, Taipei, Taiwan; Astronomical Observatory, Central Weather Bureau, Ministry of Transportation and Communications, Taipei, Taiwan) and Lin-Wen Chen (Department of Earth Sciences, National Taiwan Normal University, Taipei, Taiwan)*

Using the 4000-Å break strength (D4000) of 2000 galaxies in the Shapley supercluster (SSC) from 6dF Galaxy Survey (6dFGS) as a recent star formation indicator, we investigate how the star formation activity in these galaxies depends on galaxy stellar mass and environmental effects such as local galaxy density and clustercentric distance. By dividing the galaxy sample into different stellar mass bins, our results show that D4000 is proportional to local galaxy density for all stellar mass bins; and galaxies with higher stellar mass own higher mean D4000 values. We also find that the cluster environment plays an important role in modifying D4000 other than local density; first, in cluster outskirt regions (1-2 r_{200}), there is an obvious drop in D4000 for more massive galaxies, it is probably caused by the galaxy encounter of ICM which subsequently boosts star formation recently. In addition, the mean D4000 values show an increasing trend toward the inner region of clusters, especially for lower mass galaxies, this may be a result of the lower star formation activity toward denser cluster center, and also possibly related to the crossing time for galaxies infall into cluster center after quenching. While the cluster environmental effects shown in this work are only obvious for clusters with X-ray detection (mostly massive clusters), for those without X-ray detection (mostly galaxy groups), the star formation activity is less affected by cluster environment and they still have lower D4000 values in low mass galaxies, this may lead to a higher star-forming galaxy fraction in comparison with massive clusters as shown in our previous study.

S08: Star formation in central region of galaxies

Mengchun Tsai and Chorng-Yuan Hwang (NCU)

We investigate star formation (SF) activity in the central kpc of a sample of nearby active and nromal galaxies. Active Galactic Nuclei (AGNs) activities are expected to either trigger SF via accreting ISM to the central regions of the host galaxies or quench the SF via the energy feedback of the AGNs. To study the AGN-SF relation we select 116 nearby galaxies that host 8 GHz central radio sources. We use 8 GHz radio emission to represent the AGN activity and 8 micron dust emission in the central kpc regions of these galaxies to estimate the SF rate (SFR). The SFR is found to be correlated with the stellar mass for stellar mass. There is almost no correlation between the specific SFR (SSFR) and the AGN activity for all sources. Within central region, activity galaxies have higher stellar mass and SFR and lower SSFR than normal ones. The low SSFR in AGNs are dominated by LINERs. These results suggest that the AGN activity effect on SF activity is complicated under kpc scale.

S09: Environment of submillimeter galaxies

Kuan-chou Hou (Department of Earth Sciences, National Taiwan Normal University, Taipei, Taiwan), Linwen Chen (Department of Earth Sciences, National Taiwan Normal University, Taipei, Taiwan)*

To study the environment of high-redshift star-forming galaxies — submillimeter galaxies (SMGs) — and their role during large-scale structure formation, we have estimated the galaxy number density fluctuations around SMGs, and analyzed their cross correlation functions with lyman alpha emitters (LAEs), and optically-selected galaxies with photometric redshift in the COSMOS and ECDFS fields. We first measured the galaxy density around SMGs based on SMGs with photometric redshift $z_{\rm SMG}$ compiled from data obtained by LABOCA and AzTEC in the ECDFS field. The number density of surrounding galaxies within projected radius of 1 – 2 Mpc and $z_{\rm SMG} \pm 0.1$ suggest marginal signals of excess galaxy count at z 2.5 and 3.5, although the uncertainty of redshift estimate is still large. We have further investigated the density of passive and starforming galaxies selected by BzK colors at similar redshift around SMGs and find that BzKs have overdensity around LABOCA-SMGs at radius smaller than 1 Mpc, especially passive BzKs. On the other hand, our second task on the cross correlation functions between SMGs and LAEs detects no correlation signal between the two populations, even after the exclusion of the SMGs with redshift significantly deviated from that of LAE. Finally we discuss the property of the large scale structure where SMGs are located and the interconnection between SMGs and other high-redshift galaxy populations.

S10: The AGN influence during the (ultra)luminous infrared galaxy phase in galaxy evolution

Ming-Yi Lin (National Taiwan Normal University), Hashimoto Yasuhiro and Foucaud Sébastien (National Taiwan Normal University)*

The tight correlation between Supermassive black hole and the spherical bulge masses and the analogous redshift evolution of cosmic star-formation and cosmic mass accretion rates indicate a coeval growth of galaxies and their central Black-Hole. Merging, result of galaxy interaction and collision, provides one essential scenario to interpret the distinct evolutionary stages of galaxy formation. In particular it is an evident explanation for the parallel growth of galaxie sand their central black-hole. We are taking advantage of the multi-wavelength coverage of the Cosmic Evolution Survey (COSMOS) field to detail the AGN influence in infrared luminous objects., selected through their $70\mu\ m$ and X-ray detections. By using color-color selection, LIR-LX relation, we want to confirm which mechanism, star formation or AGN dominates our samples. Furthermore we employ SED fitting, hardness ratio of K-S test and dust temperature estimation to investigate the reciprocal influence of AGN and its host galaxy. I will demonstrate that, there is more obscured AGNs in infrared luminous galaxy, while the dust temperature is not influenced by the presence of AGN, result in apparent opposition with recent studies in the literature.

S11: UKIDSS-UDS: UV-Luminosity density at $1 < z < 3$

Jimmy Lo (National Taiwan Normal University), Sébastien Foucaud (National Taiwan Normal University)*

The star formation history is a key-element to understand galaxy evolution and formation. Recent studies have shown that the star-formation rate peaks at redshift z=1-3 and then decline to its local value. The physical processes responsible for the sudden quenching of star-formation are still unknown. In order to better understand the origin of these effects, we propose in this study to use the UV-luminosity as an indicator of the Star-formation rate. We take advantage of our deep NIR/optical data from the UKIDSS-UDS/SXDS survey and our very deep CFHT U-band data to compute the luminosity function of galaxies at z=1-3. Fitting the Schechter parameters to integrate luminosity density to explore the evolution of the Star-formation rate.

S12: The Contribution from Circumstellar Dust to the Integrated Spectral Energy Distribution of the Large Magellanic Cloud

Ciska Kemper (ASIAA), Mei-Chun Lin (NTU/ASIAA)*

The spectral energy distribution (SED) of galaxies consists of contributions due to starlight (in the UV/optical and near-infrared) and thermal emission of interstellar dust (in the far-infrared). The excess flux in the near- and mid-infrared is usually explained as emission from interstellar polycyclic aromatic hydrocarbons (PAHs). The present SED models use stellar population synthesis models combined with stellar spectral libraries that do not include dusty envelopes. While this may be acceptable for starburst galaxies, it does not accurately represent galaxies with a significant population of dusty Asymptotic Giant Branch (AGB) stars. When inspecting the Spitzer IRAC images of the Large Magellanic Cloud (LMC), a nearby dwarf galaxy, it becomes clear that AGB stars are important contributors to the overall flux of the LMC at 3.6, 4.5 and 5.8 μm, in addition to PAHs at 8.0 μm. In order to estimate the contribution from circumstellar dust, we compare population-synthesis-based SED models, which are fitted to the UV and optical fluxes, to the observed SED of the LMC. The difference between the observed SED and the modeled starlight contribution at 3.6, 4.5 and 5.8 μm represents the contribution from circumstellar dust around evolved stars. We use the SAGE (Surveying the Agents of Galaxy Evolution) point source catalogue to identify the main categories of dust producers (i.e. O-rich AGB, C-rich AGB, Red Super Giant) by means of color-magnitude classification, and separate out the circumstellar dust component to the SED in contributions from these three types of objects.

S13: Solar System 48Ca, 50Ti and 138La isotopic variations: mixing between grains condensed from the ejecta of n-rich SNe-Ia and O/Ne zone of SNe-II

Hsin-Wei Chen (Institute of Earth Sciences, Academia Sinica), and Typhoon Lee (Institute of Astronomy and Astrophysics, Academia Sinica)*

Ca isotopic variations in CAI were first found 35 years ago and shown to be dominated by 48Ca [1]. Soon afterwards similar pattern was found for Ti. Namely the most n-rich isotope, 50Ti, showed the largest variation [2]. Since n capture cannot make enough 48Ca because of the rapid decay of 47Ca (t1/2 = 4.5 days) without grossly over produce 46Ca. The only remaining process that may produce 48Ca without over-producing 46Ca seems to be the n-rich Nuclear Statistical Equilibrium (nNSE). While many sites are conducive to the nNSE operation, most of which would be unable to eject them from the deep interior of a star. So far there is only one type of site, n-rich SNe-Ia, from which the deeply buried 48Ca near the neutronized core can escape to the ISM [3]. Recently, we have improved the precision for Ca isotopic analysis by a factor of ten. It enabled us to discover that the entire solar system is heterogeneous in Ca not unlike the widespread variation of O isotopes but revealing different information about each group of meteorites [4-6]. When 50Ti/48Ti is plotted against 48Ca/44Ca, we found a well-defined linear correlation trend through different groups of meteorites. When CAI data plotted on the same diagram, they fell well above the linear trend. Assuming 48Ca came from single type of source, and the trend represents the intake of component from n-rich SNe-Ia, we can obtain the excess 50Ti by subtracting the part that correlates with 48Ca. Surprisingly, we found that 50Ti/48Ti excess show a linear correlation trend with 138La/139La [7]. Apparently, there were two types of source for 50Ti, the first one came from n-rich SNe-Ia, while the other came perhaps from O/Ne layer of SNe-II where the neutrino process is thought to be producing 138La.

[1] Lee et al. (1978) ApJ, 220, L21
[2] Niederer et al. (1981) GCA, 45, 1017
[3] Woosley (1997) ApJ, 476, 801
[4] Trinquier et al. (2007) ApJ, 655, 1179
[5] Trinquier et al. (2009) Science, 324, 374
[6] Chen et al. (2011) ApJ, 743, L23
[7] Shen and Lee (2003) ApJ, 596, L109

S14: A Study of the Diffraction by Trans-Neptunian Objects of Irregular Shape

Chih-Hao Kao (Department of Physics, National Taiwan University; Theoretical Institute for Advanced Research in Astrophysics, Academia Sinica), Sun-Kun King (Institute of Astronomy and Astrophysics, Academia Sinica)

The population of Trans-Neptunian objects (TNOs) constrains the evolution history of the Solar System. A next generation serendipitous occultation survey is needed to detect smaller TNOs of the typical comet size deep into the inner Oort cloud. As the detection rate is expected to be increased by orders of magnitude in the next decade, a more realistic understanding on the diffraction properties of the TNO shadow is required. Spherical shape was considered in most of the previous works, even though those small Solar System bodies are generally believed to have irregular shape. The absence of axial symmetry introduced more complexity in the TNO shadow. It is not very clear if some dominated features in a symmetric shadow, such as the one shown in Jones et al. 2008, can be associated with irregular TNOs as well. We studied the statistical patterns derived from several different shapes of TNOs. The diffraction from a point-like background source with a broad-band spectrum was assumed. The TNO orientation and the impact parameter in an occultation were arbitrarily selected. Gaussian fitting was applied on each diffraction pattern. Different sets of diffraction result were averaged after normalization with the fitted parameters. Our results showed some general properties similar to those obtained in Jones et al. 2008. It provides a statistical constraint on the candidate events of serendipitous occultation surveys by TAOS, RXTE/PCA, and HST/FGS. Some detail of our approach will be presented. We are planning to include extended background sources in the future work.

S15: Search for Sub-Kilometer Trans-Neptunian Objects by Using Corot Asteroseismology Level-1 Data

Chih-Yuan Liu (LESIA, Observatoire de Paris; Department of Physics, National Tsing Hua University), Alain Doressoundiram (LESIA, Observatoire de Paris), Françoise Roques (LESIA, Observatoire de Paris), Hsiang-Kuang Chang (Department of Physics, National Tsing Hua University), and Michel Auvergne (LESIA, Observatoire de Paris)

We present the search for sub-kilometer Trans-Neptunian Objects (TNOs) by re-examining the COROT (Convection Rotation and Planetary Transits) asteroseismology observations. The total observation time employed in this work is about 144408.3 star-hours. 12 possibly occultational events (POEs) were found from the deviation method. The power-law size distribution index of these 12 possible detection is $q = 4.3 \pm 0.3$, consistent with the result of the previous only detection found by Schlichting et al. in 2009, and also with the results from the observation of large TNOs.

S16: HAYABUSA Earth Impactor as an Index of Meteorite-Asteroid Association

Shinsuke Abe (Institute of Astronomy, National Central University)*

On June 13, 2010, the HAYABUSA spacecraft (S/C) returned to the Earth with the reentry capsule containing asteroid samples. The sample return capsule was separated at 10:51 UT, which was just 3 hours before the atmospheric reentry. Due to the failure of all bi-propellant thrusters for orbital maneuvering, the S/C could not escape from its Earth collision course. The sample return capsule and the S/C entered the atmosphere at 13:51 UT directly from an interplanetary transfer orbit with a velocity over 12 km/s. The S/C disintegrated in the atmosphere, and the capsule flew nominally and landed approximately 500 m from its targeted landing point. The ground observation teams were organized by JAXA and NAOJ (Fujita et al. 2011; Watanabe et al. 2011). Spectroscopic observation was carried out in the near-ultraviolet and visible wavelengths between 300 and 750 nm (Abe et al. 2011). While photographically and photoelectrically observations of the S/C reentry from two JAXA temporary stations and four stations of the Desert Fireball Network located in Southwestern Australia were carried out (Borovička et al. 2011). The extrapolated interplanetary orbit was computed by using the S/C fireball trajectory. The S/C (pre-impact orbit) was observed by ground-based optical observatories (Tenagra-II, Mt.Lemmon, Subaru, and CFHT) around 10-8 hours before the reentry. The comparison of the pre-impact orbit with its fireball orbit provides us the first index of the ' Asteroid-Meteorite' orbital association. Since there is no meteorite orbit whose parent body was identified, the orbital similarity between HAYABUSA S/C and its fireball would shed light on searching meteorite associations among Near-Earth Objects population. Here I used the orbital similarity D-criteria (Southworth & Hawkins, 1963) to check the orbital match between current known ~8,700 NEOs and ~5,500 fireballs compared with the case of the HAYABUSA impactor, which will be discussed in detail.

S17: Color Determination of Asteroids in Cometary Orbits (ACOs)

Y. C. Cheng (Institute of Astronomy, National Central University, Taiwan), W. H. Ip (Institute of Astronomy, National Central University, Taiwan)

A small population of asteroidal-like objects has large orbital eccentricities which are typical of comets. They are generally called "Asteroids-in-Cometary Orbits" or ACOs. The planet-crossing orbit reduced the orbital dynamic lifetime to about few ten kyrs. We use the Lulin One-meter Telescope to determine the surface color of 10 ACOs in the last half year. The result shows half of them are X-type color in Tholen's taxonomy; two objects are B-type asteroid. The color trends of ACOs are similar to the cometary nuclei. So they are probably cometary origin and currently dead or extinct comets.

S18: Chemical Fingerprinting of Stellar Populations in the Milky Way Halo

Mei-Yin Chou (Institute of Astronomy and Astrophysics, Academia Sinica, Taiwan), Steven R. Majewski (Department of Astronomy, University of Virginia, USA), Katia Cunha (National Optical Astronomy Observatories, USA), Verne V. Smith (National Optical Astronomy Observatories, USA), Richard J. Patterson (Department of Astronomy, University of Virginia, USA), and David Martínez-Delgado (Max-Planck-Institut fur Astronomie, Germany)*

The idea of "chemically fingerprinting" stars to their birth systems has been discussed over the last decade. Here we present an investigation of the chemical abundance patterns of halo substructures using high-resolution spectra. In particular, we study the abundances of the α-like element titanium (Ti) and the s-process elements yttrium (Y) and lanthanum (La) for M giant candidates of the Galactic Anticenter Stellar Structure (GASS, also known as the Monoceros Ring) and the Triangulum-Andromeda (TriAnd) Star Cloud. We apply "chemical fingerprinting" to the GASS/Monoceros Ring and TriAnd Star Cloud, to explore the origins of the two systems and the hypothesized connections between them. GASS has been debated either to originate from a part (e.g., warp) of the Galactic disk or tidal debris of a disrupted Milky Way (MW) satellite galaxy. Our exploration shows that GASS is indeed made of stars from a dwarf spheroidal (dSph) galaxy, although we still can not rule out the possibility that GASS was dynamically created out of a previously formed outer MW disk. And whereas the TriAnd Star Cloud has been assumed to come from the tidal disruption of the same accreted MW satellite as the GASS/Monoceros Ring, our comparison of the abundance patterns in GASS and TriAnd M giants suggests that the TriAnd Star Cloud is likely an independent halo substructure unrelated to GASS/Monoceros Ring. Furthermore, our findings also suggest that the MW may have accreted other satellites in addition to the on-going, well-known Sagittarius (Sgr) dwarf galaxy, and minor mergers may play an important role in MW galaxy formation.

S19: A Study of the Embedded Star Cluster in G173.58 Molecular Cloud

Chi-Hung Yan (Department of Earth Sciences, National Taiwan Normal University, Taipei 10617, Taiwan; Institute of Astronomy and Astrophysics, Academia Sinica, P.O. Box 23-141, Taipei 10617, Taiwan), Doo-Ho Yuk (Korea Astronomy and Space Science Institute, 838 Daeduk-daero, Yuseong-gu, Daejeon 305-348, Korea; Department of Astronomy and Space Science, Chung-nam National University, 220 Gung-dong, Yuseong-gu, Daejeon 305-764, Korea), Young-Chol Minh (Korea Astronomy and Space Science Institute, 838 Daeduk-daero, Yuseong-gu, Daejeon 305-348, Korea), Yu-Nang (Institute of Astronomy and Astrophysics, Academia Sinica, P.O. Box 23-141, Taipei 10617, Taiwan), S.-H. Lee (Astronomy Program, Department of Physics and Astronomy, Seoul National University, Astronomy program, Seoul 151-747. Korea), Y.-S. Park (Astronomy Program, Department of Physics and Astronomy, Seoul National University, Astronomy program, Seoul 151-747. Korea), Shiang-Yu Wang (Institute of Astronomy and Astrophysics, Academia Sinica, P.O. Box 23-141, Taipei 10617, Taiwan), and Yi-Jehng Kuan (Department of Earth Sciences, National Taiwan Normal University, Taipei 10617, Taiwan)

We present a study of the massive and luminous star-forming region G173.58+2.45 with near-infrared and CO line observations. The G173.58+2.45 region is embedded in the molecular cloud, which has a elliptical shape with a total mass of $\sim$150 $M_{\odot}$, and the cloud core is coincident well with an IRAS source(IRAS 05361+3539). High-velocity bipolar outflow, centered at the IRAS source, extending in the east-west direction, and a elliptical shape of the cloud looks like due to its pressure. Also, near-infrared images reveal a embedded young cluster, including several massive YSOs (spectral type : Late B - Early A). Strong H_2 shocked gas is detected around massive YSOs. We derive physical properties of the G173.58+2.45 stellar cluster, using several statistical tools, such as the K-band luminosity function (KLF), mass function and star formation efficiency (SFE). As a result, the G173.58+2.45 stellar cluster is at a very young evolutionary stage (age $\ll$ 1Myr). Comparing with other star-forming regions in our galaxy, this star-forming region is producing massive stars ($\Gamma \approx$ -0.4, S.F.E. $\geq$ 20%).

S20: Searching for T Dwarfs in the Rho Ophiuchi Star-Forming Region

Poshih Chiang (Graduate Institute of Astronomy, National Central University, Taiwan), Wen-Ping Chen (Graduate Institute of Astronomy, National Central University, Taiwan), Michael Liu (Institute for Astronomy, University of Hawaii, USA), Eugene Magnier (Institute for Astronomy, University of Hawaii, USA)*

The majority of T dwarfs found so far are in the field. We present the T-dwarf candidates in the Rho Ophiuchi star-forming region to study their formation in relation to young stars and the molecular cloud complex. To search for T dwarfs, we have conducted a deep (21.5 AB mag) methane imaging survey with CFHT/WIRCAM with the CH4ON filter at 1.7 micron. Combining with archival CFHT/WIRCAM JHK and Spitzer/IRAC 3 to 8 micron data, we use K-[4.5] and H-[4.5] as temperature indicators, and H-CH4ON and [3.6]-[4.5] as indicators of methane absorptions. Objects showing possible methane absorptions and cool temperatures are identified as T-dwarf candidates. Our candidates fit well with the theoretical 1-Myr isochrone by the COND model. We show how our selection is more secure than using colors alone to identify T dwarfs, and how contamination by AGNs and stellar variability is quantified. Infrared spectroscopic observations of some of our candidates by Gemini will be presented.

S21: Generating Extinction Maps with High Dynamical Range

Cosmos C. Yeh, Sheng-Yuan Liu, Yu-Nung Su (Institute of Astronomy and Astrophysics, Academia Sinica, Taipei, Taiwan), Barbara Whitney and the GLIMPSE360 Team (Space Science Institute, CO 80301, USA)

We introduce two approaches that can generate extinction maps with high dynamical range. Various extinction methods are known to probe molecular clouds in different column densities. Due to the nature of interstellar extinction law, extinction mapping that utilizes short-wavelength observations outlines the extended and diffuse part of molecular clouds. In contrast, extinction mapping at long-wavelengths are more suitable for tracing dense features in clouds. Mapping both dense and diffuse cloud components is important in characterizing the entire structure of molecular clouds. In order to generate maps covering both types of features, we present a couple methods for tiling extinction maps. Utilizing the data from 2MASS and GLIMPSE project, we generated an extinction map for known IRDC, G11.11 − 0.11, with a dynamical range of $A_V = 0$ to $A_V = 100$.

S22: Spatio-kinematic structure at the base of the protostellar jet from L1448C(N)

Naomi Hirano (ASIAA), Chin-Fei Lee (ASIAA), and Hsien Shang (ASIAA)

The molecular jet driven by the class 0 protostar, L1448C(N), was observed in the SiO J=8 – 7 and CO J=3 – 2 lines and 350 GHz continuum at $\sim$0.5″ resolution with the SMA. The subarcsecond images of SiO and CO resolve the jet in its transverse direction. The jet consists of a chain of knots with V-shaped bowlike features, suggesting that the knots are the internal working surfaces in the jet beam. The widths of the jet increases with increasing distance from the central star; the beam-deconvolved jet width is 70 AU at the position of the innermost knot, while it increases to 320 AU at $\sim$10″ away from the source. The opening angle of the jet is $\sim$10°. This broadening of the jet is probably due to the sideways ejection of material from internal working surfaces. The jet has two velocity components; a High Velocity Component (HVC) at $\Delta V \sim \pm$60 km s^{-1} and a broad Low Velocity Component ranging from $\Delta V \sim$10 to 60 km s^{-1}. The HVC is seen in the jet body, while the LVC is spatially confined within $\sim$200 AU from the source. The spatial and kinematic structures of the molecular jet in L1448C(N) are quite similar to those of the optical jets in Classical T Tauri stars and the near infrared jets in Class I protostars. This implys that protostellar jets in different evolutionally stages are driven by the same launching mechanism.

S23: Molecular Jet of IRAS 04166+2706

Liang-Yao Wang (NTU/ASIAA), Hsien Shang, Yu-Nung Su (ASIAA), Mario Tafalla (Observatorio Astronomico Nacional - IGN - Spain), Qizhou Zhang (CfA), Chin-Fei Lee, Naomi Hirano (ASIAA), and Joaquín Santiago-García (IRAM Spain)*

Here we report our recent observation of the bipolar outflow IRAS 04166+2706 in CO J=3-2 with the SMA. The highly symmetric bipolar outflow IRAS 04166+2706 extends over 400" in Taurus molecular cloud (140 pc). Previous CO J=2-1 (PdBI) observations revealed at least 7 pairs of knots. Their position-velocity diagram displays a prominent sawtooth pattern, and the velocity within each knot is decreasing almost linearly with distance from the central source. In this work, we mapped the inner 4 pairs of knots at 351.7GHz continuum, CO J=3-2, and HCO^+J=4-3 at an angular resolution of ~1" with the Submillimeter Array (SMA). The CO J=3-2 maps generally resemble the features observed in CO J=2-1. Conical shells are present within the Standard High Velocity range (SHV, $10> |V_{relative}| >2$ km s^{-1}), while the highly collimated knots are detected in the Extremely High Velocity range (EHV, $50> |V_{relative}| >30$ km s^{-1}). Although they appear very similar, CO J=3-2 emission almost always peaks further away from the central source than the CO J=2-1 in the channel maps. We can clearly identify the first blue-shifted knot (B1) an offset of ~4" to the North-East of the central source, distinct from the second knot. The CO J=3-2 emission also tends to appear (or concentrate more at a higher velocity than CO J=2-1 at a given position, consistent with previous findings from other Class 0 EHV jets. The fact that the first blue-shifted and red-shifted knots (B1 and R1) have the highest velocity among the knots may suggest a trend of increasing ejection velocity over the outflow history.

S24: Magnetic Field Structure of the Outflows in NGC1333 IRAS4A Protostellar Core

Tao-Chung Ching (National Tsing-Hua University), Shih-Ping Lai (National Tsing-Hua University)

We present the polarization map of CO J = 3-2 line in the molecular outflows launched from NGC1333 IRAS 4A protostellar core. The spectral line polarization arising from the Goldreich-Kylafis effect could be either parallel or perpendicular to the magnetic field direction. To resolve the orientation of CO polarization to magnetic field direction, comparisons between CO polarization and dust polarization are made with the knowledge that the dust polarization is perpendicular to the magnetic field. We found that within the IRAS 4A dusty envelope, the CO J = 3-2 polarization directions are mostly perpendicular to the dust polarization, suggesting that the CO polarization is parallel to the magnetic field. The directions of the CO polarization appear to vary smoothly from the dust continuum to the red-shifted lobe of the outflows without any abrupt changes, implying that the CO polarization remains parallel to the magnetic field direction in the outflows. We speculate that a helical field may be wrapping around the outflows, which is consistent with the theoretical expectations for outflows associated with a rotating disk. Considering that the CO J = 3-2 polarized emission is mainly contributed from low velocity component of outflows and the polarization detections distribute around the wall of outflows, the magnetic field revealed by CO J = 3-2 polarization may be at the wall of outflows and associated to the interaction between envelope and outflows.

S25: Star formation activity in Bright-rimmed clouds

Neelam Panwar (National Central university, Taiwan), Wen Ping Chen (National Central university, Taiwan)

Bright-rimmed clouds (BRCs) are small molecular clouds at the periphery of HII regions. They are the results of the implosion of the remnant molecular clouds by ionization/shock front from the massive star(s). Hence, they serve as interesting " action scenes" where massive stars influence, constructively or destructively, on their neighboring molecular clouds. We present the results of our optical and archival near- to far-infrared studies of BRCs 5,7 and 39, all of which show signatures of ongoing star formation activity. Spatial distribution of YSOs selected based on the infrared photometry suggests propagating star formation in the regions.

S26: What can ALMA reveal in the close environment of Asymptotic Giant Branch Stars?

Ronny Zhao-Geisler (National Taiwan Normal University, Dept. of Earth Sciences, 88 Sec.4 Ting-Chou Rd, Wenshan, Taipei, Taiwan)

By studying asymptotic giant branch (AGB) stars we learn the ultimate fate of most stars in our galaxy, including the Sun. The most crucial and less understood process that characterizes this phase of stellar evolution is the mass-loss. Through the mass-loss the star returns freshly processed material into the interstellar medium, contributing to the chemical evolution of galaxies. In this project we want to focus on the geometry of the mass-loss, investigating the origin of the asymmetries in the circumstellar environment of AGB stars. Are they intrinsic to the star or due to interaction with the environment? HCN and SiO traces high density regions and provides important kinematic and spatial information of molecules in the dust formation and wind acceleration zone, while the continuum follows the overall dust distribution. This will constrain possible origins of the asymmetry and will reveal new details on the not well understood but crucial mass-loss mechanism.

S27: VLA1623B: A First Core Candidate?: DCO+ and N2D+ Observations with ALMA

Nadia M. Murillo and Shih-Ping Lai (Institute of Astronomy, National Tsing Hua University)

First Hydrostatic Cores or First Cores (FC) are the transient phase between prestellar cores and Class 0 YSOs, as such they are key objects in the study of the earliest stage of star formation. FC are characterized by short lifetimes, low L_{bol} and capable of driving slow collimated outflows. Due to their difficult detection, few FC candidates have been identified. So far, FC candidates are single objects or possibly part of very wide Multiple Protostellar Systems (MPS). FC in close MPS can be a bigger challenge to identify, however they play a crucial role in understanding how and when fragmentation occurs forming MPS. VLA1623B is the youngest member of the triple non-coeval system VLA1623 (Murillo & Lai, in prep.) located in ρ Oph A. VLA1623B presents low dust temperature, lack of infrared detection, strong CO depletion and a slow collimated pole-on outflow; factors characteristic of a very young cold deeply embedded protostellar object. Jorgensen et al. (2004) detected DCO^+ emission towards VLA1623, the strongest detection among all Class 0 objects surveyed. Since the emission was unresolved the source of the DCO^+ emission could not be pinpointed. From our work, VLA1623A is known to have strong $C^{18}O$ and $C^{17}O$ emission, thus we suspect that the DCO^+ emission arises from VLA1623B, consistent with the low dust temperature and lack of $C^{17}O$ and $C^{18}O$ emissions. DCO^+ is abundant in starless cores (Lee et al. 2004), but VLA1623B shows outflow activity, indicating that VLA1623B is a very very young YSO, possibly a FC candidate. We proposed and obtained observing time with ALMA to observe DCO^+ and N_2D^+, in order to determine VLA1623B' s evolutionary stage.

S28: Magnetic Field Amplification by Turbulence in A Relativistic Shock Propagating through An Inhomogeneous Medium

Yosuke Mizuno (Institute of Astronomy, National Tsing-Hua University), Martin Pohl (Institut fur Physik und Astronomie, Universität Potsdam, Germany), Jacek Niemiec (Institute of Nuclear Physics PAN, Poland), Bing Zhang (Department of Physics and Astronomy, University of Nevada, USA), Ken-Ichi Nishikawa (CSPAR, University of Alabama in Huntsville, USA), and Philip E. Hardee (Department of Physics and Astronomy, The University of Alabama, USA)*

Aftergows of gamma-ray bursts (GRBs) are believed to require magnetic fields much stronger than that of the compressed preshock medium. As an alternative to microscopic plasma instabilities, amplification of the field by macroscopic turbulence has been proposed. Relativistic turbulence has also been proposed as a way to produce GRB light curve variability as opposed to central-engine-induced variability in the internal shock model. We have performed 2D relativistic MHD simulations of a relativistic shock propagating through an inhomogeneous medium. We showed that the postshock region becomes turbulent owing to preshock density inhomogeneity, and the magnetic field is strongly amplified due to the stretching and folding of field lines in the turbulent velocity field. The amplified magnetic field evolved into a filamentary structure. The magnetic energy spectrum was flatter than the Kolmogorov spectrum and indicated that the so-called small-scale dynamo was occurring in the postshock region. We also found that the amount of magnetic-field amplification depended on the direction of the mean preshock magnetic field.

S29: Pulsar Outer-magnetospheric Accelerators: Very High Energy Emissions from the Crab Pulsar

Kouichi Hirotani (ASIAA/TIARA)

The Crab pulsar is one of the few pulsars that have been detected in almost all energies, ranging from radio to VHE gamma-rays. In the highest energy regime, the VERITAS and MAGIC experiments have recently detected pulsed signals between 25 GeV and 400 GeV. The light curves and the spectra obtained by these observations suggest that gamma-ray pulsars have high-altitude emission zones that avoid a super-exponential cutoff, which would be caused by magnetic pair production. Thus, outer-magnetospheric emission model, which assumes emission near the light cylinder and reproduces the wide-separated double-peak light curve, attracts attention. In this talk, I first solve the outer-magnetospheric emission zone from the basic equations (without assuming the location of the emission zone and the particle distribution functions) to demonstrate that the light curves and the spectra (up to 400 GeV) can be quantitatively explained without any artificial assumptions.

[1] Aleksic et al. (2012) AA 540, 69 (158 authors), Corresponding authors: Klepser, Giavitto, Saito & Hirotani

[2] Aleksic et al. (2011) ApJ 742, 43 (158 authors), Corresponding authors: Saito & Hirotani

S30: Launching and Quenching of Black Hole Relativistic Jets at Low Accretion Rate

Hung-Yi Pu (Department of Physics, National Tsing Hua University), Kouichi Hirotani (Theoretical Institute for Advanced Research in Astrophysics, Academia Sinica, Institute of Astronomy and Astrophysics), and Hsiang-Kuang Chang (Department of Physics, National Tsing Hua University; Institute of Astronomy, National Tsing Hua University)*

Rotating black holes are the most promising energy sources of the relativistic jets observed from black hole binaries and active galactic nuclei. Although their rotational energy can be eletromagnetically extracted by large-scale magnetic field lines that thread the event horizon, it is unanswered why these jets are launched when the accretion rate is below a certain limit but quenched when above. Noting that the accretion near the horizon is quasi-spherical at a low accretion rate, a condition satisfied when the jet launching and quenching take place, we find that the plasma accretion quenches the jet when the plasmas brings more rest-mass energy than what is extracted from the hole electromagnetically. Proposing a new paradigm of the coupling between the jet and the disk, we also solve several observed puzzles such as why the jet power and Lorentz factor increase with increasing accretion rate until it is quenched.

S31: Retrograde wind accretion

Joan Wang, H.-K. Chang (National Tsing Hua University)

A new class of high mass X-ray binaries (HMXBs) — supergiant fast X-ray transients (SFXTs) — are discovered by INTEGRAL, which are associated with OB supergiants and characterized by short flares and long spin periods. There are observational evidences indicating that some accreting neutron stars in HMXBs display accretion reversals. It has been suggested that the inverted torque can lead to a very slow rotator. According to three characteristic radii in wind-fed accretion, we develop a retrograde accretion scenario and divide the accretion phase into three regimes, in order to interpret the formation of the long spin period of SFXTs. The accretion regime in some SFXT systems can be determined by their spin and orbital periods.

S32: Current Status of the Nuclear Compton Telescope (NCT)

Jeng-Lun Chiu (Institute of Astronomy, NTHU), Hsiang-Kuang Chang (Department of Physics, NTHU), and Steven E. Boggs (Space Sciences Laboratory, UC. Berkeley)*

The Nuclear Compton Telescope (NCT) is a balloon-borne soft gamma-ray (0.2-10 MeV) telescope designed to study astrophysical sources of nuclear line emission and gamma-ray polarization. The heart of NCT is a compact array of cross-strip germanium detectors (GeDs), providing high spectral resolution (0.3-0.9% FWHM at 662 keV for most channels) and capability of tracking each photon interaction with full 3D position resolution to 2 mm^3. NCT has flown successfully on two conventional balloon flights to date, and the Crab Nebula was detected at a significance of 4σ in the second flight. On the way towards the next balloon campaign, I will summarize here the achievements and current status of the joint effort among several institutions in Taiwan and in the US for this next-generation of Compton telescope.

S33: A Summary of Gamma-Ray Burst Study in Taiwan

Kuiyun Huang (ASIAA), Yuji Urata and Peikang Tsai (NCU), Satoko Takahashi and Clark Chiu (ASIAA)

The Lulin GRB program was started in 2003 with the Lulin One-meter telescope (LOT) for optical afterglow studies. In the coordination with other east Asian 1-2m class optical telescopes, we have observed more than 150 GRBs and many valuable scientific results on the GRB study were thus carried out. Base on the experience of LOT follow-up, we have been extended temporal and spectral coverage with CFHT, TAOS, and SMA. In this talk, we present our scientific results with those Taiwanese facilities and our future plans with Subaru/HSC project.

S34: Status report of UFFO project

Huang, Ming-Huey A. (National United University & LeCosPA, National Taiwan University), P. Chen, J.Nam, M.Z. Wang, T.C. Liu, Y.Y. Chen, J.J. Huang (LeCosPA & Physics, National Taiwan University)

Hundreds of gamma-ray burst (GRB) optical light curves have been measured since the discovery of optical afterglows. However, even after nearly 7 years of operation of the Swift Observatory, only a handful of measurements have been made soon (within a minute) after the gamma ray signal. This lack of early observations fails to address burst physics at short time scales associated with prompt emissions and progenitors. Because of this lack of subminute data, the characteristics of the rise phase of optical light curve of short-hard type GRB and rapid-rising GRB, which may account for 30% of all GRB, remain practically unknown. We have developed methods for reaching subminute and sub-second timescales in a small spacecraft observatory. Rather than slewing the entire spacecraft to aim the optical instrument at the GRB position, we use rapidly moving mirror to redirect our optical beam. As a first step, we employ motorized slewing mirror telescope (SMT), which can point to the event within 1s, in the UFFO Pathfinder GRB Telescope onboard the Lmonosov satellite to be launched in June 2012. UFFOs sub-minute measurements of the optical emission of dozens of GRB each year will result in a more rigorous test of current internal shock models, probe the extremes of bulk Lorentz factors, provide the first early and detailed measurements of fast-rise GRB optical light curves, and help verify the prospect of GRB as a new standard candle. We will describe the science and the mission of the current UFFO Pathfinder project, and our plan of a full-scale UFFO-100 as the next step.

E01: The Universe in a Cockpit: Popular Astronomy Lectures and Displays in Nineteenth Century Britain

Hsiang-Fu Huang (Department of Science and Technology Studies, University College London)*

Today planetariums using optical projection are common to visitors to science centres or museums, yet the history of astronomical displays far predates the invention of optical projection planetariums. Since the rise of public philosophical lecturing in the eighteenth century, lecturers had used orreries, the machinery of solar system model, as visual aids for demonstrating celestial phenomena. Orreries evolved into various types along with the development of public lecturing ventures; eventually came a large, transparent, entertaining stage setting. The nineteenth-centurys theatricalised scientific lecturing was influenced by contemporary popular culture, especially the exhibitions and shows in London. Popular astronomy lecturing was then a competitive marketplace where popularisers had different levels, means, and purposes. In addition to the development of instruments, astronomy popularisation can also be put in the context of professionalisation and institutionalisation of scientific communities throughout the nineteenth century. Such processes led to a growing distinction between serious scientific lectures and entertaining celestial shows. This research will show a broad spectrum of popular astronomy lecturing prior to the establishment of modern planetariums, and make a connection among various astronomical displays. By understanding the past of astronomy popularisation, the study expects to shed light on its nature and to inspire todays science educators.

E02: 『星。雲。行動』計畫簡介：融入高中課綱以天文為主題之跨科教學模組研發

金若蘭 楊善茜 林郁梅 (臺北市立第一女子高級中學), 賴詩萍 江國興 張祥光 (國立清華大學天文研究所), and 國科會高瞻計畫星雲行動計畫團隊 (臺北市立第一女子高級中學)

由於天文科學所需要的背景知識涵蓋各學科知能，加上受到許多學生喜愛，並且為各國重要的新興科技發展方向，其研究方式又多採用國際共同合作。因此本研究計畫以天文衛星觀測數據分析為基礎，希望能設計出符合現行高中課綱、滿足教師教學需求、提昇學生學習科學動機、擴展師生國際視野、並以天文為主題之教學模組。除此之外，也期盼藉此研究瞭解跨越不同學科領域的統整性課程，在高中施行的可行性及效益，以促使教師建立跨科對話與協同合作教學的經驗與模式。 本計畫在本校不同科教師的共同合作及相關領域教授指導下，目前正進行以光譜為主題的課程模組設計。此模組課程內容涵蓋理論與實作，並可依教師教學需要與時間自由彈性組合。目前設計的內容所需實驗器材，也盡量採用一般高中可取得之設備，以利未來的推廣。第一年度（100學年度）已完成兩個課程模組及發展出該課程的評鑑工具，並已在本校高一及高二班級（含文、理組）進行試教，作為課程設計修改的參考。本研究預計於101學年度繼續完成另外兩個課程模組的設計，並嘗試使用PBL網路平台社群之e化互動式學習模式輔助教師教學與學生學習。

E03: The Dream of Searching the Bright – Pan-STARRS Asteroid Search Campaign 青春尋星夢

Bing-Xun Wu 吳秉勳 (Taichung Municipal Hui-Wen High School 台中市惠文高中), Shih-Chao Lin 林士超 (National Dali Senior High School 國立大里高中), Dah-Lih You 游大立 (Chang-Hua Senior High School 國立彰化高中), Ruo-Lan Jin 金若蘭 (Taipei First Girls High School 台北市立北一女中), Jing-Yi Su 蘇敬怡 (National Lo-Tung Senior High School 國立羅東高中)*

The Pan-STARRS Asteroid Search Campaign, which was held by International Astronomical Search Collaboration (IASC), proceeded between March 15 and April 20 2012. This was the third times to participate for the Taiwan schools. Under the leadership of Professor Wen-Ping Chen of National Central University, the teachers and students from Taipei First Girls High School, National Dali High School, National Chang-Hua Senior High School, Taichung Municipal Hui-Wen High School, and National Lo-Tung Senior High School analyzed the data from the 1.8m diameter PS1 telescope on Mt. Maui, Hawaii. During this period, students must learn to download images, use software to locate the coordinates, determine noise, determine known objects, and informed IASC. IASC would identify them as suspected asteroids (preliminary number). If a asteroid was tracked again, MPC would give a provisional number to confirm the newly discovered asteroid. By the date of April 27 2012, the students have made 176 preliminary Main Belt asteroid (MBA) discoveries plus 16 provisional MBA designations.

E04: Classroom Efficacy for Astronomy Education: the Reflection of "ROoT Project" in Taipei City

天文教育的班級效能："臺北數位遠端遙控天文臺"方案的回顧

柳麗玲博士 (臺北市北投區湖田國小)

天文觀察技術，必須啟動數據蒐集與數據視覺化的處理；天文學利用技術開發，可以轉化與增強外部領域的新範疇。美國太空總署NASA目前正推動，"瞄準小行星(Target Asteroids)"方案，以促使人們理解靠近地球行星的計畫(near-Earth objects; NEOs)。任務目的在於提升大家對於 NEOs 基本科學的理解。臺灣小學在天文教育的實施大都聚焦在星空的觀察，實際的觀察侷限於儀器與教學時間(夜晚觀星)的困擾，因此基礎的天文教學，頗多仰賴視聽媒體的運用，比起NASA的計畫，有很大落差。臺北市6年前即結合電腦科技，建立數位遠端遙控天文臺（Remote Observatory of Taipei, ROoT），希望能夠解決觀察天文的困難。本研究即為探究ROoT議題與如何提升學生觀察行星運行能力；作者以民族誌研究與文獻分析方式，以參與者角色，融入學校，實施天文教學，祈能達成班級效能。資料分析則是參照文獻文本，觀察記錄、訪談內容、教學日誌、圖片等，三角驗證資料的信效度。研究結果發現：高山遠端遙控天文臺可以解決都市天氣與光害問題；促使學生能夠在家自行完成天文觀測。遠端遙控天文台的支持技術，在硬體方面必須提供遙控太空與地面望遠鏡、偵測器等設計。軟體方面用戶端與伺服器端軟體的開發，必須重視網頁介面的遠端遙控方式，以解決用戶端授權問題。要提升班級效能，必須整合課程內容，橫向聯繫、能夠搭上世界平台(與NASA連線)，並且也要縱向發展，利用現有之數位式星象儀，建立影像資料庫，發展從小學到大學一系列自學課程。 文末作者並對天文教育之班級效能提出具體建議。

關鍵詞: 數位遠端遙控天文臺Remote Observatory of Taipei； 美國航空暨太空總署NASA；班級效能Classroom Efficacy

E05: The Application of Amateur Astrophotography to Full Dome Star Shows Using Digital Planetarium in a Science Museum

Jim Ching-Chuan Hung (Taipei Astronomical Museum)

A digital planetarium system with Uniview database and Zorro ultra-high contrast LCoS projectors had been inaugurated in Taipei Astronomical Museum since January 2011. Four self-produced planetarium star shows for primary school pupils in the form of outreach education have been programmed ever since the installation. The researcher used some of the amateur astrophotography in the star shows to enhance the visual effect as well as the educational function for the learners. This study is focused on the approaches by which the researcher and his colleagues collaborated on the processing of the amateur images into an ultimate performance in the forms of full dome perspection or animations for educational purposes.Techniques for applying Fish-eye star field images or sky-line panoramic compositions using Photoshop CS5 and Adobe After Effect will be introduced and discussed in the paper. Implication of the potential of the digital system with better educational efficiency will also be reviewed by comparing the results collected from the images captured from the old planetarium system with the new digital one after applying the amateur astrophotographic images being digitally processed to fit the dome projection system. The museum staffs expect to raise the dynamic freedom of the new digital star show programs to bring about the motivational orientation of the students from the primary schools in the outreach program.

E06: 臺北天文館之數位星象節目製作

胡佳伶(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), 邱幗鳳(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), 高銘鴻(臺北市立天文科學教育館), 陳彥禎(臺北市立天文科學教育館), 趙瑞青(臺北市立天文科學教育館), 黎福龍(臺北市立天文科學教育館)與簡光增(臺北市立天文科學教育館)

2011年初，臺北市立天文科學教育館完成Global Immersion數位星象儀之安裝，12台Zorro極黑投影機堆疊成6個頻道，組合播出25公尺的大螢幕視覺效果。延續1980年至今三十餘年的自製星象節目經驗，自2011年7月至今，我們已製作五個長度約40-50分鐘的自製數位星象節目。結合了Uniview星象軟體的星空及飛行畫面，利用Adobe After Effect動畫製作軟體，再加上活潑的Flash元件，期望能以輕鬆有趣的方次帶領大眾認識浩瀚的星空宇宙之美。

P01: Theoretical Transition Probabilities and Oscillator Strengths of ZnI and GaII

Hsin-Chang Chi (1 Department of Physics National Dong Hwa University), Hsiang-Shun Chou (Institute of Optoelectronic Sciences National Taiwan Ocean University)

We have applied the second-order relativistic many-body perturbation theory (RMBPT) to obtain the oscillator strengths for the electric-dipole (E1) transitions in the ZnI and GaII. Transitions among the first thirteen levels of those ions have been studied. Transition amplitudes of sixteen spin-allow E1 transitions are calculated. The oscillator strengths obtained in different gauges are in excellent agreement and agree well with experiment and other calculations. Our calculated results provide reliable references for identifications of levels in ZnI and GaII. Several problematic level labels from the NIST (National Institute of Standard and Technology) are investigated. Correct identifications and labels of these levels are suggested.

P02: Numerical modeling of iron core formation in slowly accreting planetary embryos

Ja-Ren Lin (Taipei Municipal JinHua Junior high school, Taiwan), Gerya, Taras V., Tackley, Paul J. (ETH-Zurich, Switzerland), Yuen, David A. (University of Minnesota, Minneapolis, USA), Golabek, Gregor J. (ETH-Zurich, Switzerland)

This study presents a numerical investigation of a possible the process of core formation, namely the descent of metal diapirs from a global ponded iron layer through an undifferentiated solid interior to form an iron core. In this study, the radial structure of a planetary body consists of an outer silicate-rich layer and an undifferentiated solid protocore. As suggested by previous models of slow(cold) accretion, a global iron layer stands at the bottom of the outer silicate-rich layer or inside the undifferentiated solid protocore. This structure is gravitationally unstable and leads to a differentiation in a dense, iron core in the center surrounded by a silicate rich mantle. This core formation process is explored with a non-Newtonian temperature-, pressure-, and strain rate-dependent viscoplastic rheology, and taking into account the thermal contribution from gravitational energy. Three different core formation regimes are observed, the exposure mode, the fragmentation mode, and the transition mode. The core experiences large deviations from the spherical shape and may temporarily be exposed at the surface (exposure mode). The destruction of the protocores observed in the fragmentation modes and transition is driven by (i) the spontaneous strain localization along planetary-scale shear zones forming inside the protocore, and/or (ii) descending localized iron diapirs or sheets penetrating the protocore. Feedback from energy dissipation influences planetary temperature distribution although it does not significantly affect core formation regimes. However, it causes a temperature increase up to several hundred Kelvin (i) around the moving and deforming protocore and (ii) along planetary scale rupture zones that form inside the protocore. If the protocore is large and has a high viscosity, a large fraction of the dissipated heat is used to increase the temperature of iron.

P03: SPARX: Simulation Platform for Astrophysical Radiative Xfer

I-Ta Hsieh, Eric Chung and Sheng-Yuan Liu (Institude of Astronomy & Astrophysics, Academia Sinica)*

We delveloped a three-dimensional parallelized non-LTE molecular line radiative transfer package, which is called SPARX, that is based on the algorithm of accelerated Monte Carlo method, proposed by Hogerheijge and van der Tak (2000), and accelerated Lambda iteration, proposed by Rybicki and Hummer (1992). Multiresolution grid and gradient-preserving refinement was implemented to target calculating large-scale varied astrophysics. Visualizing channel map and moment map is combined as the postprocessing.

P04: Reconnection in magnetospheric launching of protostellar outflows

Miljenko Cemeljic (Academia Sinica, Institute of Astronomy and Astrophysics andTheoretical Institute for Advanced Research in Astrophysics, P.O. Box 23-141,Taipei 106, Taiwan)*

We perform resistive MHD numerical simulations with stellar dipole as an initial condition. Electrical resistivity facilitates reconnection, so that the dipole can re-shape into the stellar and disk components. This reorganization then provides channels for launching of outflows from the close vicinity of a star.

P05: Formation of An Extended Halo of Hot Oxygen Atoms on Mars

Ying Liao (Institute of Astronomy, National Central University), Yung-Ching Wang (Institute of Astronomy, National Central University), Wing-Huen Ip (Institute of Astronomy, National Central University), Lei Li (Center for Space Science and Applied Research, Chinese Academy of Sciences), Liang-hai Xie (Center for Space Science and Applied Research, Chinese Academy of Sciences), Yi-teng Zhang (Center for Space Science and Applied Research, Chinese Academy of Sciences)*

From the detailed measurements in Martian ionosphere by Mars Express, it was well known that there is a large day-to-night flow of ionospheric plasma with the horizontal speed reaching a value as high as 4 km/s between 300-km to 500-km altitude. This large-scale anti-sunward convective motion could lead to a significant distortion of the hot oxygen corona maintained by oxygen atoms from O_2^+ dissociation recombination into a tadpole-like structure. A Monte-Carlo model is developed to simulate the two-dimensional configuration of such a hot oxygen corona.

P06: Lightcurve Observation of Asteroid (3200) Phaethon

Sherry Kang-Shian Pan and Shinsuke Abe (Institute of Astronomy, National Central University)*

Apollo asteroid (3200) Phaethon (1983 TB) classified as F/B-type is thought to be a dormant or an extinct cometary nuclei because (1) Phaethon has been known as the parent of the Geminids which is the most intense meteor shower of the year (e.g. Whipple, 1983) and (2) an brightening enhancement, by a factor of two, during the perihelion passage near 0.14 AU has been reported (Jewitt and Li, 2010). It was also suggested that the Apollo asteroid 155140 (2005 UD) is most likely candidate for being a slitted asteroid that generate a large member of the Phaethon-Geminid stream Complex (Ohtsuka et al. 2006). Though Phaethon is one of the most important target for the future space missions in the near Earth space to explore water and organics, the spin state and the shape is still under debate (e.g. $\sim$ 3.604 hours by Meech 1996, $\sim$ 5.1 kilometers in diameter by Green et al. 1985). Time-resolved visible (Johnson-Cousins BVRI) photometric observations of Phaethon were carried out using 0.81-m and 1-m telescopes at Tenagra observatory in US and Lulin observatory in Taiwan, respectively. The rotational

period and the surface properties of Phaethon based on color lightcurves taken between 2011 November and 2012 February are discussed in this paper.

P07: The Exosphere and Solar Wind Interaction of Ceres

Wing-Huen Ip (Institute of Astronomy, National Central University, Taiwan), Yung-Ching Wang and Lin Tu (Institute of Astronomy, National Central University, Taiwan; Institute of Space Science, National Central University, Taiwan)

After Vesta, the Dawn spacecraft will visit the largest asteroid, Ceres, to carry out in depth observations of its surface morphology and mineralogical composition. We believe that this path-finding mission would lead to the planning of lander and/or rover missions to this protoplanet of primary importance in our understanding of the solar system origin and even the origin of life in case it does possess a subsurface ocean. Ceres does not have a thick atmosphere because of its small surface gravity. But its surface is constantly subject to the bombardment of solar wind particles, interplanetary meteoroids and solar radiation. Just like in the case of the Moon and Mercury, a thin exosphere would be generated. There are yet no observational constraints on the column densities of gas species like H, He, O, Na, K and Ar. But at an orbital distance of 2.8 AU, we would expect the possible existence of H2O, CO2, O2 and other molecules via surface chemical reactions of if Ceres is partially covered in ice. In this work we will report on the first results from our theoretical modeling. In the context of solar wind interaction, it is expected that a flux of neutral hydrogen atoms moving in the anti-sunward direction would be created on the sunlit hemisphere because of reflection of the surface neutralization of the solar wind protons.

P08: The Variation of Rotation Temperature of Methanol in Comet 103P/Hartley 2

Yo-Ling Chuang, Yi-Jehng Kuan (Department of Earth Sciences, National Taiwan Normal University, ROC), Stefanie N. Milam, Steven B. Charnley (NASA Goddard Space Flight Center, USA), Iain. M. Coulson (Joint Astronomy Center, USA)*

Thought to be primitive bodies of Solar System, comets may provide the crucial information connecting Solar Nebula and its parent molecular cloud. Thus, study of chemical and physical properties of comets is important for better understanding of the formation of Solar System. Besides, comets are believed to play a key role in the issue of beginning of life. Therefore, study of organic molecules in comets may also provide vital information to unravel the mystery of the origin life on the early Earth. 2010 was a special year for comet study because of the $EPOXI$ comet-flyby mission of NASA for the return of Comet 103P/Hartley 2. In support of the $EPOXI$ mission, we thus conducted spectral observations of methanol, using the Submillimeter Telescope (SMT) and the Kitt Peak 12 meter telescope (KP12M) of Arizona Radio Observatory, toward Comet Hartley 2 during its perihelion on 2010 October 22—24 and 29, and again at the $EPOXI$ Hartley 2 encounter on November 04. Temporal variations of methanol outgassing over days were observed; a much faster variation on a time scale of hours is also apparent. We found the rotational excitation temperature of CH_3OH rising from $\sim$ 36 K to 45 K over days, when Hartley 2 was closing toward the Sun. Moreover, the methanol production rate of Hartley 2 was also the highest, reaching $\sim 4 \times 10^{26}$ molecules per second from the cometary nucleus, at perihelion on October 24. Additionally, we examined the short-term variation of the excitation temperature of methanol to investigate the likely nuclear rotation of Comet Hartley 2. This is also essential in providing crucial information on the physical environment of Hartley 2 prior to the $EPOXI$ flyby and at the encounter.

P09: The Optical Observations of Near Earth Asteroids

Chein-Hsien Lin (Space Science Institute of Macau University of Science and Technology), Zhong-Yi Lin and Yu-Chi Zheng (Graduate Institute of Astronomy of National Central University), Wing-Huen Ip (Graduate Institute of Astronomy of National Central University and Space Science Institute of Macau University of Science and Technology)

Because of their potential impact hazards and resource in metallic and volatile materials, near-Earth Asteroids (NEAs) are an important class of objects for solar system exploration. It is possible that some of them will be visited by astronauts in near future. We have established a program of ground-based optical observations to study the physical properties of the NEAs including the rotational periods, shapes and taxonomic types. The telescope facilities include the Schmidt 1.2 m Near Earth Objects Telescope (NEOT) in Xu-Yi station of the Purple Mountain Observatory in China, the 40-cm Super Light Telescope (SLT) and One-meter Telescope (LOT) of the Lulin Observatory in Taiwan, and the 45 cm Astrograph for the Southern Hemisphere Telescope (ASH) in Argentina. We focus on those NEAs with orbital inclinations below 10 degrees, being close to ecliptic plane. In this content, we will give a progress report and present the preliminary results of the NEA 192642, 2006 VY13 and other targets.

P10: The population of Sedna-like objects

Ying-Tung Chen and Wing-Huen Ip (Institute of Astronomy, National Central University), J. J. Kavelaars and S. Gwyn (Herzberg Institute of Astrophysics, National Research Council of Canada, Victoria, BC V9E 2E7, Canada), A. Parker (Harvard-Smithsonian Center for Astrophysics, Cambridge, MA, USA), and V. Suc and A. Jordan (Pontificia Universidad Católica de Chile)*

In few years ago, the discovery of inner Oort cloud objects give a light for answering process of evolution of Solar system. Because their high perihelion orbit could not be scattered into highly eccentric orbit from interactions with planets alone, orbit and dynamic investigation are required for explanation of solar system evolution. Up to now, only 3 objects: Sedna, 2004 VN112 and 2000 CR105 have Sedna-like orbit which don't have close encounter with known planets and be vary stable in extremely long numerical simulation. We searched $\sim$ 100 square degree down to a mean limiting magnitude of 25.1 in g' by CFHT large program - NGVS. A total number of 91 NEW TNOs and Centaurs have been discovered, one of which was identified as Sedna-like objects in this survey. We also compute a population estimate for Sedna-like objects

P11: Color Properties of Brightest Cluster Galaxies with PanSTARRS Medium Deep Survey Photometry

Chin-Wei Chen (ASIAA), Lihwai Lin, Hung-Yu Jian and Sebastien Foucaud (ASIAA, NTU and NTNU)*

We conduct a series of study on the color properties of Brightest Cluster Galaxies (BCGs) against environment and redshift based on PanSTARRS data. With 1.5 year of monitoring, the PanSTARRS medium deep (MD) survey reaches a depth of 25-24.5 mag in g, r, i and z, respectively and 22.5-23 mag in y. The survey depth allows us to identify 1.47 million galaxies hence find groups up to $z \sim 1$. Starting from MD04 field which covers COSMOS field, we dervie the photometric redshift based on PS1 photometry. About 1200 galaxy clusters or groups more massive than 10^{13} $M_{\odot}$ are found by Probability

Friend-of-Friend method, for which the BCGs are identified as the most luminous galaxies in the close proximity of group centers. The PS1 photometry is augmented with CFHT u-band observation with even better depth ($\sim$ 25.5 mag) and seeing ($\sim$ 0.8"), allowing us to study the rest-frame NUV-optical properties of galaxies with z$\sim$ 0.7, a good tracer of recent star formation activity.

P12: VARIABILITY OF AGNs RECORDED WITH THE PAN-STARRS MEDIUM DEEP SURVEY

I-Chenn Chen (Institute of Astronomy, National Central University), Chrong-Yuan Hwang (Institute of Astronomy, National Central University)

The variability of active galactic nuclei (AGN) has long attracted astronomers attention for decades since it is related with the accretion rate of the central massive blackhole. The variabilities of AGNs vary from days to years, thus to record them, a short time separation survey is needed. The Medium Deep (MD), sub-project of the Panoramic Survey Telescope & Rapid Response System (Pan-STARRS) is a good tool for tracing a considerable numbers of AGNs every 3 $\sim$ 5 days continually. We adopted the AGNs in the VERONCAT (Veron Catalog of Quasars & AGN, 13th Edition) that is located in the MD04 field (COSMOS field) for a preliminary test. Well show our preliminary results.

P13: PanSTARRS1 KP2: Outer Solar System progress report

Hsing-Wen Lin (Institute of Astronomy, National Central University), Ying-Tung Chen and Wing-Huen Ip (Institute of Astronomy, National Central University)*

This poster presents the recent progress of PanSTARRS1 KP2: Outer Solar System, include the status of OSS pipeline and three sub projects: Active Centaurs, TNO binaries and Neptune Trojans. In the OSS pipeline part, we apply the chip edge cut to reduce the fasle detection to 10%. For the sub projects, we stat monitoring the coma variation of 29P Schwassmann – Wachmann from 2010 to 2012. We also estimate the ability to detecting TNO binaries via astrometry measurements. Final for the Neptune Trojan, we perform a simulation to understand how long of the observational arc we need to separate the Neptune Trojans with other TNO class.

P14: Pan-STARRS Data, Data Server, and Integrated Data Query Tool

Jhen-Kuei Guo (Graduate Institute of Astronomy, National Central University), Wen-Ping Chen, Chien-Cheng Lin, Ying-Tung Chen, and Hsing-Wen Lin (Graduate Institute of Astronomy, National Central University)*

The Pan-STARRS project is operated by an international consortium. Located in Haleakala, Hawaii, the Pan-STARRS telescope system patrols the entire visible sky several times a month, with an aim to identify and characterize varying celestial objects of phenomena, in brightness (supernovae, novae, variable stars, etc) or in position (comets, asteroids, near-earth objects, X-planet etc.) PS1 science mission has started officially from May, 2010 and expects to end in the end of 2013. Every patch of sky observable from Hawaii has been observed in at least 5 bands (g', r', i', z', y') for 5 to 40 epochs. We have set up a data depository at NCU to serve the users in Taiwan. The massive amounts of Pan-STARRS

data are downloaded via Internet from the Institute for Astronomy, University of Hawaii whenever new observations are obtained and processed. So far we have stored a total of 226.5 TB worth of data. In addition to star/galaxy catalogs, a postage stamp server provides access to FITS images. The Pan-STARRS Published Science Products (PSPS) has recently passed its operational readiness, that provides users to query individual PS1 measurements. Here we present the data query tool to interface with the PS1 catalogs and postage stamp images, together with other complementary databases such as 2MASS and other data at IRSA (NASA/IPAC Infrared Science Archive.) A few applications using our query tool will be demonstrated.

P15: To Identify the Lowest Mass Members in Praesepe (M44) by the Pan-STARRS

Ping-Fang Wang (Department of Physics, NCU), Wen-Ping Chen (Graduate Institute of Astronomy & Department of Physics, NCU)

Membership identification is the first step to determine the properties of a star cluster, such as the age, distance, size, spatial distribution, and mass function, etc. In particular, the low mass members trace the dynamical history — mass segregation, stellar evaporation, tidal stripping — of a star cluster in its Galactic environment. We have initiated a program to identify members in star clusters by photometric and kinematic data sets. Here we show our analysis of the Praesepe cluster (d = 170 pc) by using the 2MASS photometry and the PPMXL proper motions, for which a total of 892 member candidates have been identified down to a mass limit of $0.2 \sim M_{\odot}$. Even lower mass members could be found by using PS1 photometry with the faintest being $g' = 22.8 \sim$ mag, corresponding to less than $0.1 \sim M_{\odot}$. Previous studies of Praesepe member candidates relied on proper motions of bright stars, and mostly photometric measurements of faint stars. Our work is the first to determine the membership down to less than $0.1 \sim M_{\odot}$ by both photometric and kinematic criteria. Mass segregation is clearly evidenced in this mid-aged (900 Myr) cluster. Once the PS1 completes its third year survey in 2012, thereby increasing the photometric depth and astrometric baseline, we expect to detect members to a limit of $0.05 \sim M_{\odot}$, i.e., into a substellar regime.

P16: M31 Eclipsing Binaries with Pan-STARRS

Chien-Hsiu Lee (Graduate Institute of Astronomy, National Central University, Jhongli 32001, Taiwan), Johannes Koppenhoefer (University Observatory Munich, Munich 81679, Germany), and the PS1 collaboration*

The goal of this work is to conduct a comprehensive photometric study of the eclipsing binaries in M31. We perform the box-fitting method to search for eclipsing binary candidates and determine their period. The physical parameters of the candidates are characterized by fitting the Wilson-Devinney model. We also identify these candidates in the HST archive data, to better estimate their colour and reduce the light contamination. The candidates will be grouped into detached eclipsing binaries, semi-detached eclipsing binaries, and the rest so that we can spectrospcopically follow up the detached eclipsing binaries and determine the distance of M31 with the resources from Pan-STARRS consortium later on.

P17: MERGING GALAXY SYSTEMS AT Y BAND

Lin Yi-Fan (National Central University), Hwang Chorng-Yuan (National Central University)*

We study the y-band observations of the Panoramic Survey Telescope & Rapid Response System (Pan-STARRS) for a sample of morphologically-selected merging galaxies. The merging systems were selected from the merging catalog of Hwang & Chang 2009, in which merging galaxy systems were identified using pattern recognition in the images of the Red-sequence Cluster Survey 2 from the observations of the Canada France Hawaii Telescope (CFHT). We identified these source in the observations of the Pan-STARRS to obtain their y-bad data. Comparing the photometry data between RCS2 and Pan-STARRS, we can decide the near IR character of the merging system and also obtain better redshift information for these systems using photo-z methods.

P18: Effects of H2 coating of grains on depletion

O. Morata and T. Hasegawa (ASIAA)

Physical conditions in dense and cold regions of interstellar clouds favor the formation of ice mantles on the surfaces of interstellar grains. It is thought that most of the gaseous species heavier than H2 will adsorb onto the grains and will disappear from the gas-phase, changing its chemistry, within $\sim 10^9/\mathrm{n}_H$ years, where n_H is the total hydrogen number density. Nonetheless, many molecules in dense cores in molecular clouds are not completely depleted in timescales of 10^5 yrs. Several speculative mechanisms have been proposed to explain why molecules stay in the gas phase, but up to now none are fully convincing. At the same time, these mechanisms are not exclusive and we can still explore the effects of other possible processes. We speculate on the consequences of H2 coating of grains on the evaporation rates of adsorbed species. More experiments and simulations are needed to calculate the evaporation rate Eevap(X-H2). A simplified experiment could be H2 adsorption on various types of pure ice (H2O, NH3, SO, SO2, H2CO, ...) to estimate the H2-X interaction potential.

P19: Probing the Earliest Stage of Protostellar Evolution —Barnard 1-bN and Barnard 1-bS

Yun-Hsin Huang (NTU Physics/ASIAA), and Naomi Hirano (ASIAA)*

Two submm/mm sources in the Barnard 1b (B1b) core have been observed with the Submillimeter Array (SMA) and the Submillimeter Telescope (SMT). The 1.1 mm and 1.3 mm continuum maps obtained with the SMA have revealed that two sources, B1-bN and B1-bS, contain spatially compact components, suggesting that they harbor protostars. On the other hand, these two sources show very cold spectral energy distributions with $T_{\mathrm{dust}}\sim$11 – 15 K, which are similar to those of prestellar cores. In addition, none of them are visible even in the 24 and 70 μm bands of *Spitzer* MIPS. The N_2D^+ and N_2H^+ J=3 – 2 maps were obtained by combining the SMA and SMT data. The N_2D^+ and N_2H^+ lines show a large velocity difference of $\sim$0.9 km s^{-1} between B1-bN and B1-bS. If this velocity difference attributes to the orbital motion of gravitationally-bounded objects, the enclosed mass is calculated to be $\sim$0.6 $M_\odot$, which is consistent to the total mass of two sources (0.3 $M_\odot$ each) derived from the dust continuum data. The column density ratio, $N(N_2D^+)/N(N_2H^+)$, was estimated to be $\sim$0.4 at the positions of both B1-bN and B1-bS. The derived N_2D^+/N_2H^+ ratio is comparable to the highest value measured in the

centrally condensed prestellar core (0.44), and is significantly higher than the values of the most of the protostellar cores. The high N_2D^+/N_2H^+ ratio implies that the dense gas in B1-bN and B1-bS remains very cold despite the presence of protostars. The observed physical and chemical properties suggest that B1-bN and B1-bS are in the very early stage of protostellar evolution, probably between the transition stage of pre-stellar cores and Class 0 protostars.

P20: Molecular Hydrogen in the diffuse interstellar medium of the Large Magellanic Cloud

Yao-Lun, Yang (Academia Sinica, Institute of Astronomy and Astrophysics; National Taiwan University), Ciska, Kemper (Academia Sinica, Institute of Astronomy and Astrophysics)

We present the *Spitzer* spectral maps of 12 diffuse interstellar medium (ISM) regions in the Large Magellanic Cloud (LMC) from the *SAGE-Spec* project. The spectral maps are taken over a region of 1′ size and contain IRS 5-40 μm spectroscopy and MIPS SED observation over 52.7-98.6 μm. The spectral maps were integrated over a 1′ circular region. In the integrated spectra, we identified emission from molecular hydrogen, which is surprising for the diffuse ISM. Using *PAHFIT*, we determined the line strength of the low-J rotational transitions from S(0) to S(7). We found that the line strength ratios are not easily fitted with a single excitation temperature for each region indicating that the regions are not homogeneous. For the same regions, we also have *Spitzer* and *Herschel* far-infrared observations tracing thermal emission from dust; *MOPRA* CO (J = 1-0) observations tracing the presence of molecular gas; and HI emission from Australia Telescope Compact Array (ATCA) tracing the atomic phase of the ISM. Moreover, the *PAHFIT* fitting routine also identifies and fits atomic lines, tracing the ionized ISM. Thus, we explore correlations between the H_2 emission and these additional tracers of the various phases of the ISM, as well as the dust temperature. So far, our finding indicates that the 12 diffuse regions are in fact rather heterogeneous in nature. We will explain the results in the context of the Tielens & Hollenbach PDR model.

P21: Impact of grain size distributions on the dust enrichment in high-redshift quasars

Tzu-Ming Kuo (Department of Physics, National Taiwan University, Taipei 10617, Taiwan & Institute of Astronomy and Astrophysics, Academia Sinica, PO Box 23-141, Taipei 10617, Taiwan), Hiroyuki Hirashita (Institute of Astronomy and Astrophysics, Academia Sinica, PO Box 23-141, Taipei 10617, Taiwan)

The origin of dust grains in the Universe is one of the fundamental problems in astrophysics. In the interstellar medium, the radiative heating and cooling and the spectral energy distributions in galaxies are materially regulated by the abundance of dust. It is widely believed that the evolution of dust content in galaxies is influenced by dust formation in stellar ejecta, dust destruction in supernova remnants, and grain growth by the accretion of metals onto the preexisting dust grains in molecular clouds. In high-redshift ($z > 5$) quasars, a large amount of dust ($\sim 10^8$ $M_\odot$) has been observed. In order to explain the large dust content, we focus on a possibility that grain growth by the accretion of heavy elements is the dominant dust source. We adopt a chemical evolution model applicable to nearby galaxies but utilize parameters adequate to high-z quasars. It is assumed that metals and dust are predominantly ejected by Type II SNe. We have found that grain growth strongly depends on the grain size distribution. If we simply use the size distribution of grains ejected from SNe, grain growth is inefficient because of the lack

of small grains (i.e. small surface-to-volume ratio of the dust grains). However, if we take small grain production by interstellar shattering into consideration, grain growth is efficient enough to account for the rich dust abundance in high-z quasars. Our results not only confirm that grain growth is necessary to explain the large amount of dust in high-z quasars, but also demonstrate that grain size distributions have a critical impact on grain growth.

P22: Single-Dish Observations of the Class I Young Stellar Objects IRS 44 and 46

Wen-Wei Wang (Institute of Astrophysics, National Taiwan University, Taipei, Taiwan, R.O.C.), Yi-Jehng Kuan (Department of Earth Sciences, National Taiwan Normal University, Taipei, Taiwan, R.O.C.; Institute of Astronomy and Astrophysics, Academia Sinica, Taipei, Taiwan, R.O.C.), and Yo-Ling Chuang (Department of Earth Sciences, National Taiwan Normal University, Taipei, Taiwan, R.O.C.)

Observed with the Spitzer space telescope, simple organic molecules HCN and C_2H_2 in gas phase were reported to exist in the inner disk of the low-mass Class I young stellar object (YSO) IRS 46. Using the Submillimeter Telescope (SMT) of Arizona Radio Observatory, we imaged the J = 2-1 spectral emission of ^{12}CO, ^{13}CO and $C^{18}O$ toward the region around IRS 46 and IRS 44, also a Class I YSO. A ridge-like structure of molecular gas extends from IRS 44 to IRS 46 signals likely physical interaction between these two YSOs. We also derived column densities of molecular hydrogen of 2.7 10^{22} cm^{-2} toward IRS 44 and 1.9 10^{22} cm^{-2} toward IRS 46, respectively. H_2CO and CH_3OH emission was also observed toward IRS 46 and the molecular emission may come from the inner region of IRS 46, where icy mantles have been evaporated recently due to the heating from the central protostar. Our study of IRS 44 and 46 is important for our understanding the chemical evolution of Class I YSOs and, hence, of Solar Nebula.

P23: A Multiband Optical Polarimetric Study of Classical Be Stars with Exceptionally Large Near-Infrared Excess

Chien-De Lee (Graduate Institute of Astronomy, National Central University, Jhongli 32001, Taiwan), Chakali Eswaraiah (Aryabhatta Research Institute of Observational Sciences, Manora Peak, Nainital 263129, India), Anil Pandey (Aryabhatta Research Institute of Observational Sciences, Manora Peak, Nainital 263129, India), Wen-Ping Chen (Graduate Institute of Astronomy, National Central University, Department of Physics, National Central University Jhongli 32001, Taiwan)*

Polarimetric technique is an efficient tool to study the dust properties not only in the interstellar and intra-cluster media, but also in circumstellar environments. We present new UBVRI multi-bands polarimetric observations of six classical Be (CBe) stars to diagnose the spatial distribution of their circumstellar dust. Based on the Serkowski's fit to the wavelength dependence of polarizaiton, we infer that two stars, HD 45677 and HD 50138, which show very large near-infrared excess, (J−H) and (H−K) > 0.7 mag, have intrinsic polarization and variable in B,V and R bands. This indicates that dust is distributed in an asymmetric distribute of circumstellar dust, e.g., in a disk.

P24: Amplitudes ratio between VI band for pulsating stars and applications

Ding-Cheng Chang (Department of Physics, NCU), Chow-Choong Ngeow (Graduate Institute of Astron-

omy, NCU), Wen-Ping Chen (Graduate Institute of Astronomy & Department of Physics, NCU)

We tested several period search methods on pulsating stars in OGLE-III catalogs to compare their accuracy and efficiency. It turns out that, SigSpec, which is based on the Discrete Fourier Transformation, is the best method to search for periods of pulsating stars in terms of accuracy and efficiency. In addition, there is an empirical relation between I band and V band amplitudes for classical pulsating stars, $Amp(I)/Amp(V) \simeq 0.61$. To verify the relation, we use the Fourier decomposition technique to measure the amplitude ratios for classical pulsating stars found in the OGLE-III field. Furthermore, we are carrying out a pilot program to combine the V band and I band measurements into a single light curve for each classical pulsating star so as to improve their time coverage. In this poster, we present the preliminary results showing that the combined light curves do improve the period search accuracy.

P25: Characterization of the embedded open cluster G144.904+0.434 between Cam OB1-A and Cam OB1-B

Chien-Cheng Lin (Graduate Institute of Astronomy, NCU), Wen-Ping Chen and Neelam Panwar (Graduate Institute of Astronomy, NCU)

Open clusters (OCs) are good laboratories to study stellar evolution and dynamical interaction among member stars. We have developed a star-counting algorithm and tested it on the 2MASS point source catalog in Galactic latitude $|b| < 50$ degrees, to search for density enhancements significantly above the field. One such density peak located between Cam OB1-A and Cam OB1-B, is an embedded star cluster, at $(\ell, b) = (144.904, +0.434)$, first recognized, but not well characterized, by Glushkova et al. (2010). Preliminary analysis shows a distance of 1.2 $\sim$ kpc, hence likely physically related to the Cam OB1 association. We present the UCAC proper motions to constrain the membership of bright stars. Two classical T Tauri candidates are found based on their 2MASS colors, and one shows strong Hα in emissions indicative of a young age of the clusters.

P26: Magnetic Field Structure inferred by Near Infrared Polarization in the Carina Nebula and RCW 57

蘇柏合*(IANCU)*

Carina Nebula (NGC3372) and RCW 57 (NGC3576) are among the brightest Galactic nebulae, with a wealth of massive stars and infrared excess stars. It tells us they both are star-forming regions. We present near-infrared JHKs polarization images taken by SIRPOL, an infrared imaging polarimeter, mounted on the Infra-Red Survey Facility telescope in Sutherland, South Africa, to diagnose the magnetic field structure in these turbulent cloud complexes. Our SIRPOL field covers only the central part of Carina Nebula around Eta Carina where a cavity has been created. Only moderate polarization is measured, which is caused mainly by the general Galactic magnetic field. In contrast, RCW57 is associated with molecular clouds, and we were able to infer the hour-glass shaped magnetic field that governs the cloud morphology.

P27: Probing Extended Green Objects with CH_3CN

Tzu-Yu Hung (Department of Electrophysics, National Chiao Tung University), Sheng-Yuan Liu (Institute*

of Astronomy and Astrophysics, Academia Sinica), Yu-Nung Su (Institute of Astronomy and Astrophysics, Academia Sinica), Jin-Hua He (Key Laboratory for the Structure and Evolution of Celestial Objects, Yunnan Astronomical Observatory/National Astronomical Observatory), Hsu-Tai Lee (Institute of Astronomy and Astrophysics, Academia Sinica), Satoko Takahashi (Institute of Astronomy and Astrophysics, Academia Sinica), and Vivien Chen (Institute of Astronomy and Department of Physics, National Tsing Hua University)

Extended Green Objects (EGOs), identified by the presence of extended and excessive green pattern in their three-color composite Infrared Array Camera images observed in the Spitzer Galactic Legacy Infrared Mid-Plane Survey Extroadinaire project, are recognized as new candidates of massive young stellar objects (MYSOs) with active outflows possibly driven by ongoing accretion. To investigate the nature of EGOs, observations of CH_3CN J=12-11 K=0-7 transitions with frequencies ranging from 220.5 to 220.8 GHz towards 37 EGO sources were carried out with the Arizona Radio Observatory Submillimeter Telescope. CH_3CN transitions serve as a good probe for estimating the gas temperature and for testing the possible existence of molecular disk structure around massive YSOs. We present the observational results and analysis, including the detection rate, detected line intensities, line-widths, derived gas temperatures, and column densities, as well as their implications from our observations.

P28: Statistical Properties of Extended Green Objects From Bolocam Galactic Plane Survey

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

In the Spitzer GLIMPSE survey, Cyganowski et al. (2008) have identified more than 300 Extended Green Objects (EGOs) due to their strong Spitzer IRAC2 emission. EGOs are suggested as new outflow candidates from Massive Young Stellar Objects (MYSOs). The real nature of EGOs is still unclear and other wavelengths are crucial for understanding these sources. We have correlated the 1.1 mm sources in the Bolocam Galactic Plane Survey (BGPS) catalog with EGOs catalogs, and found that EGOs are mostly very bright in BGPS. Here we present the statistics results of EGOs property in the BGPS 1.1 mm sources compared with all other bright sources in BGPS, including distance, flux, physical size, mass and column density. Our results show that, within 5 kpc, EGOs are more massive and compact objects compare to other BGPS bright sources. We suggest that EGOs could be an early phase of massive star formation.

P29: Exploring Magnetic Field Structure of Star-Forming Cores at Different Angular Scales

Jeffrey Hsu 許立承 (NTHU), Shih-Ping Lai 賴詩萍 (NTHU)

Dust polarization observation is the most commonly used method for mapping magnetic field structure around star-forming cores. However, because the mapping process integrated the signals in the line of sight, magnetic field structures around the cores at different angular scales are mixed. This would prevent us from separating field structures at different scales.
In this work I probed magnetic field structure under different scales. The core idea is to develop a way to identify polarization detection in different resolution. The data set is BIMA 1mm observation for W51 and DR21OH. I calculated the average amplitude and S/N ratio for different UV-distance and UV-angle

from Q, U polarization visibility. Longer UV-distance represents higher spacial resolution which identifies smaller scale structures and different UV-angle in visibility may indicate that there is a specific magnetic field direction. Comparing mapping at specific UV-distance and S/N ratio calculation could tell us the correlation between them.

P30: Validation of Very Low Luminosity Object Candidates in Taurus

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

Very Low Luminosity Objects (VeLLOs) are the faintest embedded sources with intrinsic luminosity $L_{int} \leq 0.1 L_{\odot}$, and they could be either very young, very low mass protostars, or even proto-brown dwarfs. We searched for VeLLOs in Taurus adopting the color and luminosity criteria from Dunham et al. (2008), which are derived from known young Class 0/I objects. We further added two physical parameters, bolometric temperature and extinction value, to strengthen the possibility. As a result, we select 11 VeLLO candidates in Taurus. Together with Arizona Radio Observatory (ARO), We further observed $^{13}CO(J=2-1)$, $C^{18}O(J=1-0)$, $N_2D^+(J=3-2)$, and $N_2H^+(J=1-0)$ emission lines with Arizona Radio Observatory (ARO) to examine whether our candidates are truly embedded sources. Our results show that 10 VeLLO candidates with CO isotope information and four VeLLO candidates with $N_2H^+(J=1-0)$ detections, which indicating that the four VeLLO candidates are at the early stage of star-forming process. In addition, we also observe the outflow tracer, CO (J=2-1), toward the four young VeLLO candidates with SMA. We will present the CO (J=2-1) and $N_2H^+(J=1-0)$ data of two VeLLO candidates and also the archive data of 10 VeLLO candidates.

P31: Spectroscopic Variability of Active T Tauri Stars

Mei-Yin Chou (Institute of Astronomy and Astrophysics, Academia Sinica, Taiwan), and Michihiro Takami (Institute of Astronomy and Astrophysics, Academia Sinica, Taiwan*

Simultaneous monitoring ($\sim$ 10-year) of the jet structures and signatures of magnetospheric accretion would allow us to test theories of jet driving and mass accretion. If the jet is driven by an X-wind, the emergence of new knots should be well correlated with the time variability of magnetospheric accretion. If they are driven by a disk-wind, such a correlation may be weak since these two mechanisms are not directly related with each other. If they are driven by a reconnection wind, we would observe some time lag between magnetospheric accretion and the emergence of a new knot. As such, we should be able to test theories of jets, wind and mass accretion. However, before starting a long-term campaign, we should understand how the daily and monthly variability affect a 10-year term variability. Here we present the first year results and show the variability of four target T Tauri stars in six observation dates.

P32: Study the outflows and jets in VeLLOs

Tien-Hao Hsieh (National Tsing Hua University), Shih-Ping Lai (National Tsing Hua University)*

We have observed the Ks band and H_2 emission to trace outflows and jets, respectively, toward 13 Very Low Luminosity Objects (VeLLOs) and 7 Low Luminosity Objects (LLOs). VeLLOs are defined as YSOs with internal luminosity $L_{int} < 0.1\ L_{\odot}$ (LLO: $L_{int} < 0.2\ L_{\odot}$) and thus are believed to be

protostars at extremely early evolutionary stage. Therefore, studying the outflows and jets in VeLLOs will advance our understanding in how the earliest outflows and jets evolve with time. We have found clear outflows toward 7 sources at Ks band and 4 sources which possibly drive H_2 jets from our CFHT observations. Because opening angles of outflows widen with time is predicted by models and also shown in observations (Arce & Sargent 2006), we examine the relation of outflow opening angles with ages in 9 (Ve)LLOs with outflow association from our Ks band observations and IRAC1 (3.6 μm) images. Comparing our results with previous study, we found that VeLLOs outflow opening angles do not seem to increase as shown in previous works. Although the discrepancy may be caused by the different outflow traces, our results suggest that the outflows may be very active as soon as the protostars are formed.

P33: Probing turbulence power spectrum in molecular clouds

Shiou-Fong Li 李曉峰 (NTHU), Shih-Ping Lai 賴詩萍 (NTHU)

Turbulence plays an important role in star formation processes; therefore, it is important to quantify the distribution of turbulence in molecular clouds. Many observations and simulations show that the power spectrum of column density correlates with the turbulence power spectrum if both are approximately of power-law form ($P \propto k^{-/alpha}$). Previous observations of density power spectrum mostly only derive a single power-law index for the whole observed molecular clouds. However, it is possible that star-forming activity will input turbulence energy into molecular clouds, thus the power-law index may varies with YSO density. To understand if the star formation feedback is important, we calculate the density power-law indexes for selected regions in four molecular clouds (Lupus, Serpens, Perseus , Ophiuchus) and compare their density power-law indexes to YSO densities.

P34: The Wiggling Structure in Quadrupolar Outflow of NGC 1333 IRAS 2A

Arthur Tsai (NTHU), Vivien Chen (NTHU), Chin-Fei Lee (ASIAA), Hsieh Shang (ASIAA), Hirano Naomi (ASIAA)

A quadrupolar outflow driven by the Class 0 protostar(s), NGC 1333 IRAS 2A, was observed by Submillimeter Array (SMA) with angular resolution of 3". The collimated east-west outflow with a subtle wiggling structure of shocked knots suggests an unresolved hypothesized protostellar binary system. By studying the position distribution of knots, we can constrain the binary properties, such as orbital radius and total stellar mass. In contrast to the east-west outflow, the widespread CO (2-1) emission at low velocity in the north-south direction delineates a dense cavity structure. In addition to the low velocity cavity structure, the observation also shows high velocity clumps ($\sim$ 50 km/s) toward the tip of the CO (2-1) outflow. Examining the properties of these two bipolar outflows sheds light on the intriguing nature of their driving mechanism as well as possible configurations of the central source(s).

P35: Probing the magnetic field structure in the filamentary cloud IC5146

Jia-Wei Wang (NTHU), Chakali Eswaraiah (ARIES, India), Shih-Ping La (NTHU), and Anil K. Pandey (ARIES, India)*

Recent Herschel and Spitzer survey found a lot of filamentary clouds in the star-forming regions, which are one of the potential birth sites for massive star or cluster formation. However, how filamentary clouds form is still on debate. The filamentary clouds may form from compression of large scale convergent flows (Mac Low & Klessen 2004), while other theoretical works suggest filamentary clouds may result from the gas collapsing along the field line of a strong magnetic field (Ostriker et al. 2001). IC5146 is one of the filamentary observed in Herschel Gould Belt Survey, and the new release data have shown the complex network of filaments within a cloud which favors the scenario that the filaments network are generated by large scale MHD turbulence and the filaments fragment in to prestellar cores by gravitational instability (Arzoumanian et al. 2011). To further evaluate the relative importance of these two mechanisms on filament formation, the magnetic field measurement would provide crucial information. Here we present the result from the optical polarization observations to IC5146 taken with AIMPOL in ARIES, India. The polarization degree versus extinction plot has shown that the polarization we measured is consistent with dichroic absorption scenario, and thus the polarization vector should be a good indicator for magnetic field. Compare our polarization map to the image taken from Herschel telescope, we found that the large scale structure of magnetic field is well perpendicular to the main filament, but is likely parallel to the sub filaments. Our result favors the scenario that the filament is collapsing along the magnetic file in a large scale.

P36: The Mmembership Determination in the Open Clusters from Relative Proper Motion Data

Hsiang-Yu, Hsieh, Hsieh-Hai Fu (Department of Earth Sciences, National Taiwan Normal University)

To study stellar cluster' s age and distance, the Color-Magnitude Diagram is a classical and powerful way to solve it. But a ' clean' CMD is hard to get, especially in the milky-way region or the stellar cluster has a large angular size. The mathematically rigorous procedure was developed by Sanders (1971) with a statistical analysis of proper motions. In this work, with the data of various authors, 10 stellar clusters were examined, and we got the probability of membership. We plot the cluster membership which probability larger, and with the stander isochrones fitting on CMD, we discuss the reddening and extinction of these 10 stellar clusters. The results of age and distance of clusters is match with reference.

P37: The Information Of Milky Way From 2MASS Whole Sky Star Counts: The Bimodal Color Distributions

Chan-Kao Chang (Institute of Astronomy, National Central University, Chung-Li, Taiwan), Shao-Yu Lai (Institute of Astronomy, National Central University, Chung-Li, Taiwan), Chung-Ming Ko (Institute of Astronomy & Department of Physics & Center of Complex System, National Central University, Chung-Li, Taiwan), and Ting-Hung Peng (Ting-Hung Peng)

The $J - K_s$ color distribution of the Two Micron All Sky Survey (2MASS) star counts at Galactic latitude $|b| > 30^\circ$ shows a bimodal distribution which has two peaks at $J - K_s \sim 0.4$ and ~ 0.8. The positions of the two peaks do not change along Galactic coordinate. The height of the blue peak is higher than red peak at lower Galactic latitudes and becomes smaller at the high Galactic latitudes. The bimodal color distribution and the trend of blue-to-red peak height ratio can be well fitted by a three component galaxy model (i.e., a thin disk, a thick disk and a halo; Chang et al., 2011), a single power law luminosity function (Chang et al., 2010), and by adopting the color-magnitude relation of Wainscoat et

al. (1992). However, we have to consider evolved features on the luminosity function to generate better fits.

P38: Comparing RAVE data to the Besançon Galactic Model

Andreas Ritter (National Central University), Quentin Parker (Macquarie University), and Joss Bland-Hawthorn (Sydney University)*

I present an in-depth evaluation of the structure of our Galaxy by comparing data from the RAdial Velocity Experiment (RAVE) with the best current available Galactic model. RAVE is an unprecedented, ongoing magnitude-limited survey of stars in the southern hemisphere. To date more than 500,000 spectra of stars with an I magitude between 9 and 12 mag have been collected. RAVE is pioneering the emerging field of Galactic archaeology, which aims to reconstruct the structure and past history of the evolution of our Galaxy via intimate knowledge of key properties of large numbers of Galactic stars across a large fraction of the Galaxy. RAVE produces medium-resolution spectra (median R=7,500) over the CaII-triplet region (λ 8,410 – 8,795 Å) which provide radial velocities, spectroscopic distances, and key stellar atmospheric parameters (effective temperature, surface gravity, metallicity, and elemental abundances). The spectra are taken with the 150-fibre 6-degree field (6dF) instrument at the 1.2m UK-Schmidt Telescope (UKST), situated at Siding Spring Observatory near Coonabarabran, Australia. Being the first major magnitude-limited spectroscopic survey with modest and well understood selection effects, RAVE offers an unprecedented tool to test the formation and evolution scenarios of the Galaxy. A rigorous statistical comparison of the RAVE survey is made to the well established and commonly used Besançon Model of the Galaxy. This work has revealed some important issues with that model which incorporates the current knowledge of the formation and evolution of the Milky Way. We find systematic discrepancies for all parameters compared to RAVE data. While some of those can be explained with systematics in the RAVE survey, others cannot, indicating that the current theories of the formation and evolution of the Galaxy are too simple and far from being correct. The visualisation of these results also reveals a wealth of sub-structures in the Galaxy, most of them new.

P39: Identification of Open Cluster Members by UCAC2 Proper Motion Catalog

Chung-Kai Huang (Institute of Astronomy, National Central University), Chien-Cheng Lin (Institute of Astronomy, National Central University), Wen-Ping Chen (Institute of Astronomy, National Central University)*

Open Clusters play an important role in studying stellar evolution as well as the formation and evolution of the Galactic disk. Identification of member stars in a star cluster is the first step to derive the fundamental physical parameters of the cluster, such as the distance, age, size, spatial distribution, reddening, and metallicity. In particular, the spatial distribution of member stars, especially toward the low end of the mass spectrum, gives information regarding possible tidal structure related to the internal dynamical evolution and external influence by the Galactic environments. Here we present the methodology to identify proper-motion members in a star cluster by subtraction of filed star distribution. We show the analysis two open clusters, NGC752 and NGC5822, by using the UCAC2 proper motion data set, for which member stars can be separated from field stars. We demonstrate why hybrid data

sets such as PPMXL and UCAC3, though reaching fainter limiting magnitudes, cannot be used in our study.

P40: Measuring galaxy environment with spectroscopic and photometric redshifts.

*Chuan-Chin Lai (National Taiwan University), *Lihwai Lin (ASIAA), Hung-Yu Jian (National Taiwan University)*

It's well known that galaxy properties, for example, galaxy color, luminosity and star formation rate, strongly depend on their environment. Many estimators have been proposed and tested to be successful to quantify the environmental effect. While those environmental estimators in general work well with spectroscopic-redshift samples, their performance with photometric-redshift samples is uncertain. In this work, we adopt two estimators, 2D and 3D nth-nearest-neighbor methods, and make use of Durham mock catalog built on Millennium Simulation to probe their performance with photometric-redshift samples and how the performance correlate with photometric redshift error.

P41: Properties of galaxies in groups up to z=2 from the UKIDSS-Ultra Deep Survey

Ho Hsiao (National Taiwan Normal University), Sébastien Foucaud (National Taiwan Normal University), Hung-Yu Jian (National Taiwan University), Lihwai Lin (ASIAA), Ching-Min Lo (National Taiwan Normal University), Kuan Chen (National Taiwan Normal University), and Wei-Hao Wang (ASIAA)

Cosmic expansion and initial disturbance resulted of the formation of the cosmic web and the contrasted large scale-structure we observe today. The densest parts of the large scale structure of the universe, compose the galaxy groups and clusters. Because galaxies live preferentially in dense environment, clusters and groups play a very important role in galaxy evolution. In general, several methods are available to find overdensity member (cluster/group), each method with its own strengths and weaknesses: ICM detection, red fraction in optical or IR, Friends-of-Friends algorithm, Voronoi tessellation. However when only a limited access to spectroscopic redshifts is available, and the finder algorithm has to rely heavily on photometric redhifts, a probablistic Friend-of-Friend method is more efficient. Observing and detecting groups at high redshift is extremely challenging, especially for the redder systems, involving passive galaxies. The current generation of optically-selected surveys are biased against the passive population in pairs and groups, leading to an underestimation of their role in the galaxy evolution. Making the best use of the worldwide release of the near-infrared data UKIDSS-UDS DR8, combined with Subaru and CFHT data in the optical waveband, and Spitzer-IRAC mid-infrared data, we coupled photometric redshift with a probabilistic Friends-of-Friends algorithm to build a groups catalog up to redshift z=2. Here we will discuss results on our selection of groups up to z=2, including the description of the method and some early results on the evolution of the red fraction and comparison with X-ray selected groups and clusters.

P42: Unusual Luminous Transient in the Subaru Deep Field

Patrick P. Tsai and Yuji Urata (Institute of Astronomy, National Central University), Kuiyun Huang (Institute of Astronomy and Astrophysics, Academia Sinica), Tomoki Morokuma (Institute of Astronomy, Graduate School of Science, University of Tokyo), Naoki Yasuda (Institute for the Physics and Mathematics of the

Universe, University of Tokyo), Masaomi Tanaka (Optical and Infrared Astronomy Division, National Astronomical Observatory of Japan), Kentaro Motohara (Institute of Astronomy, Graduate School of Science, University of Tokyo), Masao Hayashi and Nobunari Kashikawa (Optical and Infrared Astronomy Division, National Astronomical Observatory of Japan)

We present results of optical transient search and SDF-05M05, an unusual optical transient, in the Subar Deep Field (SDF). The SDF is one of the best surveys to perform transient search due to its deep limiting magnitude, wide field of view, multi-band observation, and long-term coverage (7 years). The transient search process was starting with image subtraction for finding the variable sources in the field. Afterward we classified the sources according to their light curves and color information. Based on this transient search, there are 212 real optical transients. Among these transients, SDF-05M05 showed peculiar properties. The duration of the SDF-05M05 is at least 800 days in the observer frame, and the maximum brightness during observation reached approximately 23 mag in the i' - and z' -band. The faint host galaxy is clearly identified in all 5 bands of the deep SDF images. The photometric redshift of the host yields z$\sim$0.6, and the corresponding absolute magnitude at maximum is ~ -20. The total radiated energy during our observation was 2×10^{52} ergs. The light curves and color evolution are inconsistent with all known typical supernova types. We suggest that the transient may be a new type of event at intermediate redshift. The planned strategic survey with a time-domain-survey cadence using the new wide-field imager, HSC, attached to Subaru will prove invaluably.

P43: A High Definition View of Nearby Galaxies with ALMA, Chandra, and HST

Albert Kong (National Tsing Hua University)*

With the operation of ALMA, we now have an array of telescopes with very high resolution across the electromagnetic spectrum. Combining their unprecedented spatial resolution and sensitivity, we are seeing a revolution in our understanding of nearby galaxies from high energies to optical and radio. By using the Science Verification data of ALMA and archival data from Chandra and HST, we compare three nearby galaxies (M100, Antennae galaxies, and NGC3256). These stunning images provide the highest resolution views of nearby galaxies acquired with millimeter, optical, and X-ray telescopes. They also demonstrate how multi-wavelength observations can help address various astrophysical problems.

P44: The Correlation between Dust Absorption and UV Spectral Slope of Galaxies from the GOODS-North

Si-Heng Lei (National Taiwan University, Academia Sinica), Wei-Hao Wang (Academia Sinica), Wei-Hsin Sun (National Taiwan University)*

When studying star formation rate (SFR) of galaxies, we need to know the dust absorption in the UV, and then correct for the absorbed part to obtain the intrinsic UV spectrum and SFR. It is widely believed now that dust absorption is correlated with the rest-frame UV spectral slope (β) of a galaxy, defined as $f_\lambda = \lambda^\beta$. This work is to verify the above correlation; we will derive the infrared star formation rate (IR SFR) from the radio flux of galaxies, calculate the IR SFR to UV SFR ratio to infer dust absorption, and we can test if there are any correlations with β. For the rest-frame UV fluxes and redshifts, this work uses the GOODS-N catalog from Barger et al. (2008). This catalog covers a broader range of redshift, comparing to other works, and the highest redshift in this catalog is $z \sim 6$. We adopt the VLA 1.4 GHz

GOODS-N catalog from Morrison et al. (2010) and use the method in Wang et al. (2012) to convert the radio flux to IR SFR. After comparing β with IR-to-UV SFR ratios and $z-K$ colors of galaxies, we conclude that there is not a strong correlation between dust absorption and β.

P45: Acceleration parameter of MOND from Sloan Lens ACS survey

Ting-Hung Peng (Institute of Astronomy, National Central University, Jhongli, Taiwan 320, R.O.C.), Chung-Ming Ko (Institute of Astronomy, Department of Physics and Center for Complex Systems, National Central University, Jhongli, Taiwan 320, R.O.C.), and Yong Tian (Department of Physics, National Central University, Jhongli, Taiwan 320, R.O.C.)*

The characteristic acceleration is a very important parameter for MOdified Newtonian Dynamics (MOND). Theoretically, its value can be obtained directly from strong lensing systems if the velocity dispersion of the lens is also measured. We select samples from the gravitational lensing survey SLACS (S stands for SDSS, L for Lens, ACS for Advanced Camera for Survey on HST). In this contribution, we focus on strong lensing system with elliptical galaxy lenses. About 60 candidates are selected, whose velocity dispersion is available from SDSS DR8. We use images obtained by HST WFPC2 at F606W and model the lensing galaxies by GALFIT convolved with PSF from TinyTim. The position of the pair of images is then found from the residual after the model galaxy is subtracted from the image. Preliminary result will be presented at the conference.

P47: Interpretation of gravitational redshift measurement in clustes of galaxies by MOND

Chia-Jung Chuang (NCU), Chung-Ming Ko (NCU), Yong Tian (NCU)

MOdified Newtonian Dynamics (MOND) is an alternative to the dark matter (DM) paradigm in interpreting the excess acceleration (or gravity) observed in many astrophysical objects. In fact, MOND is more successful than DM in dynamics of galactic scales. A recent study on gravitational redshift measurement in clusters of galaxies by Wojtak et al. (2011) claimed that the data is consistent with general relativity only, while f(R) gravity is marginal and TeVeS (a relativistic version of MOND) can be ruled out. In this contribution, we re-examine the problem. Adopting a King' s profile, we work out the velocity dispersion and gravitational redshift in MOND. Preliminary results show that MOND can fit the data well, and DM is not needed.

P48: The MIR Properties of the Optical Selected Red QSOs

An-Li Tsai (Graduate Institute of Astronomy, National Central University), Yi-Jehng Chen (Graduate Institute of Astronomy, National Central University), Chorng-Yuan Hwang (Graduate Institute of Astronomy, National Central University)

We have selected a population of red QSOs from the Sloan Digital Sky Survey DR7 Quasar Catalog (SDSS DR7QC) which has Radio observation from the Very Large Array Faint Images of the Radio Sky at Twenty-Centimeters Radio Survey Catalog (VLA FIRST) with the redshift range between 0.6 and 2.0. We define the red QSOs and the normal blue QSOs based on the QSO color excess of $\Delta(g-i)$ described in SDSS DR7QC, i.e., $0.3 < \Delta(g-i) < 1.1$ for the red QSOs, and $-0.05 < \Delta(g-i) < 0.05$ for the

normal QSOs for comparison. We look for the MIR properties from the Wide-Field Infrared Survey Explorer (WISE) Preliminary Release Source Catalog. We found that the red radio-loud QSOs (RLQs) have warmer dust than the normal RLQ in all four WISE bands. Besides, the optical-to-MIR ratio of red RLQs are redder than that of normal RLQs.

P49: The ellipticity of elliptical galaxies with absolutely magnitude < -20 in different surface density field

Chen, Jhen-Yu (陳振予) (Insitude of Astronomy, National Central University), Hwang, Chorng-Yuan (黃崇源) (Insitude of Astronomy, National Central University)

We estimate the shape distribution of elliptical galaxies in different dense regions. The sample is selected from the SDSS DR8 and is divided into two groups with different surface densities. We consider the elliptical galaxies with absolutely magnitude < -20 and find the probability density functions of the ellipticities of these elliptical galaxies are different in these two regions. We will discuss the implication of this result in galaxy formation.

P50: The X-ray source population in M101

K. L. Li (NTHU), A. Kong (NTHU)*

We report the preliminary result of X-ray population study on the face-on spiral galaxy M101 using cumulated 1Ms Chandra observations. Hardness ratio (HR) and luminosity function diagrams of the detected X-ray point sources are presented. By cross-checking the 1Ms Chandra X-ray image and the corresponding Hubble Space Telescope (HST) data, we would be able to identify some optical counterparts for the X-ray sources.

P51: Spectral State of ULXs in Different Type of Galaxies

Chun-Cheng, Lin (Institute of Astronomy, National Tsing Hua University, Taiwan), A.H.K.Kong (Institute of Astronomy, National Tsing Hua University, Taiwan)*

I analyze the emission state of ULXs (ultra-luminous X-ray sources, Lx> 10^{39} ergs/s) in different types of galaxies by combining their spectra. The ULXs data are from the Chandra ACIS survey of X-ray point sources catalog (Liu 2011). I choose 104 ULXs in total 20 galaxies (there are at least 2 ULXs per galaxy) with faint flux (10^{-13} $\sim 10^{-14}$) due to their distant distance to earth which ranges are between 10Mpc to 50Mpc. I collect and combine their spectra based on the type of their hosting galaxy and on the X-ray hardness ratio. My early result is that the combined spectra state of Elliptical galaxy tends to be hard (power-law model dominate) state; On the other hand, the co-added spectra emission state of Spiral galaxy is likely in soft (thermal + power-law model dominate) state. The spectra fitting result based on the hardness ratio is almost ready.

P52: First Taiwan Meteor Network - Lulin & NCU Meteor System

Bing-Xun Wu, Shinsuke Abe, Hung-Chin Lin, Chi Sheng Lin (Institute of Astronomy, National Central University)*

Lulin Meteor System (LMS) has started regular observation since December 2009 at Lulin observatory in Taiwan. Three cameras towards north, east, and south are carried out using high sensitive CCD-TV cameras (Watec and Mintron) with wide field of view CCTV lens, which are recorded in video rate controlled by the software UFOCapture. A set of the camera system was also installed in NCU campus on August 2010 to make triangulation observations between Lulin and NCU. More than 17,000 meteors has been observed by LMS in which about 2% of meteors were detected by NCU camera. In addition, NCU camera detected 45 unexpected lightning phenomena such as red sprites, elves, blue jets so called Transient Luminous Events (TLEs) which are upper-atmospheric optical phenomena associated with thunderstorms. A magnitude distribution index (population index) related to a mass distribution corresponds to dust properties of meteor showers (mostly from comets) or sporadic (mostly from asteroids). Our results shows a population index for sporadic is 2.91 ± 0.02 ($-7 < mag < -2$), and that for cometary meteor showers is significantly smaller. In this paper, radiant points (a meteor shower has a point in the sky, from which meteors appear to originate), velocity distributions, magnitude distribution indexes, and interplanetary orbits will be presented in detail. For our future study, we plan to collaborate with more stations operated by several groups in Taiwan, and to establish Taiwan Meteor Network to have more triangulation meteors.

P53: The SED Machine: For PTF Science and Beyond

Chow-Choong Ngeow (National Central University), Nick Konidaris (California Institution of Technology), Andreas Ritter (National Central University), Alexander Rudy (Fulbright Taiwan), Edward Lin (National Central University), Sagi Ben-Ami (Weizmann Institute of Science), Robert Quimby (Institute for the Physcs and Mathematics of the Universe), Shri Kulkarni (California Institution of Technology), and Wing-Huen Ip (National Central University)

The Palomar Transient Factory (PTF) is a project aimed to discover transients in the Universe, including the Type Ia supernovae, core-collapse supernovae and other exotic and rare transient events. PTF utilizes the P48 Telescope at Palomar Observatory for discovering the transients, and follow-up mainly by the P60 (for photometric light and color curves) and P200 (for spectroscopic classification) telescopes. The discovery rate for PTF is about 4000 candidate transients per year, but only about 10% of the candidates being follow-up and classified. To overcome this shortcoming, a dedicated spectroscopy, called the SED Machine, is being built at the California Institution of Technology, and will be put on the P60 Telescope. The goal for SED Machine is to maximize the classification efficiency of transients discovered by PTF. The SED Machine is a low resolution ($R \sim 100$) IFU spectrograph. It consists of a rainbow camera for spectrophotometric calibration, and a lenslet array plus 3-prism optics system for providing integrated field spectra. The data reduction pipeline, on the other hands, is under development at National Central University. In this talk, we present the science, design and hardware of the SED Machine, together with on-going progress on data reduction pipeline development. We also discuss other science that could be possibly done with SED Machine beyond PTF.

P54: Simulating Images for the SED Machine — A Transient Classification Instrument

Alexander Rudy (Fulbright Taiwan, Taipei, 10043, Taiwan and National Central University, Zhongli, 32001 Taiwan), Chow Choong Ngeow (National Central University, Zhongli, 32001 Taiwan), Nick Konidaris*

(California Institute of Technology, Pasadena, California 91125 United States), Robert Quimby (Institute for the Physics and Mathematics of the Universe, Kashiwa, 277-8583, Japan)

We present a data simulator for the SED Machine Instrument. The SED Machine is an IFU spectrograph and imager for the Palomar 60-inch telescope, designed to robotically and efficiently classify transients. SED Machine consists of a lenslet based integral field spectrograph and a four color camera, designed to quickly acquire spectrophotometric calibrated spectra for newly discovered transients. We present the SED Machine Simulator. This image simulator mathematically models the integral field spectrograph at $R \sim 100$, using example data-cube sources and creating an image that would be produced from the lenslet-based integral field spectrograph on the IFU detector. The simulation models the source, as well as the throughput of the instrument and atmosphere, the geometric resampling due to the hexagonal lenslet array, and the dispersion across the image plane caused by the prism. The images produced by the SED Machine Simulator provide source material for use with the SED Machine Data Reduction Pipeline which is currently under development at National Central University. The SED Machine is a collaboration headed by CalTech, with National Central University, Carnegie Observatories, NOAO, and the Institute for the Physics and Mathematics of the Universe in Japan. It is partially funded by the National Science Foundation.

P55: The Fermi Gamma-ray Space Telescope

Pak Hin Thomas Tam, Albert Kong, Jason Wu, Regina Huang (National Tsing Hua University)

The Fermi Gamma-ray Space Telescope has revolutionzied our understanding of the gamma-ray Universe in the energy range from 100 $\sim$ MeV to 300 $\sim$ GeV. In this poster, we will introduce the Fermi-Asian-Network (FAN) that consists of astronomers from Hong Kong, Japan, Korea, Taiwan. We highlight some significant scientific results in the last two years.

P56: ALMA Cycle 1 Capabilities

Ronny Zhao-Geisler (National Taiwan Normal University, Dept. of Earth Sciences, 88 Sec.4 Ting-Chou Rd, Wenshan, Taipei, Taiwan)

The Atacama Large Millimeter/submillimeter Array located in the Atacana desert in Chile is the new generation of its kind. ALMA is already in its Cycle 0 phase and observing Early Science projects after the first call for proposals. Here I present on behalf of the ALMA Taiwan ARC the capabilities of ALMA for the Early Science Cycle 1.

P57: The Taiwan Extragalactic Astronomical Data Center

Kuan Chen (National Taiwan Normal University), Sébastien Foucaud (National Taiwan Normal University), Yasuhiro Hashimoto (National Taiwan Normal University), and TWEA-DC team

Founded at NTNU in 2010, the Taiwan Extragalactic Astronomical Data Center (TWEA-DC) is the first stepping-stone towards the building of a National Virtual Observatory. Besides the common functionalities generally provided by data centers, it has for goal to propose to the Taiwanese and international communities access to large datasets, such as SDSS, 2MASS, UKIDSS, or CFHTLS, and

allow a ” on-the-fly” cross-matching between these data and user-based catalogues, thanks to its very fast matching algorithm. The data center plans also to propose access to archival datasets, for public (CFHT) and private (HSC, PanSTARRs) usage, as well as access to raw and reducible data available from archives worldwide, allowing a friendly access to this goldmine of under-exploited information. Finally it will propose its own specific analysis tools, such as an automatic SED fitting, a groups and clusters finder, a variable objects finder and a light-curve tracer, available on-line through a user-friendly interface. Beside its function as a Data Center, the TWEA-DC project has also for goal to promote the concepts of Astroinformatics and Virtual Observatory in Taiwan, by organizing events and training students. Furthermore it aims to bridge the astronomical and computer science communities, to breed a new generation of scientists that will be fit for the future of Astronomy.

P58: Performance of Fully Depleted CCD Imager “NCUcam-1”

Daisuke Kinoshita (Institute of Astronomy, National Central University), Tse-Chuan Chen (Institute of Astronomy, National Central University), Yi-Ting Hsueh (Institute of Astronomy, National Central University), and Ru-Huei Huang (Institute of Astronomy, National Central University)

We develop a visible 4-color simultaneous imager as a first generation instrument for Lulin 2-m telescope. A main scope of this instrument is to carry out quick and efficient follow-up observations of newly discovered astronomical objects by large scale astronomical surveys, such as Pan-STARRS PS1 sky surveys. Classification and characterization of moving objects, such as asteroids and TNOs, right after the discovery are important mission of this instrument. NCUcam-1, equipped with a fully depleted CCD, is one of unit cameras of this instrument. A choice of a new type of 4K x 2K CCD with thick depletion layer is based on the requirement of higher sensitivity at longer wavelength. Significantly higher quantum efficiency at 1 micron enables us efficient and reliable checks for existence / non-existence of absorption feature due to minerals on asteroids. We have achieved the first-light of NCUcam-1 using 1-m telescope at Lulin observatory in July 2011. Both the test observations at Lulin observatory and series of experiments in the laboratory has been used to evaluate the performance of the instrument. We report the design, development of NCUcam-1, preliminary results of test observations using 1-m telescope, including the limiting magnitudes, and upcoming plan of asteroid studies using NCUcam-1.

P59: X-ray studies of the Black Widow Pulsar

Regina Huang (National Tsing Hua University, Taiwan), A. Kong (National Tsing Hua University, Taiwan), J. Takata (University of Hong Kong, Hong Kong), C. Y. Hui (Chungnam National University, Korea), L. C. C. Lin (China Medical University, Taiwan), K. S. Cheng (University of Hong Kong, Hong Kong)*

We report on Chandra observations of the black widow pulsar, PSR B1957+20. A binary-phase dependence of the X-ray emission from the pulsar is clearly detected with a deep observation. The binary-phase resolved spectral analysis reveals a non-thermal X-ray emission of PSR B1957+20. This suggests that the X-rays are mostly due to intra-binary shock emission which is strongest when the pulsar wind interacts with the ablated material from the companion star. The geometry of the peak emission is determined in our study. The softening of the spectrum of the non-thermal X-ray tail indicates that particles injected at the termination shock is dominated by synchrotron cooling.

P60: Superorbital Phase-Resolved Analysis of Spectra and Orbital Profile of SMC X-1

Chin-Ping Hu, Yi Chou, Ting-Chang Yang, Yi-Hao Su (Institute of Astronomy, National Central University, Jhongli 32001, Taiwan)*

The High-Mass X-ray Binary (HMXB) SMC X-1 is an eclipsing binary with orbital period of 3.9d. This system exhibits a superorbital modulation with period changes between ∼40d and ∼65d. The instantaneous frequency, as well as the corresponding phase, of superorbital modulation can be obtained by recently developed time-frequency analysis technique, the Hilbert-Huang Transform (HHT). With the phase derived from HHT, we were able to perform the phase-resolved analysis. Most of the X-ray spectra observed by the Proportional Counter Array (PCA) onboard the Rossi X-ray Timing Explorer (RXTE) can be well-fitted by a cutoff power law and a gaussian emission line at ∼6.4 keV. The hydrogen column density is steady in the superorbital high state but shows great diversity during the transition and low state. Furthermore, the X-ray light curve collected by the All Sky Monitor (ASM) onboard the RXTE was folded with the orbital period by different superorbital phases to obtain the variation of orbital profile. We found that the eclipse width anti-correlates with the uneclipsed count rate. Finally, the dip feature appears in the superorbital transition state might indicate that the system has a bulge, which greatly absorbs the X-ray emission from the central region, on the outer rim of the accretion disk.

P61: Gamma-rays from magnetar

J.H.K. Wu (Institute of Astronomy and Department of Physics, National Tsing Hua University, Hsinchu 30013, Taiwan), R.H.H. Huang (Institute of Astronomy and Department of Physics, National Tsing Hua University, Hsinchu 30013, Taiwan), A.K.H. Kong (Institute of Astronomy and Department of Physics, National Tsing Hua University, Hsinchu 30013, Taiwan), K.S. Cheng (Department of Physics, The University of Hong Kong, Hong Kong), J. Takata (Department of Physics, The University of Hong Kong, Hong Kong), C.Y. Hui (Department of Astronomy and Space Science, Chungnam National University, Daejeon, Republic of Korea), P.H.T. Tam (Institute of Astronomy and Department of Physics, National Tsing Hua University, Hsinchu 30013, Taiwan), and E.M.H. Wu (Department of Physics, The University of Hong Kong, Hong Kong)*

Magnetars are young isolated neutron stars with extremely strong magnetic fields of $> \sim 10^{14}$G. They are manifested in the form as either soft gamma-ray repeaters or anomalous X- ray pulsars (AXPs). AXPs were first discovered in X-rays as slowly rotating (period$\sim$ 2 $-$12 s) neutron stars. In contrast to rotation-powered pulsars, their soft X-ray ($<$ 10 keV) luminosities cannot be explained by the rotational energy loss. On the other hand, their tremendous magnetic fields inferred from the spin parameters provide a huge energy reservoir to power the observed X-ray emission. Emission at higher energies is, however, poorly understood. Although GeV emission from magnetars was predicted over a decade ago , no emission above 270 keV has been found despite intensive search. We report the result of the systematic search on the gamma-ray emission from AXP in the field.

ASROC Logo Contest
學會會徽設計比賽

ASROC會徽設計比賽 Logo Design Contest

參加中華民國天文學會會徽設計比賽的 168 件作品，經由全體理、監事投票，初步篩選出 23 件優良佳作進入決賽。這 23 件優良作品將於年會時，交由全體會員以一人 5 票之方式，投票選出特優及最佳的會徽設計。在此請會員預先欣賞。

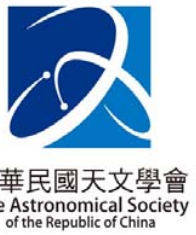
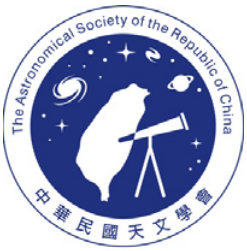
There are 168 designs entered the ASROC logo contest and 23 of them have been selected into the final by the council. Every ASROC member can cast your vote for their favorite 5 designs during the annual meeting.

(**請在 5 月 27 日上午** 10:00 **前投票**。Please cast your vote by 10:00 am, May 27, 2012.)

編號 No.	**設計理念** Description	**參賽作品** Actual Logo Design
3	星球概念結合望遠鏡，望遠鏡上的圖騰中有許多眼睛，代表"觀 "。顏色以素雅的米棕色為主色調。素雅的米棕色為主色調。	
5	整體概念以三個元素台灣島、星星、人組成，這三個元素透過"天文學會(ASROC)"做連結。其中，A 更設計成望遠鏡的圖案，表示台灣人藉由天文學會/望遠鏡看星星。而台灣因為遠方的星星發光發亮；台灣的東岸因星星照亮而呈現太陽光譜。台灣西岸以及人以黑色表現是代表處在無光害環境下，可以自由自在地享受觀星的樂趣！	
6	藍底紅邊意謂中華民國代表色、白色球代表太陽、黃色球代表月亮、藍色球代表地球地軸傾斜 23.5 度，在自轉的同時，亦圍繞著太陽作公轉也就產生了晝夜、四季變化。ASROC 為中華民國天文學會。	
12	設計理念：《天人合一》甲骨文中的「人」為一彎腰垂手樣貌(左下 A 的字樣，左撇為手，右撇為身)，象徵人的敬畏謙卑，但如果抬起雙手(綠色圓弧)擁抱天空，頂著半圓的蒼穹(藍色圓圈)，這就是甲骨文的「天」，天人合一即成天文。採用自然的深藍配色表示日夜交替與星空，漩渦意態意旨多個面向：螺旋的星系、天文的神祕、深究的漩渦。綠色代表人所站立之地，黃色之圓代表日之能量，日加人即轉變為有著舞蹈活力的圖騰。23.5 度的指引象徵著北極星仰角，暗指我們的位置在北緯 23.5 度的國家。最後配以天文協會縮寫，讓此會徽有國際辨識度。	

26	人、A(Astronomy)、書本、星星的元素為呈現。 1.兩人觀測星體的模樣，象徵學會聚集各方天文學術同好，定期發表研究成果。 2.「A」字詮釋學會研究天文之特性。 3.翻開的書本代表促進天文之普及，活化教育之交流。 4.星星象徵宇宙之探索，優質藍、卓越橙為色彩象徵。	
49	我的設計理念是保持樂觀、開朗和友善的心去探索地球。兩個圈，上面的藍色代表天空，也代表地球；而下面的弧度則表示綠地和地球表面，兩者合在一起就是一個笑臉，代表著友善和樂觀，既容易了解，又非常簡約。而中間的星，則代表星星和宇宙，被旁邊的藍色天空或者是宇宙包圍著。	
51	會徽構想以中華民國天文學會英文各字首縮寫 ASROC 為主視覺，其中主要圖騰落在字母 O 上，它可以是星球的象徵，是天文台的圓頂，是天文觀測基地，是仰頭的觀星者，亦或是中國古代天象儀之意像。三角形代表著觀測天文星象不可或缺的工具“天文望遠鏡”，弧線則象徵星球運行和流星般的瞬間軌跡。整體呈現以活潑簡單造型，展現親民與專業養成，提升民眾對天文的興趣。	
54	玉山不儘是我們台灣本島最高峰，亦是我們這塊寶島的標識，星軌是一種天文攝影的手法，夜空下的星星看似停留，透過相機，我們可以拍出以某一點為圓心，交織成美麗的星軌，把這個手法用在此次的視覺元素，是代表著我國的天文知識，不斷地在成長，永不停歇。	
60	Logo 的半框用半圓形的星球來框住星空和城市，表現出宇宙的感覺，裡面有天文望遠鏡朝上邊望著浩瀚的星空。	
77	**變形小寫 R:** 春分點 γ 符號 (天球座標的原點)。**寓意:** 象徵中華民國天文學會為一個起點。**右邊 OC 合體圖:** 漢朝馬王堆出土的彗星圖。**寓意:** (過去) 承襲天文一脈相傳的歷史發展。**中間水平弧線:** 地平線/日出/弦月。**寓意:** (未來) 迎接未來/蒸蒸日上/天文之美。 整體設計以色塊呈現俐落感適合印製在各種背景及印刷品上。	

89	敝作以中華民國天文學會之英文簡稱「ASROC」為題材，將字型稍作變體、並融入漢人張衡之發明「渾天儀」，表達我國從古而今，在天文科學上的致力發展。 「AS」二字中，以「A」稍作修飾模擬渾天儀之支架，並以「S」佐以插圖，模擬渾天儀旁之托龍。兩字的原形為了配合圖形，選用 Bodoni MT。而「ROC」三字，則以仿似平臺的插圖包圍，字體選用較為正式的 Adobe Caslon Pro，符合學會對學問研究的正經態度。	
111	以地球、月亮的結構描述外太空的星球和軌道的組成，月亮用橙色表示保護力，地球以藍色代表真理、溫馨及希望的顏色。	
113	一本書像徵文學氣息，深藍色代表著這宇宙中的神秘，而天文學讓人聯想到宇宙中的星群、月亮以及太陽。就讓我們拿著望遠鏡觀看這宇宙中的奧妙吧！	
120	月亮現身於蒼穹，而全家福攜著手觀賞與探索著星空，藉由此景像傳達台灣的天文蓬勃發展之形象。而星星創意構成台灣形狀的星空圖，有著從台灣看宇宙，同時也象徵著台灣天文成就在地球、甚至是宇宙發光發熱！	
124	原會徽的理念二十八星宿加以四象，雖然型式複雜但是以中文表現卻是不想捨棄的設計概念，一但縮小其中文可以化為圖騰般的圖像，這也是中文的醍醐味與趣味。 四象當然以它應有顏色表示，十道還則是十大行星。外型有參考張衡的混天儀(復原)概念。	
126	以星星當主角,被銀河系圍繞著,運用淺柔的色調符合天文學的氣質,再以墨水線條邊框,呈現天文的夢幻。	

135	以宇宙及銀河系作為代表天文學會的象徵，透過簡易明瞭的線條把概念表達出來，另一方面整體造型也以星球的意象做為另一個象徵，透過雙重的的符號來代表天文學會，顏色上以活潑自然的色調，跳脫暗色系色調，讓天文學會以更活潑的形式出現。	
149	取天文學會(Astronomical Society)的縮寫「A.S.」為設計中心，「A.S.」結合演繹為無限大的數學符號，代表天文學的浩瀚偉大，加上台灣地圖代表中華民國天文學會。圓代表地球，輔以星象，象徵天文學會參加國際天文活動，達到知識交流，並普及天文學於國人，彰顯地球村的願景。色彩選用藍色代表浩瀚的宇宙，及探索天文學的無限可能，深淺的運用代表天文知識的傳遞與推廣。	
151	運用星軌交錯組合為「a」，為天文學(Astronomical)之英文字首，代表中華民國天文學會。充滿律動的星軌，傳達出天文學之美，流暢的線條，象徵中華民國天文學會對天文學研究的推動運轉不止，及推廣天文知識的努力不懈。色彩運用以藍色代表浩瀚的宇宙，也代表天文知識的普及化，傳達出「遨遊星空，共享璀璨銀河」的意涵，鼓勵大家共同參與天文學之旨。	
153	色塊上方為深藍漸層變化到藍綠色，下方則是穩重的黑色，代表中華民國天文學會，立足台灣這塊土地，望穿了大氣探索那片奧妙的宇宙，星球與星環所勾勒出的線條，組成了天文學 Astronomical 開頭字母 A，而環繞在週遭的 12 顆星芒，正點綴呼應出屬於中華民國國旗上的表徵。	 
159	將星系軌道、星系團和台灣、天文望遠鏡結合，象徵致力台灣觀察和研究宇宙天體的科學，「無限探索・發現未來」的蘊意。	
161	將宇宙穹蒼與台灣、天文望遠鏡結合，象徵致力台灣觀察和研究宇宙間天體的科學，超越時空、探索未知的新宇宙。	

166	星系團中置入台灣，象徵致力台灣觀察和研究宇宙天體的科學，超越時空、探索未知的新宇宙。	

Participant List
與會名單

No.	姓 名	所 屬 單 位
1	曾耀寰	中研院天文所
2	顏吉鴻	中研院天文所/國立臺灣師範大學
3	張祥光	國立清華大學
4	莊幼玲	國立清華大學
5	黃明輝	國立聯合大學
6	傅谷石	國立臺灣師範大學
7	趙家驊	國立臺灣師範大學
8	黃相輔	University College London
9	王文暐	國立臺灣大學
11	許瑞榮	國立成功大學
12	洪景川	臺北市立天文科學教育館
13	譚栢軒	國立清華大學
14	張敏悌	臺南市南瀛科學教育館
15	秦一男	淡江大學
16	黃崇源	國立中央大學
17	饒兆聰	國立中央大學
19	紀信昌	國立東華大學
20	陳婉芬	桃園縣立迴籠國民中小學
21	黃修慧	國立清華大學
24	黃培育	國立臺東大學
25	李仕卿	國立臺灣大學
26	陳彥蓁	國立東華大學
27	王嘉瑋	國立清華大學
28	周美吟	中研院天文所
29	賴詩萍	國立清華大學
30	段皓元	國立清華大學
31	林明儀	國立臺灣師範大學
32	穆美蓉	國立清華大學
33	謝天晧	國立清華大學
34	宋仁翔	國立清華大學
35	王仁博	花蓮縣立宜昌國民小學
36	江華德	國立中興大學
37	鄭宇珣	輔仁大學
38	胡欽評	國立中央大學
39	陳惠茹	國立清華大學
40	羅經閔	國立臺灣師範大學
41	陳錦威	中研院天文所
42	胡佳伶	臺北市立天文科學教育館
43	阿部新助	國立中央大學
44	陳姿穎	國立臺灣師範大學
45	水野陽介	國立清華大學
46	黃立晴	國立中央大學
47	曹俊傑	國立臺東大學
48	蔡政宏	國立清華大學
49	蔡安理	國立中央大學
50	楊燿綸	中研院天文所
51	顏鴻選	國立臺灣師範大學
52	江國興	國立清華大學
53	胡毓倫	國立東華大學
54	王柏雄	國立東華大學
55	林玫君	國立臺灣大學/中研院天文所
56	龍志鈞	國立臺灣師範大學
57	許嘉儒	國立臺灣師範大學
58	蕭赫	國立臺灣師範大學
59	陳寬	國立臺灣師範大學
60	柳麗玲	臺北市北投區湖田國小
61	賴傳錦	國立臺灣大學 /中研院天文所
62	卜宏毅	國立清華大學
63	林建爭	國立中央大學
64	蘇羿豪	國立中央大學
65	林郁梅	台北市立第一女子高級中學
66	張桂蘭	臺北天文館
67	蔡佩剛	國立中央大學
68	楊善茜	台北市立第一女子高級中學
69	金若蘭	台北市立第一女子高級中學
70	楊義清	國立臺東大學
71	陳文屏	國立中央大學
72	姜博識	國立中央大學
73	侯冠州	國立臺灣師範大學
74	章展誥	國立中央大學
76	郭子銘	中研院天文所/國立臺灣大學
77	韋心潔	國立臺灣師範大學
78	呂聖元	中研院天文所
80	廖瑩	國立中央大學
81	林聖鈞	國立清華大學
82	塗翎	國立中央大學
83	李曉峰	國立清華大學
84	慶道沖	國立清華大學
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86	王品方	國立中央大學
87	張鼎成	國立中央大學
88	許立承	國立清華大學
89	葉則敬	中研院天文所
90	謝翔宇	國立臺灣師範大學
91	何佩勵	國立臺灣師範大學/中央氣象局
92	陳林文	國立臺灣師範大學
93	Deschamps, Frederic	IES Academia Sinica
94	林佳人	台北市立金華國中
95	簡鴻裕	國立臺灣大學
96	陳筱琪	中研院天文所
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105	蘇柏合	國立中央大學
106	Panwar, Neelam	國立中央大學
107	王亮堯	中研院天文所/國立臺灣大學
108	鍾定安	國立中央大學
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112	湯濟家	中研院天文所/國立臺灣大學
113	Nakamura, Masanori	中研院天文所
114	蔣龍毅	中研院天文所
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127	顧芳祺	新北市秀峰國小
128	林美汝	新北市秀峰國小
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130	HIROTANI, Kouichi	中研院天文所/高等理論天文物理研究中心
131	劉姵汝	國立臺灣師範大學
132	黃昱瑾	國立臺灣師範大學
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137	鄭宇棋	國立中央大學
138	康鎧麟	國立中央大學
139	Ritter, Andreas	國立中央大學
140	李景輝	中研院天文所
141	程永華	台灣科技大學
142	林自奮	國立臺東大學
143	蔡孟均	國立中央大學
144	蘇可洛	國立清華大學
145	Cemeljic, Miljenko	中研院天文所/高等理論天文物理研究中心
146	鄭守倫	國立臺灣師範大學
147	郭鎮魁	國立中央大學
148	黃可芸	國立清華大學
151	謝宜達	中研院天文所
152	郭俊鑫	國立中央大學
153	丁小強	無
154	謝宏偉	無
155	王靜	國立清華大學
156	王金保	國立臺東大學
157	陳心維	中研院地球科學研究所
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163	劉志安	臺灣親子觀星會
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166	彭定弘	國立中央大學
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170	Rudy, Alexander	Fulbright Foundation for Scholarly Exchange, Taiwan
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173	范祖佾	國立清華大學
174	Yang , Yi-Jung	University of Amsterdam
175	陳英同	國立中央大學
176	汪仁鴻	中研院天文所
177	蘇裕農	中研院天文所