

5. Astronomy and Astrophysics

Japanese Coordinator:

Prof. Hiroshi Shibai
Professor
Nagoya University

Indian Coordinators:

Prof. Rajaram Nityananda
Director
National Centre for Radio Astrophysics
Pune

Astronomy and Astrophysics

【 Coordinators 】

Japanese Coordinator	Indian Coordinator
Prof. Hiroshi Shibai Professor, Graduate School of Science Nagoya University	Prof. Rajaram Nityananda Director, National Centre for Radio Astrophysics, Pune

Overviews and Future Plan

【 FY2002-2003 Overview 】

A unified theme in the field of Astronomy and Astrophysics was successfully executed in the last two years. Professor Ramanath Cowsik, the former Indian coordinator, was retired from this role in 2003 after establishment of the tight partnership in this field between both countries. Professor Rajaram Nityananda was nominated as a new coordinator.

【 FY2004-2005 Future Plan 】

The current program should be continued to promote the scientific research in this field. Several new sub-themes are expected to be included in this program by completion of some of the ongoing programs.

【 Summary 】

The coverage of this field is not limited in Astronomy and Astrophysics at present. New interdisciplinary fields, such as high energy gamma-ray detection, gravitational wave detection, and the solar system science. Gradual extension of the coverage is desirable for mutual collaboration in this field.

As this field has only one unified collaboration program, detailed description is in the following pages.

Implementation Chart of Program

Priority Area: Astronomy and Astrophysics

FY	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Joint Research Project	1. Astronomical Observations with Advanced Research											
	J:3m/30md I:5m/72md	J:1m/16md I:6m/193md	J:7m/61md I:1m/27md	J:10m/94md I:4m/102md	J:8m/65md I:4m/40md	J:8m/128md I:5m/95md	J:9m/96md I:8m/117md	J:6m/88md I:8m/111md	J:7m/58md I:8m/119m	J:9m/105md I:8m/93md	J:9m/83md I:9m/123md	
Sub Themes	1-1											
	Ground-Based Astronomy from Hanle											
	J:1m/9md I:2m/25md	J:4m/33md I:2m/71md	J:3m/26md I:1m/27md	J:1m/10md I:3m/29md	J:1m/8md I:2m/42md	J:2m/8md I:2m/35md	J:1m/20md	J:2m/14md I:1m/14md	J:1m/10md I:2m/29md			
	1-2											
	Cosmic Ray Physics											
	J:1m/11md I:1m/10md		J:1m/9md									
	1-3											
	Simulation with Advanced Computer Technology											
	J:1m/10md I:1m/27md	J:3m/105md	J:1m/8md I:1m/15md	J:1m/8md	J:1m/8md							
	1-4											
	Solar Physics											
	J:1m/16md I:1m/10md	J:2m/21md I:1m/17md	J:1m/11md I:1m/28md			J:1m/8md	J:1m/16md	J:1m/4md I:1m/14md	J:1m/7md I:1m/15md	J:1m/15md		
	1-5											
	X-ray Astrophysics											
		J:1m/7md	J:2m/24md I:1m/33md	J:3m/23md	J:2m/19md I:2m/41md	J:2m/12md I:2m/44md	J:2m/22md I:2m/40md	J:2m/13md I:2m/32md	J:2m/20md	J:1m/6md I:2m/31md		
	1-6											
	Balloon-Borne Infrared Astronomy											
	J:2m/16md I:1m/26md	J:3m/24md I:1m/11md	J:4m/93md I:1m/12md	J:3m/63md I:2m/28md	J:2m/41md I:1m/15md	J:2m/18md I:1m/14md	J:3m/55md I:2m/30md	J:6m/58md				
	1-7											
	Interplanetary Space P											
	J:1m/5md I:2m/10md	J:1m/9md I:3m/28md	J:1m/16md I:1m/15md	J:2m/17md I:1m/8md								
	1-8											
	Development of Gravitational Wave Detector											
		J:1m/7md I:1m/15md	J:1m/8md I:1m/15md									
	1-9											
	Optical Observation of Open Clusters											
		J:1m/9md I:1m/15md	J:1m/9md I:1m/9md									
	1-10											
	Principal Components Analysis											
												I:1m/16md
Seminar	The 1st India-Japan Seminar on Cooperation in Astronomy and Astrophysics, Jan.15-21, 1994, Tokyo J:10m/89md											
	The 2nd India-Japan Seminar on Cooperation in Astronomy and Astrophysics, Mar.16-23, Tokyo I:9m/72md											
	The 3rd India-Japan Seminar on Cooperation in Astronomy and Astrophysics, Sep.26-Oct.23, Leh J:3m/21md											
Visiting Scientist							I:2m/27md					
Total	J:3m/30md I:5m/72md	J:11m/105md I:6m/193md	J:7m/61md I:10m/99md	J:10m/94md I:4m/102md	J:8m/65md I:4m/40md	J:8m/128md I:5m/95md	J:9m/96md I:10m/144md	J:9m/97md I:7m/95md	J:7m/58md I:8m/119md	J:9m/105md I:8m/93md	J:9m/83md I:9m/123md	

Report

1. Joint Research Projects

1-1 Project 1			
Title		Astronomical Observations with Advanced Technologies	
Principal Investigator	Japan	Prof. Hiroshi SHIBAI, Professor, Graduate School of Science Nagoya University	
	India	Prof. Rajaram NITYANANDA, Director, National Centre for Radio Astrophysics, Pune	
Period		From 2001 to 2005	
No. of Exchange	FY2001	Japan to India 7m/ 58md	India to Japan 8m/119md
	FY2002	J to I 9m/105md	I to J 8m/93md
	FY2003	J to I 9m/83md	I to J 9m/123md
	FY2004	J to I	I to J

Objectives:

This research is aimed to advance collaborative activities in astronomical observations with advanced technologies. The following eight sub-themes are set for the period FY2002-2003. All sub-themes except for the last one are continuation from the previous period. The last sub-theme was started in 2003.

- 1-1) Ground-Based Astronomy from Hanle
- 1-4) Observational Study of Solar Physics
- 1-5) X-ray Astronomy
- 1-6) Balloon Observations of Infrared Objects
- 1-7) Observation of Interplanetary Dust Particles
- 1-8) Development of Gravitational Wave Detector
- 1-9) Optical Observation of Open Clusters
- 1-10) Principal Component Analysis

Accomplishment Status :

In the field of Astronomy and Astrophysics, Japan and India has a long history of mutual collaboration, which was initiated by great scientists in both countries. On the basis of those successful collaborations, several new collaborations were initiated.

1-1). Ground-Based Astronomy from Hanle

Indian Institute of Astronomy, Bangalore, headed by Prof. R. Cowsik and Prof. T. Prabh, has successfully constructed Himalayan Chandra Telescope at Hanle, Himalaya. This place is one of the best places in the world for ground-based astronomical telescope. The altitude is 4600m high. The weather is excellent, the humidity and the aerosols are very small. Indian astronomers successfully constructed the new telescope there, and, in 2001, they started astronomical observations as its steady state. New and important astronomical results have been obtained from this telescope. One of the remarkable features, this telescope is the most sophisticated, remote-controlled telescope. It can be fully controlled from IIA, Bangalore through a satellite communication link. The electric power is generated by a big solar array. Japanese astronomers have been supported in several technical issues, such as the site test of the Himalaya, development of astronomical instruments and detectors. Now, Indian astronomers have a next plan to make a very big telescope at the same site. They already have enough technical and astronomical capability for it through the success of the 2-m remote controlled telescope.

In addition to these optical telescope projects, the Hanle site is known that it is the good site for radio-wave astronomy as well as for high-energy particle astronomy, too. The site test for these

two projects is being made as a collaboration of both countries. TIFR continues to observe high energy gamma-ray (10 - 1000 TeV) as collaboration with Osaka City University for long years. This facility has the best sensitivity for diffuse gamma-ray. In order to extend this research, a new project was considered, that is, Cerenkov telescopes based on Ooty, Patchmari, and Hanle. The possibility of this project was investigated in detail.

1-4). Solar Physics

A collaborative research of the solar activity was executed by comparison between the data from the Japanese satellite, YOHKOH, and the data taken by a ground solar telescope in India. For several flare events, cooperative analysis has been executed. In 2003, India succeeded a satellite that has an instrument for solar physics. Japanese astronomer assisted to make calibration of this instrument. This instrument was developed mainly by the PRL group.

1-5). X-ray astronomy

The collaboration in this field has a long history of more than 30 years. They have been keeping a mutual and tight collaboration for many years. In particular, the X-ray astronomy group of TIFR, Mumbai headed by Prof. Agrawal, will be able to start the first Indian astronomy satellite (ASTROSAT), soon. The astronomical instruments onboard this satellite are soft X-ray, hard X-ray, and UV telescopes developed as collaboration between Indian and Japanese astronomers. In particular, super-mirror technology for x-ray telescopes developed in Japan are being successfully transferred to TIFR. In addition to the instrument development, they are exchanging techniques on data reduction, data analysis, as well as the scientific investigation, too.

1-6). Infrared Astronomy

India has a very good facility for scientific ballooning at Hyderabad. By using this, TIFR infrared group headed by Prof. S. K. Ghosh and H. Shibai at Nagoya University are executing far-infrared astronomical observations by balloon. The target is the star-forming processes in the universe. Generally, star-forming objects are radiating far-infrared radiation at most. The telescopes and instruments are developed by both countries. We have made almost ten balloon flights during the past 4 years. Almost ten scientific papers have already been published from this collaboration.

1-7) Observation of Interplanetary Dust Particles

The zodiacal light is the light scattered by irregular-shaped interplanetary dust particles of sub-micron size. The distribution and the spectra of the dust particles are important information on the origin of the solar and planetary system. Kobe University and IUCAA investigated the possibility of the observation of the zodiacal light from the Hanle site as collaboration. The preparatory study is made for the observation of interplanetary dust particles from the Hanle site. In addition to this, simulation work for scattering by irregular-shaped solid particles was executed.

1-8) Gravitational Wave Detection

This collaboration is aiming detection of the Gravitational Wave, which was predicted by the Einstein's General relativity for long ago. Japanese scientists are developing the new big facility for it in Japan. An India group headed by Prof. Dhurandhar, are contributing the simulation analysis of this new facility by using advanced computer and software technology in India. Especially, simulation technique including non-Gaussian noises was developed by Indian side.

1-9) Optical Observation of Open Clusters

By a visit of an Indian astronomer to Japan, nine open clusters were successfully observed by the Schmidt Telescope of Kiso Observatory. The analysis was made by astronomers of both countries. Including these new data, important results were published as several scientific papers. A new possibility for using the 2-m telescope at Hanle was investigated.

1-10) Principal Component Analysis

This sub-theme is on statistical analysis of observational data. The collaboration is focused on the development of the method for interpolation of defect data by using the principal component method.

Future Plan:

In the period of 2004 - 2005, new sub-themes will more actively be included in this collaboration by completing some of the ongoing sub-themes, as follows.

Himalayan Chandra Telescope entered into its steady-state operation phase. It will produce fruitful observational results. Japanese astronomers are interested in using this telescope for their own research. Additionally, the follow-up observation of the Japanese ASTRO-F survey will be planned by constructing a new near-infrared instrument by collaboration.

Balloon-borne observation in the far-infrared wavelength will enter into the harvest. As the telescope and the balloon flight became stable and reliable, the wide-area survey in the far-infrared will be executed effectively. The energy budget/flows between various phases in the interstellar space will be resolved by this collaboration.

The ASTROSAT project has approved by the Indian government. Indian and Japanese X-ray astronomers are jointly developing onboard instruments for this satellite by using the super mirror technology in the hard X-ray region

By frequent exchanges in solar physics and planetary science, much closer collaborating program will be able to be established. Exchange programs other than those existing sub-themes are also effective for extend this Japanese-Indian close collaboration in this field. They should be kept at the same level in the latter half of the current period.

Collaboration on gravitational wave detectors, open cluster observation, and principal analysis will be continued to the next years for obtaining scientific results.

A new Indian center, IUCAA, and two Japanese centers for space science, ISAS and NAO will investigate to have more tight relationships. This collaboration program will be able to assist these mutual cooperation programs.

*** Exchange Visits Undertaken**

Japan to India

No. of Project	Name & Affiliation	Research Subject	Main Host Researcher	Period
Project 1 (FY2001)	Prof. Kojun Yamashita Professor Nagoya University	Development of X-ray Telescopes with Multilayer Supermirrors	Prof. P.C. Agrawal Professor Tata Institute of Fundamental Research	2001/9/9~ 2001/9/16 (8 days)
	Prof. Kiyoshi Hayashida Associate Professor Osaka University	1) Discuss on the Future Plan for X-ray Polarimetry 2) Inspect and Gather Informations about Calibration Facility	Prof. P.C. Agrawal Professor Tata Institute of Fundamental Research	2002/3/24~ 2002/3/28 (5 days)
	Prof. Hiroshi Shibai Professor Nagoya University	Study of Galactic and Extragalactic Far-Infrared Dust Emission by Balloon-Borne Observations	Prof. R.P. Verma Professor Tata Institute of Fundamental Research	2002/3/10~ 2002/3/16 (7 days)
	Prof. Takao Nakagawa Professor The Institute of Space and Astronautical Science	To make Indian-Japanese Collaborative Balloon Experiments for Far Infrared Spectroscopic Observations of Galactic and Extragalactic Star-Forming Regions	Prof. R.P. Verma Professor Tata Institute of Fundamental Research	2001/11/15~ 2001/11/25 (11 days)
	Prof. Satoshi Masuda Assistant Professor Nagoya University	Energy-Release Mechanism of Solar Flares	Prof. Rajmal Jain Professor Physical Research Laboratory	2001/10/7~ 2001/10/22 (16 days)
	Prof. Tadashi Mukai Professor Kobe University	Polarization Properties of Star Forming Clouds	Prof. Ranjan Gupta Professor Inter-University Centre for Astronomy and Astrophysics	2002/3/26~ 2002/3/29 (4 days)
	Prof. Masakatsu Fujimoto Professor National Astronomical Observatory	Gravitational Data Analysis	Prof. Sanjeev Dhurandhar Professor Inter-University Centre for Astronomy and Astrophysics	2002/2/24~ 2002/3/2 (7 days)

No. of Project	Name & Affiliation	Research Subject	Main Host Researcher	Period
Project 1 (FY2002)	Prof. Saburo Kawakami Professor Osaka City University	To Work Out the Possibility of International Collaboration in High Energy Gamma Ray Physics	Prof. T.P.Prabhu Professor Indian Institute of Astrophysics	2002/12/21~ 2002/12/27 (7 days)
	Prof. Masahiro Teshima Associate Professor University of Tokyo	To Work Out the Possibility of International Collaboration in High Energy Gamma Ray Physics	Prof. T.P.Prabhu Professor Indian Institute of Astrophysics	2002/12/21~ 2002/12/27 (7 days)
	Prof. Yasushi Ogasaka Assistant Professor Nagoya University	To learn and discuss about scientific balloon observations in India	Prof. P.C. Agrawal Professor Tata Institute of Fundamental Research	2003/2/20~ 2003/3/1 (10 days)
	Prof. Kojun Yamashita Professor Nagoya University	Development of Multilayer X-ray Optical Systems for X-ray Astronomy	Prof. P.C. Agrawal Professor Tata Institute of Fundamental Research	2003/3/21~ 2003/3/30 (10 days)
	Prof. Hiroshi Shibai, Professor Nagoya University	Study of Galactic and Extragalactic Far-Infrared Dust Emission by Balloon Borne Observations	Prof. R.P. Verma Professor Tata Institute of Fundamental Research	2003/1/28~ 2003/2/9 (13 days)
	Dr. Yasuo Doi Research Associate Tokyo University	Study of Galactic and Extragalactic Far-Infrared Dust Emission by Balloon Borne Observations	Prof. R.P. Verma Professor Tata Institute of Fundamental Research	2003/2/8~ 2003/3/5 (26 days)
	Dr. Hidehiro Kaneda Research Associate Institute of Space and Astronautical Science Japan Aerospace Exploration Agency	To make Indian-Japanese Collaborative Balloon Experiments for Far-Infrared Spectroscopic Observations of Galactic Star-Forming Regions	Prof. R.P. Verma Professor Tata Institute of Fundamental Research	2003/2/10~ 2003/2/25 (16 days)

No. of Project	Name & Affiliation	Research Subject	Main Host Researcher	Period
Project 1 (FY2002)	Prof. Takeo Kosugi Professor Institute of Space and Astronautical Science Japan Aerospace Exploration Agency	Collaborative Study of Solar Flares based upon Japanese Yohkoh X-ray Observations and Indian Optical Observations	Prof. Rajmal Jain Professor Physical Research Laboratory	2003/2/23~ 2003/3/1 (7 days)
	Prof. Katsuo Ogura Professor Kokugakuin University	Wide-Field Photometry of Young Open Clusters	Dr. Anil Kumar Pandey Doctor State Obserbatory, Naintal	2002/10/27~ 2002/11/4 (9 days)
(FY2003)	Dr. Yasuo Doi Research Associate Tokyo University	Balloon Observation of Infrared Objects	Prof. Swarna Kanti Ghosh Professor Tata Institute of Fundamental Research	2004/3/10~ 2004/3/16 (7 days)
	Prof. Saburo Kawakami Professor Osaka City University	Ground-Based Astronomy from Hanle	Prof. Tushar P. Prabhu Professor Indian Institute of Astrophysics	2003/10/11~ 2003/10/20 (10 days)
	Dr. Akihiro Furusawa Research Associate Nagoya University	X-ray Astronomy	Prof. P.C. Agrawal Professor Tata Institute of Fundamental Research	2004/3/7~ 2004/3/12 (6 days)
	Dr. Hidehiro Kaneda Research Associate Institute of Space and Astronautical Science, Japan Aerospace Exploration Agency	Balloon Observation of Infrared Objects	Prof. Swarna Kanti Ghosh Professor Tata Institute of Fundamental Research	2004/3/7~ 2004/3/15 (9 days)
	Prof. Hiroshi Shibai Professor Nagoya University	Balloon Observation of Infrared Objects	Prof. Swarna Kanti Ghosh Professor Tata Institute of Fundamental Research	2004/3/10~ 2004/3/16 (7 days)
	Dr. Yasuo Doi Research Associate Tokyo University	Balloon Observation of Infrared Objects	Prof. R.P. Verma Professor Tata Institute of Fundamental Research	2003/10/15~ 2003/10/27 (13 days)
	Prof. Takao Nakagawa Professor Institute of Space and Astronautical Science, Japan Aerospace Exploration Agency	Balloon Observation of Infrared Objects	Prof. Swarna Kanti Ghosh Professor Tata Institute of Fundamental Research	2003/12/17~ 2003/12/27 (11 days) 2004/2/27~ 2004/3/8 (11 days)
	Prof. Katsuo Ogura Professor Kokugakuin University	Optical Observation of Open Clusters	Prof. Tushar P. Prabhu Professor Indian Institute of Astrophysics	2003/8/21~ 2003/8/29 (9 days)

India to Japan

No. of Project	Name & Affiliation	Research Subject	Main Host Researcher	Period
Project 1 (FY2001)	Prof. Tushar P. Prabhu Professor Indian Institute of Astrophysics	Utilization of the Himalayan Ghandra Telescope in the Infrared Band	Prof. Munetaka Ueno Professor University of Tokyo	2002/3/18~ 2002/3/31 (14 days)
	Prof. P.C. Agrawal Professor Tata Institute of Fundamental Research	Discussion on Cooperation and Collaboration in Research in X-Ray Astronomy	Prof. Kojun Yamashita Professor Nagoya University	2002/3/9~ 2002/3/24 (16 days)
	Prof. Biswajit Paul Fellow-E Tata Institute of Fundamental Research	Joint Experiment for X-ray Polarimetry	Prof. Kiyoshi Hayashida Associate Professor Osaka University	2002/3/3~ 2002/3/18 (16 days)
	Prof. R.P. Verma Professor Tata Institute of Fundamental Research	Infrared Astronomy	Prof. Hiroshi Shibai Professor Nagoya University	2002/3/17~ 2002/3/30 (14 days)
	Prof. Rajmal Jain Professor Physical Research Laboratory	Study of Solarflares Using the YOHKOH Satellite, and Ground-Based Observations in India	Prof. Takeo Kosugi Professor Institute of Space and Astronautical Science	2002/3/3~ 2002/3/17 (15 days)
	Prof. R.P.Singh Professor Indian Institute of Technology	Light Scattering and Its Use in Monitoring Aerosol and Terrestrial Remote Sensing	Prof. Tadashi Mukai Professor Kobe University	2001/12/16~ 2001/12/29 (14 days)
	Prof. Sanjeev Dhurandhar Professor Inter-University Centre for Astronomy and Astrophysics	Gravitational Wave Data Analysis: Searching for Coalescing Binaries and Continuous Wave Sources	Prof. Nobuyuki Kanda Associate Professor Miyagi University of Education	2002/1/16~ 2002/1/30 (15 days)
	Dr. Anil Kumar Pandey Doctor State Observatroy Nain tal	CCD Photometry in a Wide Field around Open Clusters	Prof. Katsuo Ogura Professor Kokugakuin University	2001/11/14~ 2001/11/28 (15 days)
(FY2002)	Prof. B.S.Acharya Professor Tata Institute of Fundamental Research	Feasibility Study on High Energy Gamma Rays Measurement with Large Telescope at Hanle	Prof. Saburo Kawakami Professor Osaka City University	2003/03/19~ 2003/03/29 (11 days)

No. of Project	Name & Affiliation	Research Subject	Main Host Researcher	Period
Project 1 (FY2002)	Prof. R.Manchanda Professor Tata Institute of Fundamental Research	Development of X-ray Instrumentations for X-ray Astronomy	Prof. Kojun Yamashita Professor Nagoya University	2003/02/19~ 2003/03/02 (12 days)
	Prof. Hemant Dave Professor Physical Research Laboratory	Sub-Millimeter Wave Facility	Prof. Hiroshi Shibai Professor Nagoya University	2003/03/15~ 2003/03/29 (15 days)
	Prof. D.K. Ojha Doctor Tata Institute of Fundamental Research	Activities Related to Far-and Near-Infrared Astronomy	Prof. Hiroshi Shibai Professor Nagoya University	2003/01/06~ 2003/01/20 (15 days)
	Prof. Uddin Wahab Astronomer Department of Science and Technology State Observatory	Study of Solar Flares	Prof. Takeo Kosugi Professor Institute of Space and Astronautical Science	2003/01/05~ 2003/01/19 (15 days)
	Prof. Asoke Kumar Sen Reader Department of Physics Assam University	Investigation of the Light Scattering by Irregular Shaped Particles	Prof. Tadashi Mukai Professor Kobe University	2003/01/22~ 2003/01/29 (8 days)
	Prof. Ranjan Gupta Professor Inter-University Centre for Astronomy and Astrophysics	Present/Discuss the T-Matrix Calculations Recently Carried Out by Indian PI in Context of Understanding the Interstellar Extinction Observed Curves from Out Milky-Way, LMC and SMC etc.	Prof. Tadashi Mukai Professor Kobe University	2003/03/12~ 2003/03/20 (9 days)
	Prof. Sanjeev Dhurandhar Professor Inter-University Centre for Astronomy and Astrophysics	Astronomical Observations with Advanced Technologies	Prof. Nobuyuki Kanda Professor Osaka City University	2002/12/15~ 2002/12/22 (8 days)
(FY2003)	Prof. Dorje Angchuk Engineer Indian Institute of Astrophysics	Ground-Based Astronomy from Hanle	Prof. Munetaka Ueno Professor University of Tokyo	2004/03/09~ 2004/03/18 (10 days)
	Prof. S.C. Tonwar Professor Tata Institute of Fundamental Research	Ground-Based Astronomy from Hanle	Prof. Saburo Kawakami Professor Osaka City University	2004/03/06~ 2004/03/24 (19 days)

No. of Project	Name & Affiliation	Research Subject	Main Host Researcher	Period
Project 1 (FY2003)	Prof. P.C. Agrawal Professor Tata Institute of Fundamental Research	X-ray Astronomy	Prof. Kojun Yamashita Professor Nagoya University	2003/10/28~ 2003/11/12 (16 days)
	Mr. P.B. Shah Scientific Staff Tata Institute of Fundamental Research	X-ray Astronomy	Prof. Kojun Yamashita Professor Nagoya University	2003/11/1~ 2003/11/15 (15 days)
	Prof. Mrinal Kanti Das Professor University of Delhi	Principal Components Analysis	Prof. Manabu Yuasa Professor Kinki University	2004/03/14~ 2004/03/29 (16 days)
	Prof. Rajmal Jain Professor Physical Research Laboratory	Observational Study of Solar Physics	Prof. Takeo Kosugi Professor Institute of Space and Astronautical Science, Japan Aerospace Exploration Agency	2004/03/07~ 2004/03/21 (15 days)
	Dr. Asoke Kumar Sen Reader Department of Physics Assam University	Observation of Interplanetary Dust Particles	Prof. Tadashi Mukai Professor Kobe University	2004/03/20~ 2004/03/27 (8 days)
	Prof. Sanjeev Dhurandhar Professor Inter-University Centre for Astronomy and Astrophysics	Development of Gravitational Wave Detector	Prof. Nobuyuki Kanda Professor Osaka City University	2004/03/03~ 2004/03/17 (15 days)
	Prof. Ram Sagar Director State Observatory Naini Tal	CCD Photometry in a Wide Field around Open Clusters	Prof. Katsuo Ogura Professor Kokugakuin University	2003/09/13~ 2003/09/21 (9 days)