

CAST Annual Meeting 2003

天文年會議程及摘要集



2003.4.18 ~4.19

地點：台灣大學凝態中心

主辦單位：中國天文學會 (CAST)

協辦單位：中研院天文所 (ASIAA)

中央大學天文所 (NCU)

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（以上依筆劃順序排列）



08:20~08:50 Registration
08:50~09:00 Opening Speech

Chair : **Chang Hsiang-Kuang**

09:00~09:45 (Invited Talk) Kaifu, N. (Director of NAOJ)
Subaru Telescope: Instruments, status and some results
09:45~10:00 (O-01) Yuan, Chi (ASIAA)
Bar-driven Spiral Waves in the Galactic Central Regions
10:00~10:15 (O-02) Yen, D.C.C. (ASIAA)
Numerical Simulations of the 3-kpc Arm of the Milky Way
10:15~10:30 (O-03) Jiang, Ing-Guey (NCU)
On the Spiral-Warped Structures of Disc Galaxies
10:30~10:45 (O-04) Chen, I-Cheng (NCU)
Dynamics of Galactic Centers with Massive Binary Black Holes
10:45~11:05 (Coffee Break)

Chair : **Kuan Yi-Jehng**

11:05~11:20 (O-05) Ko, Chung-Ming (NCU)
Diffusive-compression acceleration of cosmic rays
11:20~11:35 (O-06) Huang, Minghuey A. (NTU)
Observing Very High Energy Neutrino by NuTel
11:35~11:50 (O-07) Chen, Alfred (NCKU)
The Study of Time-varying Objects at Lulin One-meter Telescop (LOT)
11:50~12:05 (O-08) Liu, Chih-Yuan (NTHU)
Search for Signature of Waves on the Surface of Neutron Stars
12:05~13:30 (Lunch Break)

Chair : **Yuan Chi**

13:30~14:15 (Invited Talk) Ho, Paul (Director of ASIAA)
State of Radio Astronomy in Taiwan
14:15~14:30 (O-09) Ohashi, N. (ASIAA)
Early Results from the SMA: Observations of Low-mass YSOs
14:30~14:45 (O-10) SU, Yu-Nung (NCU/ASIAA)
Early Scientific Results form the SMA: Observations of the AFGL 5142 Region
14:45~15:00 (O-11) Kuo, Cheng-Yu (ASIAA)
Imaging of starburst galaxies with the Submillimeter Array
15:00~15:15 (O-12) Trung, Dinh Van (ASIAA)
Early Scientific Results from the SMA: Observations of AGB and post-AGB stars
15:15~15:30 (Coffee Break)

Chair : [Chen Wen-Ping](#)

15:30~16:00 (Invited Talk) Ishiguro ,M. (Prof. of NAOJ)

The status of ALMA project and its scientific goals

16:00~16:30 (Invited Talk) Fridman, A. (Russian Academy of Science)

Collective phenomena and turbulent viscosity in accretion disks

16:30~16:45 (O-13) Chin, Yi-nan (TKU)

Detection of H₂CCCH(CN) and its implication to astrochemistry

16:45~17:00 (O-14) Lee, Typhoon (ASIES)

How did magic Ti-50 get mixed up with doubly odd La-138 before reaching the solar nebula?

17:00~17:15 (O-15) Yan, Chi-hung (NTNU)

Strategies for Detecting Extragalactic Submillimeter Sources with SMA

17:15~17:30 (O-16) Woo ,Tak-Pong (NTU)

Cosmological Simulation on Ultra Light Multi-Component Scalar Field Dark Matter.

18:00~20:00 (Banquet)

4月18日(學術研討會) 地點:台灣大學凝態中心一樓演講廳



08:20~08:50 報到、註冊

08:50~09:00 開幕演講



主持人: 張祥光

09:00~09:45 (Invited Talk) 海部宣男 (N. Kaifu) 教授 (日本國家天文台台長)

Subaru Telescope: Instruments, status and some results

09:45~10:00 (O-01) 袁旂 (中研院天文所)

Bar-driven Spiral Waves in the Galactic Central Regions

10:00~10:15 (O-02) 嚴建彰 (中研院天文所)

Numerical Simulations of the 3-kpc Arm of the Milky Way

10:15~10:30 (O-03) 江瑛貴 (中央大學)

On the Spiral-Warped Structures of Disc Galaxies

10:30~10:45 (O-04) 陳宜貞 (中央大學)

Dynamics of Galactic Centers with Massive Binary Black Holes

10:45~11:05 (休息)



主持人: 管一政

11:05~11:20 (O-05) 高仲明 (中央大學)

Diffusive-compression acceleration of cosmic rays

11:20~11:35 (O-06) 黃明輝 (台灣大學)

Observing Very High Energy Neutrino by NuTel

11:35~11:50 (O-07) 陳炳志 (成功大學)

The Study of Time-varying Objects at Lulin One-meter Telescope (LOT)

11:50~12:05 (O-08) 劉志原 (清華大學)

Search for Signature of Waves on the Surface of Neutron Stars

12:05~13:30 (午餐)



主持人: 袁旂

13:30~14:15 (Invited Talk) 賀曾樸 (Paul Ho) 教授 (中研院天文所所長)

State of Radio Astronomy in Taiwan

14:15~14:30 (O-08) 大橋永芳 (中研院天文所)

Early Results from the SMA: Observations of Low-mass YSOs

14:30~14:45 (O-10) 蘇裕農 (中央大學/中研院天文所)

Early Scientific Results from the SMA: Observations of the AFGL 5142 Region

14:45~15:00 (O-11) 郭政育 (中研院天文所)

Imaging of starburst galaxies with the Submillimeter Array

15:00~15:15 (O-12) 丁文忠 (中研院天文所)

Early Scientific Results from the SMA: Observations of AGB and post-AGB stars

15:15~15:30 (休息)

主持人：陳文屏

15:30~16:00 (Invited Talk) 石黑正人 (M. Ishiguro) 教授 (日本國家天文台教授)

The status of ALMA project and its scientific goals

16:00~16:30 (Invited Talk) Fridman, A. 教授 (俄羅斯科學院院士)

Collective phenomena and turbulent viscosity in accretion disks

16:30~16:45 (O-13) 秦一男 (淡江大學)

Detection of H₂CCCH(CN) and its implication to astrochemistry

16:45~17:00 (O-14) 李太楓 (中研院地科所)

How did magic Ti-50 get mixed up with doubly odd La-138 before reaching the solar nebula?

17:00~17:15 (O-15) 顏吉鴻 (師範大學)

Strategies for Detecting Extragalactic Submillimeter Sources with SMA

17:15~17:30 (O-16) 胡德邦 (台灣大學)

Cosmological Simulation on Ultra Light Multi-Component Scalar Field Dark Matter.

18:00~20:00 (晚宴)

4月19日(會員大會) 地點：台灣大學凝態中心一樓演講廳



08:30~09:00	會員報到
09:00~09:30	會務報告 (理事長 葉永烜)
09:30~11:00	會員大會
11:00~11:20	休 息
11:20~12:00	台灣天文概況報告 (葉永烜 中央大學)
12:00~13:30	午 餐

4月19日(天文推廣活動及教育研討會) 地點：台灣大學凝態中心一樓演講廳



13:00~13:30	報 到
13:30~13:55	後院天文學家計畫 (周翊 中央大學)
13:55~14:10	台北市立天文教育館之推廣教育 (陶蕃麟 台北市立天文科學教育館)
14:10~14:25	台北師大之推廣教育 (傅學海 台北師大地科會)
14:25~14:40	台中科博館之推廣教育 (林志隆 台中科博館)
14:40~14:55	成大之推廣教育 (許瑞榮 成大物理系)
14:55~15:10	中央大學之推廣教育 (孫維新 中央大學天文所)
15:10~15:30	休 息
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15:30~15:45	台南市天文協會現況、活動與成果 (楊水利)
15:45~16:00	台中市天文協會現況、活動與成果 (林志隆)
16:00~16:15	台北市天文協會現況、活動與成果 (鄭念雪)
16:15~16:30	總結與討論
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Invited Talk (1)

09:00~09:45 ,Friday , April 18, 2003

Title : Subaru Telescope: Instruments, status and some results

Speaker: Norio Kaifu (海部宣男)

(Director of National Astronomical Observatory of Japan)

Email: kaifu@nao.ac.jp



Invited Talk (2)

13:30~14:15 ,Friday , April 18, 2003

Title : State of Radio Astronomy in Taiwan

Speaker: Pual, T.P. Ho (賀曾樸)

(Director of ASIAA)

Email: pho@asiaa.sinica.edu.tw



Invited Talk (3)

15:30~16:00 ,Friday , April 18, 2003

Title : The status of ALMA project and its scientific goals

Speaker: Masato Ishiguro (石黒正人)

(Prof. of National Astronomical Observatory of Japan)

Email: ishiguro@nro.nao.ac.jp



Invited Talk (4)

16:00~16:30 ,Friday , April 18, 2003

Title : Collective phenomena and turbulent viscosity in accretion disks

Speaker: Alexei M. Fridman

(Head of Department of Physics of Stellar and Planetary Systems, Russian Academy of Science)

Email: afridman@inasan.rssi.ru





O-01

Bar-driven Spiral Waves in the Galactic Central Regions

Chi Yuan and Yin-Hui Chen

Institute of ASIAA and Physics, National Taiwan University

Abstract:

We discuss two basic issues concerning the spiral structure in the central regions of disk galaxies: the rigid-body rotation and the inner inner Lindblad resonance (IILR). We show that the rigid-body rotation, which is suggested by observations near the galactic center, would result in a wave forbidden region in the center. No ordinary inward going waves can penetrate it. We also show under normal circumstance that the IILR does not really exist. However, when there is a sizable rigid-body rotation region at the center, the IILR do exist and it is located near the border of the rigid-body rotation region. The leading spiral waves excited there, when interacting with the incoming trailing spirals excited at the outer inner Lindblad resonance (OILR), would form a ring structure. This may explain the "bar within a bar" phenomenon.

O-02

Numerical Simulations of the 3-kpc Arm of the Milky Way

D.C.C. Yen and C. Yuan

Institute of ASIAA

Abstract:

A nonlinear asymptotic theory and application to the 3 kpc arm has been developed by Yuan & Chen 1991. They have confirmed the earlier suggestion of Yuan that either a minor oval distortion or an uneven distribution of mass in the center region can excite a spiral wave which has the radial velocity and mass concentration in excellent agreements with the observation of the 3 kpc arm. However, the dynamics evolution of disks can not be achieved by the asymptotic theory. For that, we must use numerical simulations. In this talk, we employ the high order Godunov method on Cartesian coordinates to calculate two cases for the evolution of Milky Way. The first case is that a pair of spiral waves are generated by a rapidly rotating bar at the outer Lindblad resonance which is located at $r = 3.0$ kpc to mimic an uneven distribution of matter. The second case is that an one-arm is generated by an off-set bar. The outer Lindblad resonance is also located near $r = 3.0$ kpc.

O-03

On the Spiral-Warped Structures of Disc Galaxies

Ing-Guey Jiang and Yi-Jen Lee

Institute of Astronomy, National Central University

Abstract:

It is known that at least one-third of spiral galaxies are warped. One might ask:
(1) Could those mechanisms which generate warps produce spiral structures ?
(2) What would the spiral structures be like for different shape of warps ?

A discussion for these interesting questions will be presented

O-04

Dynamics of Galactic Centers with Massive Binary Black Holes

I-Cheng, Chen & Ing-Guey, Jiang

Institute of Astronomy, National Central University

Abstract:

We investigated the dynamical properties of elliptical galaxies with binary black holes

in their centers. The test particle's trajectory affected by binary black holes near the galactic center is studied. The stars between the galactic center and black holes would move on a larger area, and this result might explain the observations that some galaxies have a central minimum in stellar luminosity density.

O-05

Diffusive-compression acceleration of cosmic rays

Chung-Ming Ko¹ and Garry M. Webb²

¹ NCU, Taiwan; ² IGPP, UCR, CA, USA

Abstract:

Multiple scales perturbation analysis is used to study the transport and acceleration of cosmic rays in quasi-periodic or fluctuating velocity structures. The length scale of the velocity structure variation is much less than the diffusion length scale. The cosmic ray diffusion tensor is also allowed to vary on the velocity structure variation scale. The cosmic ray distribution function at the lowest order is shown to satisfy a transport equation with a term similar to Fermi acceleration.

O-06

Observing Very High Energy Neutrino by NuTel

M.A. Huang for the NuTel collaboration (H. Arthar¹, N. La Barbera², S. Bouaissi³, O. Catalano², Y.K. Chi⁴, G. Cusuman², W.S. Hou⁴, H.B. Hsiung⁴, C.C. Hsu⁴, H.C. Huang⁴, M.A. Huan⁴, J.G. Learned⁵, G.L. Lin¹, T. Mineo², B. Sacco², K. Ueno⁴, F. Vannucci³, M.Z. Wang⁴, P. Yeh⁴, Y. Velikzhanian⁴)

¹ Institute of Physics, National Chiao-Tung University, Hsin-Chu, TAIWAN

² IASF/CNR Palermo, Italy

³ LPNHE Universite Paris 7, Paris, France

⁴ Department of Physics, National Taiwan University, Taipei, TAIWAN

⁵ University of Hawaii, Hawaii, USA

Abstract:

Recent observations indicate that muon neutrinos oscillate with tau neutrinos, though ν_τ appearance still needs to be confirmed. At PeV energies and above, neutrinos interact readily via the charged current interaction in the earth or even traversing mountains. At such energies only a tau can escape from mountains, subsequently decay and initiate a detectable particle shower. This technique performs best in the range of 10^{16} eV to 10^{17} eV, where detection of fluorescence emission is not practical but the Cherenkov light is strong enough to be detected by even a 1 m diameter telescope. Active Galactic Nuclei (AGN) constitute likely candidates for detection by such an experiment, with predicted useful rates. Since March 2002, the NuTel collaboration has been preparing to build a wide field-of-view Cherenkov telescope to observe tau neutrinos emerging from a mountain. The potential site of this telescope is Mt. Hualalai on the Big Island of Hawaii. The current status of the project will be reported in this meeting.

O-07

The Study of Time-varying Objects at Lulin One-meter Telescope (LOT)

Alfred Chen

Department of Physics, NCKU

Abstract:

The study of time-varying objects, including Low Mass X-ray Binaries (LMXB) and Cataclysmic variables (CV), will become the major topic for the astronomical research at NCKU. We'll present the progress on the observation, data reduction pipeline, and some preliminary results of the long-term monitoring work and fast photometry.

O-08**Search for Signature of Waves on the Surface of Neutron Stars***Chih-Yuan Liu¹ and Hsiang-Kuang Chang²*¹ *Institute of Astronomy, NTHU*² *Department of Physics and Institute of Astronomy, NTHU***Abstract:**

The stable pulsar PSR B1509-58 has been monitored with the Rossi X-ray Timing Explorer for eight years, since the start of that mission in January 1996. The long-term observation has enabled us to determine the first and the second period derivatives, which can help us to search for other possible periodicity with data over a long time span. These possible periods may reveal properties of MHD waves on the surface of neutron stars, and thus promote our understanding of neutron star physics.

O-09**Early Results from the SMA: Observations of Low-mass YSOs***N. Ohashi¹ and the SMA-team^{1,2,3}*¹ *ASIAA*, ² *SAO*, ³ *PMO***Abstract:**

The Sub-Millimeter Array (SMA), a collaborated project of the Smithsonian Astrophysical Observatory (SAO), USA and the Academia Sinica Institute of Astronomy & Astrophysics of Taiwan (ASIAA), is under construction at the top of Mauna Kea, Hawaii. It will consist of eight 6-m antennas, operating at frequencies ranging from 180 to 900 GHz. As of this writing (Mar 20, 2003), five antennas are fully operational with 230 and 345 GHz receivers. In addition, 4 antennas are equipped with 690 GHz receivers.

We have started observations of astronomical objects using the partially completed SMA, to obtain the initial scientific results as well as to check all the functions of the array. Here we present observations of low-mass young stellar objects (YSOs) at 230 GHz and 345 GHz. In this project we mainly aim to investigate circumstellar disks around T Tauri stars and the innermost envelopes around embedded protostars. In this talk, I will briefly summarize the latest status of the SMA, and will show the observational results, with emphasis on the nearest T Tauri star TW Hydra and the prototypical protostar L1551 IRS5.

O-10**Early Scientific Results from the SMA: Observations of the AFGL 5142 Region***Yu-Nung Su & Sheng-Yuan Liu**NCU/ASIAA***Abstract:**

One of the important questions in studying the star formation process is how massive stars are formed - whether they acquire their masses through stellar coalescence or via accretion phenomenon. The latter mechanism is presumably channeled by accretion disks and outflows/jets, which are often witnessed observationally in molecular emission. In this talk, the results from observations of the massive star forming region AFGL 5142 carried out with the Sub-Millimeter Array (SMA) are presented. CO emission is clearly detected in the compact outflows, while CS and HCN showed pronounced emission in the dense rotating molecular core. These results echo the earlier suggestion that accretion process dominates the formation of this massive (proto)stellar system. Future high angular resolution observations by the SMA may reveal the elusive accretion disk.

O-11**Imaging of starburst galaxies with the Submillimeter Array***Cheng-Yu Kuo and Van-Trung Ding,**ASIAA***Abstract:**

Starburst galaxies are known to be undergoing vigorous bursts of star formation in their nuclear region; the star formation takes place at a rate for higher than that in normal galaxies, such as the Milky way. For a complete understanding of the phenomenon, high resolution imaging of the molecular gas is necessary. We have imaged two nearby starburst galaxies, M83 & M51, with 5 antennas by SMA. M83 was observed in CO(2-1) and CO(3-2) with high angular resolution ($\sim 3''$) for first time. New features such as ring and gas ridges are revealed. M51 was observed in CO(2-1) at angular resolution of $5'' \times 4''$. One can clearly see the spiral arms and a very compact core on the map. The compact core is not seen on lower angular resolution CO(1-0) map observed by single dish.

O-12**Early Scientific Results from the SMA: Observations of AGB and post-AGB stars***Dinh Van Trung, Naomi Hirano and the SMA team.**Institute of Astronomy and Astrophysics, Academia Sinica***Abstract:**

Near the end of their lifetime, intermediate mass stars evolve through a short but important phase - the AGB phase. During this short period the stars experience copious mass loss and are enshrouded in the envelope of dust and molecular gas. In order to understand how stars evolve in the AGB phase, it is necessary to look into the molecular envelopes. The Sub-millimeter array (SMA), a collaborative project of the Smithsonian Astrophysical Observatory (SAO) and the Academia Sinica Institute of Astronomy & Astrophysics of Taiwan (ASIAA), provides us opportunity to probe what is going on inside of the AGB envelopes. Using the partially completed SMA, we have observed the CS J=14-13 line near 690 GHz from the nearby AGB star IRC+10216 and CO J=2-1 line in 230 GHz from the post-AGB star V Hya. Thanks to the high angular resolution of $2.9'' \times 1.8''$ as well as the high excitation level of the J=14, we could successfully obtained the spatial distribution of the hot ($T_k \sim 200$ K) and dense gas in the very inner region of the envelope of IRC+10216. The CO J=2-1 image of V Hya observed by the SMA reveals that the outflow blown out from this star has two distinct components: a bipolar molecular jet in the east-west direction with extremely high velocity of 100 - 150 km/s and a more extended, slowly expanding envelope elongated almost perpendicular to the bipolar jet. The spatial and velocity structures of the envelope and high velocity jet suggest that the circumstellar structure of V Hydra consists of an expanding disk-like envelope and a pair of jet blown out in the polar direction. Future observations with the full SMA array will give us a better understanding of the structure of the molecular envelope around agb stars and of the stellar evolution in the agb phase.

Invited Talk**The status of ALMA project and its scientific goals***Masato Ishiguro**National Astronomical Observatory of Japan***Abstract:**

ALMA is a merger of three large projects originally proposed in Europe, Japan and the United States. European and North American partners have started the construction of the baseline part of the project from 2002 and Japan is planning to join ALMA from 2004. The Japanese contribution plan proposed by the NAOJ includes, 1) Atacama Compact Array (ACA) system which consists of twelve 7-m

antennas and four 12-m antennas all equipped with receiver frontend and backend systems, 2) three new frequency bands, and 3) new correlator with improved spectral performances. The baseline part of ALMA is comprised of 64 12-meter antennas distributed over an area 10 km across the Andean plateau at 5,000 meters altitude in northern Chile. The ACA system provides short-baseline and single-dish data to be combined with the data from the baseline array to improve the image quality of ALMA. The important scientific targets are the most distant galaxies enshrouded in dusty envelopes, and proto-planetary systems deeply embedded in dark clouds. Observations with ALMA with an unprecedented resolution and sensitivity will have a strong impact on many fields of astronomy and astrophysics.

O-13

Detection of H₂CCCH(CN) and its implication to astrochemistry

Yi-nan Chin, Claudia Lemme and Ralf I. Kaiser

Tamkang University, Bonn University, University of Hawaii

Abstract:

A new organic molecule, H₂CCCH(CN), was identified for the first time in the Taurus Molecular Cloud (TMC-1). Four of its rotational transitions were detected with the 100-m Effelsberg telescope in Germany. Comparing with the abundance of its isomer, CH₃CCCN, provides an opportunity to understand the role of cyano radical in astrochemistry.

O-14

How did magic Ti-50 get mixed up with doubly odd La-138 before reaching the solar nebula?

Jason Jiun-San Shen and Typhoon Lee

Academia Sinica, Taipei, TAIWAN

Abstract:

A La-138 nucleus consists of an odd number of neutrons and an odd number of protons thus is relatively unstable in the nuclear physics sense hence very rare not even one part in a thousand of its stable neighbors. Interestingly in spite of its low abundance, there is presently no credible mechanism to make enough of it. It is shielded against beta decays of both senses thus can not be made by r-process or proton captures. The s-process capture path does not pass through it. Gamma n reactions on the s-process enriched targets probably is too slow but could use a carefully re-examination. We have improved our earlier method to use multiplier instead of Faraday cup and reduced the processing blank level. Out of the seven Ca-Al-Inclusions from the Allende meteorite we studied, five showed significant anomalies up to 7.5 sigmas. Surprisingly, our La-138 excesses do not correlate with the Al-26 abundance as we had hoped to find if both were made by irradiations with flare particles. Instead, its excesses correlate well with the excesses for Ti-50 that is believed to have been produced by r-rich nuclear statistical equilibrium. In order to interpret the correlation between La-138 and Ti-50, we propose that the Ti-50 were made in Supernovae type I with implosion to compress the central density to 10¹¹ g/cc which is high enough to produce Ti-50. In the mean time this neutronization event should emit a strong flux of neutrino. When these intense bursts of neutrinos hit the overlying O-rich layer the neutrino spallation should have a good chance to produce enough La-138. Therefore, in these rare events, the Ti-50 would be produced very close to the center while the O-layer would be just above it. So it will be favorable to make Ti-50. Furthermore, since the La-138 layer consists of mostly O-16

it is plausible that best carrier grains was perovskite (CaTiO_3) with hibonite a distinct second while both can have up to 1000 ppm La!. The up to 5 permil La-138 excesses can be explained by the fluctuation of the small enough number of refractory grain and the La-138 excesses would show correlation with respect to Ti-50. It is ironical that we set out to look for the evidence of early irradiation but found evidence for the presence of refractory carriers in the early solar system.

O-15

Strategies for Detecting Extragalactic Submillimeter Sources with SMA

Chi-hung Yan & Lin-wen Chen

Earth Sciences Dept., National Taiwan Normal Univ.

Abstract:

One of the most challenging frontiers in submillimeter astronomy is to understand the nature of recently discovered extragalactic submillimeter sources. These sources are probably related to the star formation history (SFH) at different cosmic epochs. Different versions of submillimeter source count models have been proposed by various SFH scenarios, but they are not well constrained because of large statistical errors in observation data, which are due to small number of submillimeter sources (about 150) detected in previous surveys. To disentangle these models, it is particularly important to detect the sources at the faint end (below 1 mJy), or to reduce the error bars of current source counts by detecting more sources. With their high-resolution capability, submillimeter interferometers suffer much less from the confusion limit problem in previous observations (eg. SCUBA). We have carried out a series of mock observations, based on different source count models to estimate the detection rate of submillimeter sources with interferometers, and discuss what constraints on the properties of these submillimeter sources can be obtained from these future observations. Our simulations include blank-field surveys with the Sub-Millimeter Array (SMA) and the Atacama Large Millimeter Array (ALMA). The 3-sigma detection rate is about 40% ~ 60 % for objects fainter than 1 mJy using the compact configuration in an SMA 50-hour observation. Our result shows that the SMA is able to extend presently known submillimeter source catalogs. The comparison of SMA and ALMA is also discussed.

O-16

Cosmological Simulation on Ultra Light Multi-Component Scalar Field Dark Matter.

Tak-Pong Woo, Tzi-hong Chiueh

Department of Physics, National Taiwan University, 106, Taipei

Abstract:

We treat dark matter as extremely light multi-component scalar fields. Each component has a De-Broglie wavelength comparable to or slightly smaller than the Jean's length. As quantum fluctuations provide effective pressure, they act against gravitational collapse in the central regions of bound objects. The quantum fluid may be slightly phase de-coherent initially and the phase de-coherent can be subsequently amplified by the dynamical evolution of self-gravity. When all the components are in phase, the whole system can be described by a single scalar field. When they all become random phased, those de-coherent waves behave as particles. Our aim is to study how such field-like CDM evolves to particle-like CDM under cosmological evolution.



P01

The Taiwanese-American Occultation Survey: The Nature of Occultations of Bright Stars by Small KBOs

C. Alcock, S.-K King, and 16 TAOS collaborators

U. Penn, ASIAA, NCU, LLNL, Yonsei, UC Berkeley, ARC

Abstract:

Objects smaller than about 10 km in diameter will be too faint to detect in reflected sunlight if they are located in the trans-Neptunian region or beyond. These objects can in principle be detected via their occultations of relatively bright stars, as proposed by Bailey (1976). This technique is difficult to implement because the anticipated occultation rate is extremely low, the occultation events are brief (<1 sec) in duration, and the strength of the events is reduced by diffraction of visible light around the objects. We have performed an extensive series of computations of occultation events, including the effects of size and shape of the occulting objects, finite angular size of the source stars, finite bandwidth and integration time. These allow us to estimate the signal to noise of plausible events by trans-Neptunian Objects. This project is supported by NASA (at UPenn), DOE (at LLNL), Academia Sinica (at ASIAA), NSC (at NCU), and KRF (at Yonsei).

P02

Simulations->Observations of Collapsing Molecular Clouds

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ASIAA

Abstract:

Theoretical calculations provide much data about the simulated collapse of molecular clouds. But, raw data is difficult to compare with observations. This work is intended to facilitate comparisons between theory and observation by presenting simulated data as maps and spectra similar to real observations.

P03

Shape of Galactic Open Clusters

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Abstract:

Thirty-six open clusters were selected from the 2MASS database on the basis of the latest open cluster catalogue (Dias et al 2002). The morphological parameters such as eccentricity, orientation were obtained via isodensity elliptic fitting. Most star clusters are elongated, and the eccentricity is correlated with z as an indication of the influence of the Galactic disk. The morphology shows clear evidence of competing internal dynamics and external Galactic disturbances when a cluster becomes 100 Myr old.

P04

GALAXY OVERDENSITIES IN THE SHAPLEY SUPERCLUSTER

Chen Lin-wen, Ho Pei-li, Leon St eacute phane, Yan Chi-Hung and Guibert Jean

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Abstract:

To study the nature of superclusters, and to detect candidates for merging clusters and galaxy groups, we analyze the spatial distributions and intrinsic shapes of galaxy clumps over

a 400 square degree area covering the Shapley concentration. The study is based on a new galaxy catalogue made from the digitized Schmidt plates in R and B bands by the MAMA group at Observatory of Paris. More than 100 overdense regions are detected at 4 sigma level, including few tens of Abell-class clusters. The distribution of the intrinsic ellipticities derived from the galaxy clumps shows a higher mean value than that of APM galaxy clusters, indicating the members of the Shapley supercluster are still under frequent interaction. A marginal correlation of ellipticity—distance (to the Shapley core) is detected, which may provide an additional constraint on the mass of the Shapley supercluster. We also compare the X-ray hardness ratio map of the region with the structure of galaxy clumps to find evidence of the intra-supercluster medium.

P05

X-ray Sources and Optical Variability in the ASAS

Chiou M. Z., Chen W. P., Paczynski B. and Sanchawala K.

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Abstract:

We present a cross-identification of archived x-ray point sources with optical variable stars found in the All-Sky Automated Survey (ASAS). In a surveyed sky area of 300 square degrees, 29 objects were identified with X-ray sources. This includes variable types like Algol, Beta Lyrae, W Ursae Majoris eclipsing binaries and other types of variables. We compute the distances to the EW Ursae Majoris systems and present their X-ray luminosities.

P06

Early Scientific Results from the SMA: Circumstellar structure of the low-mass YSOs

Hirano N.¹, Ohashi N.¹, Ho P.T.P.¹, Takakuwa S.² and the SMA team^{1,2}

¹ASIAA, ²CfA, U.S.A.

Abstract:

The Sub-Millimeter Array (SMA) at the summit of Mauna Kea in Hawaii has started scientific observations with four to five out of eight antennas at 230 GHz, 345 GHz, and 690 GHz. The study of the circumstellar structure of low-mass young stellar objects (YSOs) is one of the major subjects for the SMA because the molecular transitions in the submillimeter range as well as thermal emission from dust trace the warm and dense gas in the close vicinity of the protostar. We have obtained the CO J=2-1 and 3-2, and the CS J=5-4 and 7-6 images of circumstellar envelopes/disks and outflows associated with the low-mass YSOs. In this poster, we discuss the structure and kinematics of the circumstellar disk of the nearest T Tauri star TW Hya, the dense gas envelope surrounding the protostar L1551 IRS5, and the circum-binary envelope and outflow of the binary protostar IRAS 16293-2422.

P07

The Caustics of Gravitational Lensing by Planetary Systems

Hou Shu-Huei (侯淑慧) and Jiang Ing-Guey (江瑛貴)

Institute of Astronomy, National Central University.

Abstract:

The phenomenon of gravitational lensing, which was first observed in 1979 (Walsh et al.), has been a powerful probe of non-luminous astrophysical objects. Particularly, microlensing observations have now been used to search for these gravitating matters: brown dwarfs, faint stars, neutron stars, black holes and even planets. We theoretically calculate the outcome of microlensing events for given planetary systems. The outcome strongly depends on the locations of caustics, which are where the amplification of the brightness of the source diverges. We provide detailed result for the structure of caustics and we're planning to model the light curves via microlensing by planetary systems in the future.

On the dynamical origin of the bipolar morphology of the Saturn Nebula --NGC 7009

Hsia C.-H. (夏志浩), Takahashi S. (高橋茂), Ip W.-H. (葉永烜) and Li J.Z. (李金增)

Institute of Astronomy, National Central University.

Abstract:

Within the framework of the study of the life cycle of stars, planetary nebulae play an important role. This is because they represent the end phase of the evolution of low mass stars by which a significant amount of stellar materials in the form of dust and complex molecules are recycled into the interstellar medium. The dynamical interaction with ISM and the resultant morphologies of the planetary nebulae are therefore of key interest. It is for this reason that a comprehensive program on the study of PNe has been initiated. A specific object now under close scrutiny by us has to do with the Saturn Nebula - NGC 7009 -which is a classical example of elliptical planetary nebulae with ansae or FLIERS (Bohigas et al., 1994). The presence of a ring of dense matter in the equatorial region to confine the gas expansion in this direction has been proposed to explain the bipolar structures of many PNe (Balick,1987) . For the case of NGC 7009, Hyung and Aller (1995a,b) detected the presence of a high-excitation bright ring region on the minor axis. We have used the 2.16 m spectrograph at the Beijing Astronomical Observatory to obtain medium spectral resolution data with $R \sim 5000$ to map the velocity distribution across the ring region. We are in the process of making a more comprehensive velocity map with higher spectral resolution ($R > \sim 10000$) to establish the dynamical structure of this classical bipolar PN. The preliminary result from the observations on 5 July 2002 is presented here.

References:

1. Balick, B., The evolution of planetary nebulae I. Structure, ionizations, and morphological sequences, *ApJ*, 94, 671, 1987.
2. Bohigas, J., Lopez, J.A. and Aguilar, L., Bidimensional analysis of the planetary nebula NGC 7009, *A&A*, 291, 595, 1994.
3. Hyung, S. and Aller, L.H., The optical spectrum of NGC 7009 - I. A low-excitation bright ring region on the major axis, *MNRAS*, 273, 958, 1995a.
4. Hyung, S. and Aller, L.H., The optical spectrum of NGC 7009 - II. A high-excitation bright ring region on the minor axis, *MNRAS*, 273, 973, 1995b.

Exoplanets Search in NGC 188 and other Star Clusters

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Abstract:

As a pilot project in the detection of exoplanets using transit measurement, we have made use of the time series CCD photometry survey of the old open cluster NGC 188 obtained by the wide-field observations (one square degree) of the BATC (Beijing-Arizona-Taiwan-Connecticut) Schmidt telescope at Beijing Astronomical Observatory. The main purpose is to assess whether the photometric accuracy of the BATC observations and, by inference, of the Lulin One-meter Telescope (LOT) can be used to search for Jupiter-sized exoplanets. As a follow-up study of the NGC 188 data set by Zhang et al. (2002) we have found 105 variable stars candidates in the field in total and six W UMa-type binaries are classified.

P10**Dynamical History of High Velocity Clouds**

Huang Kui-Yun (黃癸雲) and Jiang Ing-Guey (江瑛貴)

Institute of Astronomy, National Central University

Abstract:

It is known that there is a contradiction between Blitz et al. (1999) and Zwaan & Briggs (2000) about the distances and origins of High Velocity Clouds. N-Body simulations are used to explore the possible distances and thus origins of High Velocity Clouds. We found that there is no obvious constraint for the distances of High Velocity Clouds from the dynamical point of view and therefore the contradiction is a soft one.

P11**Finding Low Surface Brightness Galaxies in the Subaru Archive data**

Huang K.Y. (黃癸雲), Yoshida F. (吉田二美) and Ip W.-H. (葉永炬)

Institute of Astronomy, National Central University

Abstract:

After the first Deep Field North observations by the Hubble Space Telescope, increasing amount of attention has been given to the formation and evolutionary history of dwarf galaxies. This is particularly so because it was found that dwarf galaxies were more numerous in the early universe and they hence must have played an important role serving as building blocks of larger galaxies according to the hierarchy theory of galaxy formation. Furthermore, we would like to seek answers to fundamental questions like: (a) the evolutionary track and interrelation among the dwarf elliptical, dwarf irregulars, and Blue Compact Dwarfs; (b) the origins and life histories of dwarf galaxies in small galaxy clusters, small groups of galaxies, and even in our neighborhood. The evidence found for hidden spiral and bar features in bright early-type dwarf galaxies (Jerjen et al., 2000; Barazza et al., 2002) gives new impetus to resolve the inner structures of such objects. With a view to investigate the evolutionary histories of dwarf galaxies, we have initiated a program to identify and delineate the morphologies of and faint galaxies and low surface brightness objects detected in the Subaru Deep Survey 2 with a limiting magnitude of 26.1 in R band. Some of the preliminary results will be reported here.

P12**The Mysterious H I Deficiency of the Interacting Galaxies G0248+430**

Hwang Chorn-g-Yuan (黃崇源) and Chioua Shwu-Huey (邱淑慧)

Institute of Astronomy, National Central University

Abstract:

We present high-resolution H I 21-cm, CO(1-0), and optical observations of the QSO-galaxy pair G0248+430. The QSO G0248+430 has been found to show two metal-line absorption components at redshifts $z \sim 0.052$, which are consistent with the redshift of a foreground luminous infrared galaxy 15 arc second away. The CO emission of this foreground galaxy G0248+430 shows broad velocity distribution but is spatially confined to a small, unresolved region less than 1.5 kpc. The molecular mass of the galaxy based on the traditional CO-H₂ conversion factor is about 10 billion solar masses, which is approximately 30 times of the molecular mass within a similar region of the Milky Way. Nonetheless, no significant H I 21-cm emission is found in the foreground galaxy. On the other hand, toward the QSO, we find distinct H I absorption at the redshift of a strong Ca II absorption line; however, we did not detect significant CO(1-0) absorption, although the background QSO has rather strong continuum emission at millimeter and the hydrogen column density derived from the metal-line absorption is very high. We discuss the puzzling H I deficiency of this

interacting galaxy system and the implication on the origins of the damped Lyman alpha systems.

P13

Two-dimensional Shape Effect in the Distribution of Geometric Occultation Duration

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Abstract:

Transneptunian objects (TNOs) are probably small comets beyond the orbit of Neptune. Study of TNOs might be able to explain the origin of short-period comets and to help our understanding of the process of planets formation and the early history of the solar system. Occultation survey is currently the only way available to detect these objects down to the size of a few kilometers. On the other hand, an occultation survey like TAOS project will have poor resolution in distance. Occultation events could be so rare that multiple observation on a given object is unlikely with existing telescopes. Except the size distribution, the effect of their shape is also an interesting topic in the study of distribution of geometric occultation duration. Circular, elliptical, and rectangular objects with random orientation in two dimension were analyzed. These can be simply reduced to a purely geometric problem. It turns out that the distribution curve differ from each other significantly if objects of the same size are considered. Follow-up observations of a larger object may be crucial to provide the resolution needed. Though, unlikely with the existing technology, we might still be able to tell the shape of TNOs statistically in principle. Knowing the general shape may have some implication in the formation and collision history of TNOs in the outer solar system.

P14

The rotation of a dumbbell asteroid

Ko Chung-Ming

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Abstract:

Many asteroids look like a long potato. To the lowest order, they can be described as dumbbells (in fact, a couple of asteroids look like a dog-bone). In this study, we examine the motion of a dumbbell in an attractive central force field. The rotation of the dumbbell about its centre of mass is analyzed under the assumption that the size of the dumbbell is much smaller than the distance of its centre of mass from the origin. For near circular orbits, the dumbbell is either librating or rotating. However, for near elliptic orbits, it is possible for the dumbbell to switch from one motion to the other and back. Moreover, we also study the change in angular velocity of the dumbbell when a nearby object passes by.

P15

The Evolution of Diffuse Radio Sources in Galaxy Clusters

Kuo Ping-Hung, Hwang Chorng-Yuan and Ip Wing-Huen

Institute of Astronomy, National Central University

Abstract:

We investigate the evolution and number distribution of the diffuse radio sources in galaxy clusters. Without re-acceleration or regeneration, the relativistic electrons responsible for the diffuse radio emission will lose their energy via inverse-Compton and synchrotron losses in a rather short time, and the diffuse radio sources will have lifetimes ~ 0.1 Gyr. The diffuse radio sources could last for \sim Gyr if a significant level of re-acceleration is involved. The lifetimes of the diffuse radio sources would be comparable with the cosmological time if the radio-emitting electrons are mainly the secondary electrons generated by pion decay following proton-proton collisions between cosmic-ray protons and the thermal intra-cluster

medium within the galaxy clusters. Adopting both observational and theoretical constraints for the formation of the radio sources, we calculate the formation rates and the comoving number density of the diffuse radio sources in the hierarchical clustering scheme. Comparing with observations, we find that the lifetimes of the diffuse radio sources are \sim Gyr. Our results indicate that a significant level of re-acceleration is necessary for the observed diffuse radio sources and the secondary electrons cannot be a dominant origin for the radio sources.

P16

**Large interstellar mass outflow to galactic halos by the cosmic ray driven
Parker instability**

Kuwabara Takuhito¹; Nakamura Nenji² and Ko C.M.¹
¹ NCU, Taiwan; ²National College of Technology, Japan

Abstract:

The importance of interstellar magnetic fields has been studied by many researchers. The spiral galaxies have the strength of magnetic fields $\sim 3\text{-}8 \text{ mG}$. The average of magnetic energy density is comparable to the average of the cosmic ray energy density and the average of the interstellar medium (ISM) thermal energy density. This means, in other words, that the plasma β , the ratio of the gas pressure to the magnetic pressure, and the ratio of the gas pressure to the cosmic ray pressure are of order unity. These magnetic fields and the effect of cosmic ray will play an important role for the evolution of ISM. The role of magnetic fields on the evolution of superbubbles was studied in several papers (e.g. Mineshige et al. 1993). Kamaya et al. (1996) showed that even a single supernova (SN) explosion can easily trigger a Parker instability. When SNe take place in the galactic disk with horizontal magnetic fields, an outgoing blast wave will lift up the fields, thus forming an Ω -shaped field structure. In this study, we show the effect of cosmic-ray for Parker instability by magnetohydrodynamical (MHD) simulation. The initial condition is that there is a cold galactic disk with horizontal magnetic fields surrounded by hot halo and we put the cosmic-ray energy in the shell where we suppose SN explosion took place. As being said in Hanasz et al. (2000), the growth rate was faster than classical Parker instability.

P17

Star Formation in the Orion Complex

Lee Hsu-Tai and Chen Wen-Ping
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Abstract:

We use the near-infrared colors of the Two Micron All Sky Survey (2MASS) to identify classical T Tauri star (CTTS) candidates in the Orion complex. Most CTTS candidates are associated with CO emission (Dame, T. M. et al, 2000, ApJ). Following up spectroscopic observations confirms that most CTTS candidates associated with molecular clouds are CTTS indeed, and CTTS candidates far from molecular clouds are red giant or dMe stars.

P18

On the Formation of Galactic Warps

Lee Yi-Jen and Jiang Ing-Guey
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Abstract:

The warping of galactic discs is a general phenomenon for disc galaxies and it has been an important subject for four decades since its first discovery. Jiang & Binney (1999) have used complete numerical simulations to model the formation of warps by introducing the fresh material to reorientate the symmetrical axis of the dark halo and thus warp the disc. To be able to explore all the parameter space and different ways of warp formation, we set up a simple dynamical model and check all different possibilities. We conclude that a persistent

warp implies a distorted dark halo profile and thus galactic warps could become good tracers of dark halo density distributions.

P19

Deep Intermediate-Band CCD Photometry of Globular Cluster M13 and Its Stellar Population

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Abstract:

We present CCD photometry, in 12 intermediate bands covering from 450-1000 nm, on the galactic globular cluster M13 (NGC 6205). The data --- effectively low-resolution spectroscopy --- were taken by the 60/90 cm Schmidt telescope, with a 1-degree field, as part of the Beijing-Arizona-Taipei-Connecticut (BATC) color survey. The spectral energy distribution of individual stars in the outer region of the cluster provides information of their membership and of the evolutionary status of the cluster. We also derived surface color gradient of the unresolved core, from which stellar population and the dynamical status of the cluster are inferred.

P20

Current Status of the Lulin Observatory

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Chang Ming-Hsin (張明新) and Chang Yung-Hsin.
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Abstract:

After more than ten years of development, the Lulin Observatory is now a full-fledged scientific compound for astronomical observations and other experiments. Among the scientific activity, the Lulin One-meter Telescope (LOT) sees its first light in early fall. The Taiwan-America Occultation Survey (TAOS) telescope array is about to begin routine operation. The Lulin Emission-Line Imaging Survey (LELIS) has started its observing queue. This paper overviews the current status of the site, its operation and management, and future planning at the Lulin Observatory. The purpose of the TAOS project is to measure directly the number of these Kuiper Belt Objects (KBOs) down to the typical size of cometary nuclei (a few km). Three small (20 inch) fast (f/1.9) wide-field (2 square degrees) robotic telescopes equipped with 2,048 x 2,048 CCD cameras will be University.

P21

Spectrographic Study of the Optical Coma of Comet 2001 A2 (LINEAR)

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Abstract:

Comet 2001 A2 (LINEAR) was discovered on January 15, 2001. This comet which is from the cometary Oort cloud reached perihelion at 0.78 AU on UT 2001 May 24. The 2.16 m telescope at the Beijing Astronomical Observatory was used to observe its optical emission and coma activity on UT 2001 July 4, 5, 6 and 9 when it was at solar distance between 1.09 AU and 1.14 AU. The spectrographic observations provide information on the spatial distributions of species like C₂, C₃ and NH₂ as well as their time variability. We will compare our results with measurements in other wavelengths to study the chemical origins and spatial distributions (i.e., the possible formation of jets or shells) of these molecular radicals.

P22

Early Scientific Results from the SMA: Observations of High-mass YSOs

Liu Sheng-Yuan

ASIAA

Abstract:

A major emphasis in the scientific program of the Sub-millimeter Array (SMA), a collaborative project of the Smithsonian Astrophysical Observatory (SAO) and the Academia Sinica Institute of Astronomy & Astrophysics of Taiwan (ASIAA), is to understand the formation processes of high mass stars. Molecular transitions at the sub-millimeter band are particularly suitable for disentangling the compact and warm massive (proto)stellar cores from the surrounding colder envelopes which they are deeply embedded within. These molecular lines are also ideal for probing the energetic jet/outflow activities that occurs when star are forming. Here we present the initial results from observations of a sample of high mass star formation regions including AFGL 5142, W3, G5.89-0.39 and IRAS 22506+5944 carried out by the SMA. These pioneering observations demonstrate the promising instrumental capability and scientific outcome the array will bring for this field in the near future.

P23

Preliminary study on open clusters in externals

Lou I.Y.; Lee H.C. and Ko C.M.

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Abstract:

The morphology of open clusters is determined, at least in part, by the gravitational potential provided by other components of the galaxy, e.g., molecular clouds. N-body simulation is a good tool to study self-interacting stellar systems. We employ a tree-code developed by Joshua E. Barnes to simulate the evolution of an open cluster in different external potentials. The parameter space is explored systematically. The results are analysed by various statistical methods, e.g., cluster analysis. We provide some preliminary results.

P24

Photometric and Polarimetric Observations of (216) Kleopatra

Takahashi S., Yoshida F., Shinokawa K., Ogawa K., Minato T., Mukai T. and Kawabatra K.

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Abstract:

The main-belt asteroid (216) Kleopatra has been frequently observed by ground based photometric technique because its drastic amplitude changes attracted many observers. The variations of amplitudes are between 0.09-1.2 mag. at different geometries and this phenomenon suggest that the shape of Kleopatra must be too elongated or contacted binary.

We have observed (216) Kleopatra by both photometrical and polarimetric techniques simultaneously using a spectra-photo-polarimeter, HBS installed at Dodaira Observatory, astronomical observatory of Japan in November 1999. In this meeting we will present the results of observations using the HBS and lightcurve simulations accounted for light scattering based on the Roche binary model and report the density of Kleopatra.

P25

Search For Gravitational Lensing Events In The CFHT Data

Tan Sze-Yeong and Ip Wing-Huen

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Abstract:

The wide-field survey by CFHT(Canada-France-Hawaii Telescope) provides important informations on the formation of arc-like structures due to the gravitational lensing effect by galaxy clusters. As a potential contribution to the CosPA Project, image processing techniques are developed to uncover new features unseen before in the CFHT dataset. First, galactic bodies found in the images are segmented by means of texture analysis. Through skeletonization we could use thread of simple lines to describe these objects morphologically. The skeletonization tends to shrink the symmetric objects like stars and galaxies, whereas preserves the curvature of arc-like structures. These strong features will then processed by unsupervised learning Clustering Analysis. We believe that this method of data reduction will shorten processing time and improve the accuracy of pattern recognition. Such data mining scheme could be applied to Cosmology and other types of astrophysical studies.

P26

Study of the Molecular Line Emission Associated with the HH270 Outflow

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Institute of Astronomy, NTHU / ASIAA

Abstract:

The HH 270 Herbig-Haro jet is driven by a protostar in the L1617 molecular cloud in Orion. Recent observations of the HH 270 region with BIMA array in the 13CO and C18O 1-0 lines are presented. Previous HCO⁺ line observations showed enhanced emission along the jet axis, but no evidence of mechanical disturbance was found. By comparing the line intensities of HCO⁺, 13CO and C18O, we investigate possible molecular line enhancement mechanisms. The Spectral energy distribution (SED) and infall motion in the dense core containing driving source of the outflow are discussed.

P27

A Chemical Model of the Coma of 19P/ Comet Borrelly

Tseng Wei-Ling and, Ip Wing-Huen

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Abstract:

It is generally believed that the chemical composition of cometary nuclei is representative of the most primitive material in the outer solar system as well as the end product of interstellar grains. It is therefore of great interest to study the physical structures and chemical abundances of different classes of comets(i.e., short-period comets from the Kuiper belt and long-period comets from the Oort cloud) so that more information on their origins and physicochemical conditions can be obtained. The encounter of Comet Borrelly by the Deep Space 1 spacecraft in September 2001 provided the first opportunity for in-situ measurements of the coma of a short-period comet. The plasma instrument (Pepe) obtained important information on the chemical abundances of the water-group and other ions as functions of distance from the cometary nucleus (Reisenfeld et al., 2002). As a part of a systematic effort to build up the chemical modeling in cometary comas, molecular clouds, and interstellar medium, we will use the updated molecular abundances from ground based observations (Hamane et al., 2002) to construct models of the neutral gas coma and ionosphere of Comet Borrelly during the Deep Space 1 encounter. In addition, a 2-dimensional cometary plasma flow field is adopted to examine the chemical compositional changes of the water-group ions.

P28

"Angular Size-Redshift" Relation and Its Constraining on Cosmological Parameters

Wu Ronin, Lin Lihuai and Chiueh Tzi-Hong
National Taiwan University

Abstract:

With 5GHz VLBI observational data of 330 compact radio sources taken from the literature, we discuss their "angular size-redshift" relation under the application of k -correction. Our study is based on the samples locating in the region $0.016 < z < 4.715$ under selection criterion $L_h^2 > 10^{26}$ W/Hz while samples appearing on the tail of distribution in each bin are cut off. In this analysis, we adopt a quintessence model to constrain cosmological parameters where "linear size-flux" and "linear size-redshift" relations are also taken into account.

P29

MONICA II

Wu Yu-Li and IP Wing
Institute of Astronomy, National Central University

Abstract:

The basic design of the MONICA camera considered previously by C.P. Chang has been upgraded to facilitate observations of the sodium cloud emission from the Moon.

(MONICA=Monitoring Observations of Neutral and Ion Clouds of Atoms)

P30

Gasdynamics in NGC 5248: Theory vs. Observations

Yang Chao-Chin, Yang Chi x, and Shiue Ming-Cheng
ASIAA/NTU

Abstract:

Recent high resolution CO observations and HST NICMOS data have revealed the spiral structure in the circumnuclear region of the nearby grand-design spiral galaxy NGC 5248. Along with the optical arms, NGC 5248 exhibits a spiral pattern all the way towards the galactic center, from about 7 kpc to about 100 pc, which may cause the gas in the disk to fall to the center to fuel a nuclear ring. Using an improved non-linear asymptotic theory of the resonance excitation mechanism, based on the work of Shu, Yuan, & Lissauer (1985), Yuan & Cheng (1991), and Yuan & Kuo (1997), we can demonstrate that the inner two-arm spiral structure of NGC 5248 is driven by a slowly rotating bar potential at the outer inner Lindblad resonance, and is a continuation of the outer optical spiral arms. We calculate the streamlines, surface density, and line-of-sight velocity contours of the bar-driven flow in the central gas disk and these results are in good agreement with the observations. We also use numerical simulations to confirm the results from our theory. Finally, We compare our results with the recent work by Jogee et al. (2002, ApJ, 575, 156). The work is in parts supported by a grant of NSC (NSC-91-2811-M-001-067).

P31

The preliminary results of optical observation of XTE J1118+480 with LOT

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Abstract:

We present the preliminary optical observation results of low mass xray binary XTE J1118+480(KV UMa). The observations were made by Lulin One-meter Telescope from Feb.18 to Feb. 22. The ellipsoidal modulations owing to orbital motion of binary can be clearly seen in the light curves. The power spectrum shows a significant peak at 0.17 cycles/day($P \sim 4.1$ hr), which is agree with previous observations. The further analyzing is still processing.

Size distributions of faint asteroids: Main-belt asteroids and Trojans

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Abstract:

We report here the results of the first systematic investigation of sub-km MBAs using the 8.2m Subaru telescope; we call this survey SMBAS (Sub-km Main-belt Asteroid Survey). Asteroids belonging to this size region in the main-belt has never been explored before, due to their faintness. Recent theoretical works and laboratory experiments on collisional evolution of asteroids highlight the importance of sub-km MBAs from the two viewpoints: 1) the majority (70-80%) of the near earth asteroids (NEAs) are sub-km-sized and are supposed to be originated from the main-belt, and 2) this size region lies near the border-line size separating the two catastrophic impact mechanisms, namely those in the strength regime and the gravity regime. Therefore, the research of the sub-km MBAs contributes to the estimation of the production rate of NEAs in the main-belt, and furthermore could give us clues on the mechanism of the collision evolution among the small bodies.

For the analysis of this survey, we developed a method to derive the size distribution of sub-km MBAs, based on statistical estimates of the semi-major axis (a) and inclination (I) for each detected asteroid, because the traditional determinations of orbits for sub-km MBAs by follow-up observations are practically impossible owing to short telescope-time of the Subaru telescope or other 8-10m large telescopes. Hence, our SMBAS cannot determine other orbital elements except the a and I . In addition, we cannot avoid some errors in our a - and I -estimates, caused by the lack of information on eccentricity (e). Therefore, we evaluated those errors from Monte Carlo simulations by adopting Bowell's equations which assume $e=0$. We confirmed that these errors could vary the slope of Cumulative Size Distributions (hereafter CSD) for the main-belt asteroids (MBAs) detected from the SMBAS within the range of only ± 0.1 . It is found that the slope of the CSD from our statistical method has a precision comparable to that from the past MBAs survey observation. Then we applied the above estimation of errors to analyze our SMBAS data, which were taken in February 2001.

The main results of the survey observations are summarized as follows:

- (1) The sky number density of MBAs is found to be ~ 290 per deg² down to $R \sim 24.4$ mag near opposition and the ecliptic.
- (2) The slope of the CSD for small MBAs ranging from a few km to sub-km seems to be fairly shallower (1.2) than that for large MBAs obtained from the past asteroid surveys (1.8). This means that the number of sub-km MBAs is much more depleted than a result extrapolated from the size distribution for large asteroids.
- (3) The CSD in the inner-belt is steep (1.4) and one in the outer-belt is shallow (1.0).

Finally, the implication for depletion of sub-km MBAs is discussed in relation to collisional mechanisms such as the formation of rubble pile asteroids. The difference of the CSDs between inner- and outer-belt may reflect the distribution of S- and C-type asteroids in the main-belt. So, we carried out the color observation to distinguish S- and C-type asteroids, which we are now analyzing.

And we also found 51 Trojan asteroids in the data above-mentioned, and obtained their CSD. In our talk, we argue the similarity in the CSDs between MBAs and Trojans

Delivery of Asteroidal Volatile Materials to the Terrestrial Planets

You Dah-Lih and Ip W. -H.

. Institute of Astronomy, NCU

Abstract:

Long-term integration method is employed to simulate the dynamical evolution of asteroidal objects injected into Earth crossing orbits. The orbital distribution of the test particles is used to model the impact rates of these small bodies during the early history of the Solar system, namely, the late heavy bombardment event between 4.5 and 3.8 billion years ago. The numerical results will give us an accurate picture of the input of volatile materials (water and organic molecules) to Earth and other terrestrial planets.

P34

The effect of cosmic rays on Jeans instability

Yu Fu-Me and Ko Chung-Ming

. Institute of Astronomy, NCU

Abstract:

A self-gravitating gas supported by thermal pressure is susceptible to Jeans instability. When the perturbation length scales exceed a certain finite value the gas becomes unstable. In this contribution we address the effect of cosmic rays on Jeans instability. Owing to the diffusion of cosmic rays the Jeans criterion does not change, but the growth rate does depend on the cosmic ray energy density and diffusion. We studied the stability of two equilibrium states in detail. One of them is a uniform state and the other is a self-gravitating disk.

P35

Rotation Curve vs. Central Spiral-bar Structure in the Nearby Galaxies

Yuan C. (袁旂)^{1,2} and Lin L.H. (林蓮宣)¹

¹Physics Dept., NTU, ²ASIAA

Abstract:

Most of the nearby galaxies are found to have a central gas-dust disk. Their structures, however, are often obscured by the background luminous star lights. These hidden structures, however, can be extracted from the observations by using wavelet methods, after the broad contributions of the Population II stars in the center are removed. The trouser wavelet method proves to be extremely useful for such a purpose. We have analyzed the NICMOS and WFPC (WFPC2) data from HST for more than 30 nearby disk galaxies, for which reliable rotation curves, either by HI or by H(alpha), are available. We divide our sample galaxies into two groups: one with rapidly rising rotation curves and the other, slowly rising rotation curves. According to the theory developed by Yuan and Kuo (1997, ApJ, 486, 750), the former tends to host a fast nuclear bar (or oval distortion) capable of exciting tightly wound central spirals and the latter tends to give rise to open central spirals which can be excited resonantly either by a slowly rotating nuclear bar or by the major bar of the galactic system. To simplify the problem, we choose galaxies without major bars. We use wavelet methods to search for the central spirals in our sample galaxies and test the theory. We find, for most of them, the central regions are characterized by spiral or/and bar structures. The majority supports the theoretical prediction.

P36

Upper atmospheric transient luminous phenomena for astronomers

蘇漢宗、許瑞榮、陳炳志、李羅權

成功大學 物理系 天文實驗室

Abstract:

在過去的數年裡，高空大氣暫態發光現象(如紅色精靈、藍色噴流、巨大噴流等)是成大天文實驗室成員的主要觀測目標之一。高空大氣暫態發光現象和天文觀測兩者都需要觀測地點有極佳的天氣，因此相容性相當高。在這個講題裡，我們將呈現過去二年我們在台灣記錄的部份事件。其中有些事件具有相當清晰的背景星場，因此它們的亮度可以加以估計。因為高空大氣暫態發光現象是相當年輕的研究題目，觀測數據還相當缺

乏。位在高山的天文觀測儀器，偶而可以使用部份時間來進行觀測，

P37

MHD simulation of black hole accretion

Shing Kwong Wong¹, Ue-Li Pen², Chris Matzner³

¹ *Department of Physics, National Taiwan University*

² *Canadian Institute for Theoretical Astrophysics, University of Toronto*

³ *Department of Astronomy and Astrophysics, University of Toronto*

Abstract:

We report our result of 3D magnetohydrodynamic (MHD) simulation about the black hole accretion. The simulation code is a second order accuracy TVD (total variation diminishing) grid base code and the simulation box contains 1400x1400x1400 grids. This is the world largest MHD simulation of accretion disk. In this simulation, we consider angular momentum of gas, random tangling magnetic fields and large scale coherent magnetic fields simultaneously.

P38

High-Resolution Very Long Baseline Interferometry Observations

Z.-Q. Shen

Institute of Astronomy and Astrophysics, Academia Sinica

Abstract:

Very Long Baseline Interferometry (VLBI) observations can provide the highest angular resolution so far achievable in astronomy over the entire electro-magnetic spectrum. We report on the high-resolution imaging study of a nearby bright southern blazar PKS 1921--293 (OV--236) with the VLBA and the VSOP. These observations have clearly revealed a strongly curved jet extending out to about 50 parsecs from the presumed central engine. Furthermore, our multi-epoch 43 GHz VLBA data found consistently that the central (less than 1 parsec region) consists of two equally compact components, whose relative position remains unchanged.

P39

Probing the envelope of the Egg nebula

Dinh-Van-Trung and Jeremy Lim

Institute of Astronomy and Astrophysics, Academia Sinica

Abstract:

We present VLA observations with sub-arcsecond angular resolution at 7 mm of the Egg nebula, the prime example of the proto planetary nebulae, to study the structure of the envelope and the shaping effect of collimated high velocity outflows emanating from the central star. The HC3N J=5-4 emission is seen distributed in a clumpy and incomplete ring, as expected from the chemistry of cyanopolyynes. However, the clumpiness and reduced size of the envelope near the systemic velocity suggest that part of the envelope is disrupted by the collimated high velocity outflows. The continuum emission at 7 mm from dust is well resolved at angular resolution of 0.7 arcsec. The central source is resolved into two main clumps and more diffuse structures. The amount of material ejected from central star and traced by the dust emission is about 0.9 Msun.

P40

Molecular Gas in Powerful Radio Galaxies

Jeremy Lim

Institute of Astronomy and Astrophysics, Academia Sinica

Abstract:

Luminous extragalactic radio sources, in particular those that exhibit jet-lobe morphologies,

are commonly thought to be produced as a result of vigorous accretion onto a supermassive black hole. The vast majority of such sources are hosted by luminous elliptical galaxies. Given that normal elliptical galaxies usually do not possess detectable quantities of cool (neutral) gas, what feeds the central supermassive black holes of powerful elliptical radio galaxies? Here, we present preliminary results of an ongoing survey to search for molecular hydrogen gas in a sample of nearby powerful radio galaxies. Of the sixteen galaxies so far observed, eight have been detected. The inferred gas masses range from $\sim 10^7$ to $\sim 10^9$ Msun, with the vast majority lying in the narrow range $1-4 \times 10^8$ Msun. The observed line profiles are consistent with the gas being distributed a rotating disk or torus (i.e., disk with central depression or hole), as has been confirmed from follow-up imaging of one of the radio galaxies. The results are consistent with the idea that the molecular gas originates from the cannibalism of a minor gas-rich galaxy by the pre-existing host elliptical galaxy, and may form the reservoir for fueling the central supermassive black hole (Lim et al. 2000, ApJ, 545, L93).

P41

Giant Convection Cells as the source of Betelgeuse's Complex Extended Atmosphere

Jeremy Lim

Institute of Astronomy and Astrophysics, Academia Sinica

Abstract:

What drives the extended atmospheres and massive winds of red supergiant stars? Here, we show high angular-resolution images of the atmosphere of the red supergiant star Betelgeuse made in December 1996 and December 2000. The observations were conducted at a wavelength of 7 mm with the Very Large Array (VLA), and are the highest angular-resolution measurements ever made of the (thermal) atmosphere of another star other than our Sun. The atmosphere of Betelgeuse is asymmetric, and has clearly changed in structure over the 4 years between our two observations. At the highest angular resolution of ~ 20 mas, individual bright features are perhaps starting to become visible. These results are consistent with the idea proposed by Lim et al. (1996, Nature, 392, 575) that giant convection cells are responsible for driving the extended atmosphere of Betelgeuse. Radiation pressure on dust grains that form in the dense but cool extended atmosphere may therefore be responsible for driving the stellar wind.

後院天文學家計畫

周翊 (中央大學)

大綱

後院天文學家計畫結合了世界上職業與業餘的天文愛好者, 形成了一個全球觀測網路, 突破了地域及天候的限制, 充份發揮小望遠鏡的功能, 針對於特定的科學目標, 進行長時間的觀測與研究, 近年來已獲得了豐碩的成果。這個計畫提供了業餘天文愛好者一個直接參與天文科學研究的機會。我將針對它的組織, 科學目標, 所須裝備, 初步的資料處理與近年來成果等作一簡介。

台北市立天文科學教育館之推廣教育

台北市立天文科學教育館 陶蕃麟

大綱

台北市立天文科學教育館是台北市政府教育局所轄的非營利社會教育機構, 目標設定為一個專業及富趣味的實用科學館, 除了配合學校教育, 提供莘莘學子一個能夠學習天文科學知識的校外教室, 更進一步以整個社會為教育對象, 以行銷的觀念塑造本館為一個全民化教育場所。

在這個理念下, 天文館的設備有劇場、展示場、主題展覽場、觀測區, 以與教娛樂的方式吸引民眾前來接受教育, 並積極的推出各項推廣活動, 不僅對來館參觀的民眾提供解說服務, 也針對不同的族群與人士辦理不同的營對活動:

(一) 學生

甲、少年天文營: 於寒暑假辦理二或三天的通勤營隊活動。

乙、野外觀測營: 於寒暑假辦理三或四天的住宿營隊活動。

丙、題研討營: 配合特殊天象辦理的通勤營隊活動。

(二) 教師

甲、師資培育: 針對校外教學活動的半日速成班。

乙、基礎班: 為期一週, 依據地球科學天文部份辦理的研習營隊活動。

丙、進階(專題)班: 三天以內, 單一主題的天文研習營隊活動。

(三) 家庭

甲、星姐姐說故事: 家長與國小低年級或幼稚園大班學童一起參與。

乙、摘星動手做: 家長與國小學童以紙模型製作為主的假日特別活動。

(四) 社會人士

甲、天文營: 利用周休二日辦理的營隊活動。

乙、特殊天象觀測會: 七夕、中秋、日月食等特殊天象的說明與觀賞。

丙、每月一星: 每月重要天象的主題介紹。

丁、亞卓天文館: 每月一星的網路版。

(五) 複合式

甲、假日天文一日遊: 全程導覽與參觀天文館的假日套裝行程。

乙、天地之旅: 晚間上陽明山觀星的天文一日遊活動

(五) 專案: 天文小尖兵

成大之天文推廣教育

許瑞榮 (成功大學)

大綱

成大物理系天文實驗室除了繼續從事「天日一天文圖」

(<http://www.phys.ncku.edu.tw/~astrolab/mirrors/apod/apod.html>)翻譯工作與「成大天文實驗室網站」(<http://www.phys.ncku.edu.tw/~astrolab/>)的維護之外, 也陸續地增購基本的天文教學設備, 更於 2002 年建立了「成大天文台」(<http://www.phys.ncku.edu.tw/ckuo/>), 並

在規劃了包括有天文學（一）、（二）、天文觀測、天文物理導論等課程的「太空與天文學程」。讓有志於從事天文研究的成大學生能獲得適當的訓練。另外，我們也在成大地球科學系也開授一學期的天文學課程，為這些可能是未來的中學地科教師的學生，提供基礎的天文訓練。我們也定期開放成大天文台與舉辦天文活動，協助推廣台南地區天文教育。

中央大學之推廣教育

孫維新

大綱

科學研究首重人才和經費，而優秀的人才來自於大量對科學有興趣的年青學子，經費的多寡則需視國會及民意的支持，因此這兩項開展研究工作的關鍵因素，都與科學推廣和普及密不可分。

中央大學天文所的推廣教育可大別分為兩個層面，一為針對各級學校，另一為面向社會大眾。所內教授不定期接受邀約，至各級學校就不同課題進行專業及科普演講；對社會大眾的科學演講則多經由台北天文科學教育館、台中自然科學博物館、高雄科學工藝博物館等重要科學館所的安排進行。

至於有系統的進行科學及推廣教育，可以『墾丁天文台』為例。該處配備有完整數位化光學觀測設備，及長期駐守的專任助理。每年於寒暑假期間舉行數梯次的『大學生天文觀測研習班』，而於學期中間，對南部地區高中學生，舉辦『週末天文學家』計畫；日常則接待國中、國小，以及社會大眾的參觀團體，服務對象自小學、國中、高中、大學，以至一般社會大眾。

就推廣教育的實施層面而言，針對學生和社會大眾仍有差別，因為學生未來將選擇是否走向自然科學的研究道路，而社會大眾則著重在科普知識的提升，以及認知尖端科技的視野開拓，兩者的實施方式和著重因素確有不同，我們會在此次報告中加以剖析。

高雄市天文學會現況、活動與成果

(一)沿革

本會成立於一九八四年十一月十二日，創會兼首任理事長涂常雄先生羣路藍縷，使學會先具雛型，再加以推廣，業務始得穩定發展。之後由於涂先生赴美定居，在美創立亞特蘭大天文學會並擔任理事長，會務中斷若干時日，常務理事李奉超教授四處奔走，又將組織重整起來，是為第二屆理監事會，再歷經第三屆理監事會後，由林子盟先生接任理事長，是為第四屆。林先生任內辦理諸多重大天文活動，其中以彗星撞木星的觀測大會為最傑出，當時掀起港都的一陣天文狂熱，也是本會的成就之一。第五、六屆理事長蘇明俊先生，領導會務方向準則為「法制」、「計畫」、「協調」及「合作」。第七屆選舉翁慶才先生擔任理事長，他同時也是本市港和國小校長，校內的天文館設施在南台灣首屈一指，由他領導會務，使財力與人力上的運用，發揮得淋漓盡致，會務必然蒸蒸日上。

自成立迄今，會員一直在持續增加，目前約有會員二百五十餘人，經常參與服務工作的會友約近百人。

(二)宗旨

本會以「天文推廣教育」為主要宗旨，另以天文觀測及研究為輔。因此活動以學校教師及學生為主，會員也以學校教師占大多數；活動方式配合學校野外教學活動，辦理觀星及天文活動，有專題演講、星象觀測、及其他配合活動等。

本會主要活動項目如下：

1. 支援各級機關學校之戶外觀星活動。
2. 定期辦理大眾科學講座及觀星活動，為全市民眾服務。
3. 配合重要天象辦理大型觀測活動 - 如彗星、日月食、流星雨等。
4. 設立圖書室及網際網路討論區，出版會員刊物及專題叢書。
5. 對天文學及天文推廣教育從事研究，參加相關之研討會。
6. 召開理監事聯席會議、及會員聯誼活動。
7. 參加國內外友會之聯誼活動、及會員互訪。
8. 其他與本會宗旨相關之天文活動。

嘉義市天文協會天文推廣教育活動報告

總幹事：黃傳俊

一、現況：

近年來，本會因受經濟不景氣的影響，使得在籍會員有減少的趨勢，目前共計有會員 70 人。經過 92 年 3 月 8 日第八屆第一次會員大會後，新任理事長為劉哲富先生，並由劉理事長任命黃傳俊先生為總幹事，負責往後各項活動的實際推展工作。

二、活動：

1. 每月分別在嘉義大學附設小學及嘉義市蘭潭國民小學辦理 Star Party 活動三次，對象為國小學生。
2. 每月在嘉義市蘭潭國小辦理天文教師研習活動兩次，對象為國中小教師及各校義工家長。
3. 每月辦理一次自助式戶外觀星活動，對象為天文協會會員及其家屬，嘉大附小及蘭潭國小學生及其家長。
4. 配合民俗節慶，輔導嘉義市各國小及社區辦理中秋節賞月活動，共計八個地點。
5. 92 年 5 月 31 日將在玉山國家公園塔塔加遊客中心停車場辦理「諸羅杯觀星大獎賽」，對象為社區民眾及學生。

三、成果：

1. 一年來共計辦理 28 場次 Star Party 活動，每一場次約有 120 人參加。
2. 教師研習活動持續辦理 8 個月，共計有 30 位教師及義工家長參加。
3. 自助式戶外觀星活動去年度共辦理 7 次，每次約有 12 個家庭，50 餘人參加。
4. 協助嘉義市蘭潭國小成功改裝 20 公分折射式望遠鏡為電腦操控望遠鏡，並輔導成立網路天文台，於 92 年 3 月 19 日正式開播。

四、未來發展

願景

1. 促使天文話題進入家庭生活中，培養天文休閒活動習慣與興趣。
2. 做為學術天文界與業餘天文界的橋樑，促進業餘天文界學術化。
3. 統整地區天文資源，創造天文發展綜效。
4. 社團國際化，成為世界天文社團重要一員。

策略一：開辦公民大學休閒天文課程，推展天文教育，培養天文休閒習慣。

策略二：主動整理並提供天文訊息給新聞媒體，形成天文話題吸引民眾關注。

策略二：引進新興天文技術及天文觀測儀器，開辦研習課程，將觀測技術及理論進行轉移。

策略三：組織雲嘉地區各級學校天文社團領導人聯誼會，統整發展方向及步調，辦理成果展覽鼓勵研發創新。

策略四：統整現有天文觀測儀器及教育場地，鼓勵充分應用及跨領域研究活動。

策略五：積極參與國際天文觀測組織及觀測活動，並與各地天文社團加強交流聯繫。

策略六：提供國際天文新知，鼓勵社員於國際刊物中發表成果。

台南市天文協會天文推廣教育活動報告

台南市天文協會

* 基本資料

創立時間:民國 75 年 4 月 28 日

會址:台南市南門路 189 號

* 組織架構:

理事長(劉永泰)

總幹事(周銀王)

* 推廣天文教育活動

1. 台南天文之友
2. 南門城觀星活動
3. 遠程觀星活動
4. 暑期天文夏令營
5. 社區大學開班授課
6. 不定期配合天象舉辦活動(Ex:中秋賞月)

* 推廣教育上的困境

1. 人力
2. 經費

台中市天文協會現況、活動與成果

台中市天文協會

台中市天文學會創立於民國 85 年的元月 30 日，由台中地區的一群天文同好發起組成。在此之前，台中市也曾於民國 75 年成立過天文學會，但是在哈雷熱潮過後沒幾年就無疾而終。而 85 年會再有組織一個天文學會的念頭，主要也是因為民國 85 年(1996)百武彗星造訪所掀起的熱潮。

中部地區在哈雷熱潮過後雖然沈寂了十幾年，但是當時很多人都受到了啟蒙並且開展了接觸學習天文的大門，其影響力其實一直悄悄的在醞釀之中。到了 1996 年，這股潛藏了許久的天文狂熱便在百武彗星的號召之下激發了出來。在新的台中市天文學會中，有好幾位都是從哈雷之前就投入天文攝影、星象教學、天文科學的研究中。這樣子累積下來的熱誠當然和只是一時興起而組成的社團不同，所以台中市天文學會在這批有經驗有熱誠的幹部推動之下，活動便能不斷的向前推進。

活動與成果

台中市天文學會自從成立以來，隨時隨地都在嘗試增加新的活動內容。舉辦過的活動種類有：

1. 國外天文奇觀旅行活動：1998 年的馬來西亞日蝕觀測團、1999 年的慕尼黑日蝕觀測團、2001 年的阿拉斯加極光觀測團，今(2003)年暑假期間可能會有日本「胎內星祭」參訪團。
2. 長程野外觀星之旅：每年都會舉辦好幾次。一般而言，暑假的英仙座流星雨期間都會舉辦野外觀測活動，其他時間就隨時隨機舉辦。這一類活動有些會收費統一處理食宿交通，有些則是約定時間地點，然後發通知給會員自行前往參加。由於自行參加的方式機動靈活，因此最近的野外觀星活動大多採用這種方式。活動地點主要有合歡鳶峰、清境農場、新中橫塔塔加等幾個地方，一年可能多達 4、5 次。
3. 短程野外活動(不過夜)：台中市天文學會的活動並不只限於天文觀星或演講活動，常常也兼及其他賞鳥、賞螢、昆蟲、植物等自然生態活動。而由於地利上的優勢，所以每年有幾個時段都會辦一些不務正業的活動。像三月底春分附近會去八卦山賞「南路鷹」，四月中到五月中會到東勢、大雪山地區賞螢火蟲。
4. 教師天文研習：由於台灣曾經有一段時間非常不重視天文科學和教育，因此這一段時間的課程很少有關於天文的材料，而師資養成教育中也沒有這樣的課程。所以近年來的中小學教材增加了許多關於天文的內容後，很多教師便大感困擾。台中市天文學會的會員中以各級學校教師為主要成員，而幹部中教師的比例佔了一半以上，大家都清楚體會教師們的需求，於是便有人提議辦理教師天文營。初期是以在市區上課的方式，後來在彰師物理系郭西川教授的協助下，開始與彰師合辦三天兩夜的教師天文研習活動，曾去過的活動地點有大雪山鞍馬山莊、阿里山青年活動中心等，預計今年暑假還會再辦理一個梯次 80 人。

5. 星空饗宴：台中市天文學從 1997 年開始便固定每年會舉辦一次大型的「星空饗宴」活動。1997 年在大雪山，1998 年在清境農場，1999 年因為 921 地震停辦，2000 年在台中都會公園，2001 和 2002 年都在清境農場舉辦。在多年的合作之後，漸漸受到當地民眾的認同和支持，往後可能就和清境地區建立長久而穩定的合作模式來辦理「星空饗宴」活動。而星空饗宴活動是一個完全免費的活動，除了中國天文學會的補助之外，也會透過幹部人脈去籌募贊助，或者靠著本身活動的結餘來挹注。活動內容大致有：望遠鏡展示與觀測、天文講座、星空音樂會、星象解說、天文闖關等。
6. 天文講座：由於本會幹部群根基深厚，所以許多社教機構都會和本會接洽辦理講座。像省圖、飛狼、科博館以及許多中小學都曾邀請本會去辦理講座，目前比較固定的是每個月的第四個週六，和科博館有一個固定的講座時間。其他單位的時間就比較隨機安排，沒有特定時間。
7. 支援活動：由於本會的幹部群人多勢眾設備又齊全，口才也都不錯，加上設計的活動也蠻生動活潑，所以中部許多單位都喜歡邀請本會去支援他們的活動。像去(2002)年就曾經支援過台中都會公園的終身學習節、公園園慶，東勢林管處的大雪山知性之旅，科博館、大里市公所、惠文中學的中秋賞月活動。其他小規模的支援活動更是不計其數。

台中由於佔了地利之便，許多 2800 公尺的高山都在兩個小時到兩個半小時的車程之內，所以天文觀測學習風氣很盛，也因此吸引了很多業餘天文高手在中部定居。不只中部同好會在山上聚集，其他地區的天文同好也經常喜歡到中部的鳶峰等地觀測，所以每到朔的前後，經常可以在山上遇到來自各地的同好。歡迎大家常到中部來觀測，希望常有機會在山上遇到大家。