

REPORT OF THE SCIENTIFIC HIGHLIGHTS OF IAU SYMPOSIUM 296

In 2011 the Scientific Organizing Committee proposed to IAU that an IAU Symposium be held in India. The organizers subsequently selected the venue of the Symposium at The Fort Raichak on the banks of river Ganga south of the city of Kolkata in eastern India.

The unifying theme of this Symposium was the interaction of supernovae with their environments, i.e. both interstellar and circumstellar mediums. New observations spanning the entire electromagnetic spectrum have caused the study of supernovae (SNe) and supernova remnants (SNRs) to advance at a rapid pace. Automated synoptic surveys have increased the detection rate of supernovae manyfold and have led to discovery of highly unusual supernovae. Observations of gamma rays from SNRs with ground-based Cherenkov telescopes and the Fermi telescope have given us new insights into particle acceleration in supernova shocks. Far-infrared observations from the Spitzer and Herschel observatories have revealed much about the properties and fate of dust grains in SNe and SNRs. Multi-wavelength surveys have provided new insights into the influence of SNe on the ecosystems of galaxies.

Their diversity of core collapse SNe in terms of their light curves and spectral evolution is determined largely by the history of mass loss from the progenitor star, which determines the distribution of circumstellar matter and the structure of the star immediately before it explodes. The remarkable SN2009ip shows that the some supernova progenitors have major episodes of mass loss only a few years before they finally explode. The impact of the explosion debris with the extended stellar envelope may result in a supernova of exceptional luminosity, such as SN2006gy. Explosions of stars with extended circumstellar envelopes give rise to X-ray and radio supernovae. Such systems blur the distinction between SNe and SNRs. Alternatively, if the supernova progenitor has lost most of its envelope and has become a relatively compact star, the explosion may be sub-luminous, as is the case of SN1987A. A strong stellar wind from a blue giant progenitor to a supernova may create a cavity in the circumstellar environment, displacing the interstellar matter to great distance from the supernova. Thus, the evolution of the supernova progenitor may have a great influence on the subsequent evolution of X-ray and radio emission from the SNR. Moreover, supernova explosions can stimulate star formation by compressing interstellar gas and can also help to terminate star formation by dispersing gas in star-forming molecular clouds. Supernovae in low-density regions, such as superbubbles or galactic bulges, cannot effectively radiate energy therefore may drive global outflows, affecting the galactic ecosystem.

The meeting consisted of talks by invited and contributing speakers. Many young researchers presented exciting new results in oral presentations and poster sessions. Apart from professional astronomers, graduate students and advanced undergraduates with strong interest in astronomy took part in the meeting. Participants came from many countries of north and south as well as from all regions of India.

The scientific program started with a session on SN 1987A, the nearest SN in recent times in the Large Magellanic Cloud and continued with recent developments of supernova models and surveys to find new supernovae. Almost all aspects of research on different types of core-collapse supernovae and their interactions with the surrounding medium, including observational studies of light curves and spectra in the radio, mm, optical, UV, X-ray and gamma-ray bands using many ground and space based telescopes and facilities were presented at the Symposium. There was also an impromptu session on SN 2009ip where research in progress was discussed. Work on various aspects of Supernova Remnants (as a young supernova ages and develops full-scale interaction with the interstellar medium), how they affect galactic outflow, star formation and superbubbles and large scale structure of the host galaxies, acceleration of high energy cosmic rays were presented in the five days of the meeting. The unifying theme of the Symposium was the physics of shocks and the observations of their radiation in both SNe and SNRs. The website of the conference at: <http://www.tifr.res.in/~iau296/> has many details of the scientific program and rationale, names of the members of the Scientific Organizing Committee, talks and posters presented at the Symposium etc. It also has a link to the video and audio recordings of the talks arranged according to the scientific sessions. These recordings will remain deployed at the above site for sometime.

Cambridge University Press published the Proceedings of the Symposium 296 "Supernova Environmental Impacts" in February 2014.

All delegates stayed in the same Hotel Complex during the meeting, which significantly enhanced the interactions both formal and informal among the participants. Many individuals and organizations helped in innumerable ways to make the IAU Symposium 296 a successful scientific meeting in a rural setting in the state of West Bengal. Generous funding was received from the International Astronomical Union, Tata Institute of Fundamental Research, Mumbai, Indian Institute of Astrophysics, Bangalore and the Indian National Science Academy, New Delhi.


Richard McCray and Alak Ray

On behalf of the Scientific Organizing Committee

April 2014

Talks . Scientific Program

Day 1, Monday 7 January 2013				Speaker		Chair
09:00 - 09:15		Symposium opening		Roger Chevalier + Alak Ray		
09:15 - 09:45	1.1.1	SN 1987A		Claes Fransson	I-29	Cesarsky
09:45 - 10:15	1.1.2	HST observations of SN 1987A: Evolution of the Reverse Shock and the Transition to a Supernova Remnant		Kevin France	I-07	
10:15 - 10:33	1.1.3	25 years of Infrared Observations of SN 1987A		Patrice Bouchet	C-33	
10:33 - 11:05		Tea				
11:05 - 11:35	1.1.4	Radio Observations of SN1987A		Lister Staveley Smith	I-25	Podsiadlowski
11:35 - 11:53	1.1.5	The Radio Remnant Of Supernova 1987A At High Frequencies And High Resolution		Giovanna Zanardo	C-34	
11:53 - 12:23	1.1.6	Recent developments in Supernova Models		Kenichi Nomoto	I-22	
12:23 - 12:53	1.2.1	Supernova Rates and Surveys		Enrico Cappellaro	I-01	
12:55 - 14:30		Lunch				
14:30 - 16:00		Poster viewing session				
16:00 - 16:30		Tea				
16:30 - 17:00	1.2.2	Binary Effects on Supernovae		Philipp Podsiadlowski	I-13	Cherchneff
17:00 - 17:18		Recent Developments in Supernova Research with VLBI		Norbert Bartel	C-10	
17:18 - 17:36		Early UV/Optical Emission of core-collapse Supernovae		Melina Bersten	C-30	
17:36 - 17:54	1.2.4	A Comparative Study of Late-time Light Curves of Type Ic Supernovae		Kuntal Misra	C-11	
17:54 - 18:12	1.2.5	SNIC interacting with CSM		Massimo Turatto	C-25	
18:15 - 18:45		Break				
18:45 - 19:30		An impromptu session on SN 2009ip				Chevalier

Day 2, Tuesday 8 January 2013					
09:00 - 09:30	2.1.3	Superluminous Supernovae			
09:30 - 10:00	2.1.7	Supernova Optical Observations and Theory	Robert Quimby	I-27	Turatto
10:00 - 10:18	2.1.4	Light Curve Modeling of Superluminous Supernovae	Keiichi Maeda	I-12	
10:18 - 10:36	2.2.6	Distance determination to six nearby galaxies using type IIp supernovae	Takashi Moriya	C-16	
10:36 - 11:05		Tea	Subhash Bose	C-32	
11:05 - 11:35	3.2.6	Young Supernova Remnants			
11:35 - 12:05	2.1.8	X-rays from core collapse supernovae	Roger Chevalier	I-06	Staveley-Smith
12:05 - 12:23	1.1.6	A tale of two shocks revealed in X-rays: SN 2004d	David Pooley	C-26	
12:23 - 12:41	1.1.7	Radio observations of nearby type II-P SN 2012aw	Alak Ray	C-04	
12:41 - 13:00	1.2.1	The optical photometric and spectroscopic investigation of Type IIp supernova 2012A	Naveen Yadav	C-07	
13:00 - 14:30		Lunch	Rupak Roy	C-27	
14:30 - 15:00	2.2.1	Short-lived radionuclides in the solar system: the massive star connection			
15:30 - 15:48	2.2.4	Progenitor mass constraints through spatial correlations with host galaxy star formation	Mathieu Gounelle	I-18	Wang
15:48 - 16:18	3.1.3	An Astronomical Time Machine : Light Echoes from Supernovae and eruptions	Joseph Anderson	C-31	
16:20-16:50		Tea	Armin Rest	I-14	
16:50 - 17:20	2.1.1	Circumstellar interaction in Type IIa supernovae			
17:20-17:38	2.1.2	Early optical evolution of some recent type IIa SNe	Poonam Chandra	I-03	Fransson
			Firoza Sutarla	C-24	
18:00-19:15		Cultural Program: Classical Indian Dance, Odissi genre	Sharmila Biswas & group		

Day 3, Wednesday 9 January 2013				
09:00 - 09:30	3.1.1	The dusty debate: core-collapse supernovae and dust	Rubina Kotak	i-10
09:30 - 09:48	3.1.2	Molecules and Dust in the ejecta of Type II-P supernovae	Isabelle Cherchneff	c-21
09:48 - 10:06	3.1.4	Autopsy of the Core-Collapse Supernova Remnant Cassiopea A	Dan Milisavljevic	c-06
10:06-10:24	3.1.5	The Cygnus Loop Supernova Remnant	Ravi Sankrit	c-09
10:25 -11:00		Tea		
11:00-11:18	3.1.6	A three-dimensional view of Balmer-dominated shocks in the remnants of SN1006 Tycho and FH Ser	Sladana Nikolic	c-15
11:18-11:48	3.1.7	Molecular Environments of SNRs	Yang Chen	i-04
11:48-12:06	3.1.8	The molecular emission from the shocked regions in SNRs	Antoine Gusdorf	c-20
12:06-12:24	3.1.9	SRAO CO Observation of 11 Supernova Remnants in $l = 70^\circ$ to 190°	Il-Gyo Jeong	c-18
12:24 - 12:42	3.2.1	Searching OB Runaway Stars Inside Supernova Remnants; Discovery of a BBV Type Runaway Star in SNR Gamma Cygni	Baha Dincel	c-13
12:42-14:30		Lunch		
14:30 - 15:00	3.2.2	The distribution of Galactic SNRs	David Green	i-08
15:00 - 15:18	3.2.3	Discovery of new supernova remnants with GMRT	Subhashish Roy	c-22
15:18 - 15:48	3.2.4	Polarization observations of large supernova remnants	Jinlin Han	i-19
15:48 - 16:04	3.2.5	Discovery of supernova remnants in the Sino-German lambda 6cm polarization survey of the Galactic plane	Xuyang Gao	c-29
16:04 - 16:35		Tea		
16:35 - 17:05	3.2.6	Thermal Infrared Emission from Supernova Remnants	Bon-Chul Koo	i-09
17:05 - 17:23	3.2.7	Infrared survey of supernova remnants in the Large Magellanic Cloud	Ji Yeon Seok	c-23
17:23 - 17:41	3.2.8	The First Systematic Multi-wavelength Survey of Extragalactic Supernova Remnants	Ioanna Leonidaki	c-01
17:41 - 18:45		Poster Discussions: 1 min presentation by each poster presenter	Moderators: Catherine Cesarsky & Somak Raychaudhury	Cesarsky & Raychaudhury

Day 4, Thursday 10 January 2013				
09:00 - 09:30	4.1.1	Thermal X-ray Spectra of SNRs	Patrick Slane	I-28 Nath
09:30 - 10:00	4.1.2	Spatially resolved spectroscopic and multiwavelength imaging studies of SNR Kes 73 hosting the magnetar 1E 1841-045 + SNRs associated with highly magnetized neutron stars (on behalf of Samar Safi Harb)	Harsha Kumar + (on behalf of Samar Safi Harb)	C-05
10:18 - 10:36	4.1.2	Supernova Remnants Stay in Shape	Laura Lopez	C-05
10:36 - 10:54	4.1.3	Tycho supernova remnant: Bridging the discrepancies of its dynamical and emission properties through an interaction history with circumstellar medium	Alexandros Chiotellis	C-02
10:55 - 11:25		Tea		
11:25 - 11:43	4.1.4	X-ray emission from ejecta fragments and protrusions in and around the SN1006, shell	Fabrizio Bocchino	C-12 Vink
11:43-12:13	2.2.5	Supernovae driven galactic outflows	Biman Nath	I-32
12:18 - 12:48	4.1.8	Reprise of the Supershells	Sayan Chakraborti	I-02
12:48 - 14:30		Lunch		
14:30 - 15:00	4.1.7	Supernovae and Star Formation	Gerhard Hensler	I-20 Lu
15:00 - 15:30	4.2.1	Supernovae and the Galactic Ecosystem	Q. Daniel Wang	I-26
15:30 - 15:48	4.2.2	Formation of cold filamentary clumps around superbubbles	Evangelia Ntormousi	C-28
15:48 - 16:18	4.2.3	Non-Thermal X-rays from supernova remnants	Anne Decourchelle	I-05
16:18 - 16:45		Tea		
16:45 - 17:15	4.2.4	Gamma Ray Emission from SNRs	M. Lemoine-Gourard	I-11 Slane
17:15 - 17:33	4.2.5	Fermi-Large Area Telescope and WMAP observations of the Puppis A Supernova Remnant	Marie-Helene Grondin	C-08
17:33 - 17:51		High-resolution spectra of supernova remnants with the Micro-X rocket payload	Enectali Figueroa-Feliciano	C-35
17:51 - 18:09	4.2.6	Modeling of the TeV Gamma-ray Source MGRO J2019+37 in the Cygnus Region Using Multiwavelength Information	Lab Saha	C-14
18:09 - 18:27	4.2.6	The First Fermi-LAT Supernova Remnant Catalog	Theresa Brandt	C-34

Day 5, Friday 11 January 2013					
09:00 - 09:30	5.1.1	Supernova remnants and the origin of cosmic rays	Jacco Vink	i-15	Lemoine-Goumard
09:30 - 09:48	5.1.2	High energy particle acceleration by shocks	Salvatore Orlando (Marco Miceli)	c-17	
09:48 - 10:06	5.1.2	Magnetic field amplification by cosmic rays in supernova remnants	Klara Schure	c-17	
10:06 - 10:36	5.1.3	Interaction of escaping cosmic-rays with molecular clouds	Stefano Gabici	i-16	
10:36 - 10:50	5.1.5	Conference Summary	Roger Chevalier		
10:50 - 11:00	5.1.6	Conference Ends	Organizers		

Final Scientific Program: List of Posters Accepted

s-01 : SN 1987A at 25 years		
p-06	The complex circumstellar environments of SN 1987A	Philipp Podsiadlowski
p-17	Three-dimensional simulations of the expanding remnant of SN 1987A	Toby Potter
s-02 : SNe - Type II, Ibc		
p-15	Light curve morphologies of supernovae type II	Joseph Anderson
p-37	Optical photometric and spectroscopic observations of Type IIP SN 2012aw	Subhash Bose
p-18	Photometric and spectroscopic observations of type IIb SN 2011fu	Shashi B. Pandey
p-25	Low-frequency view of Type IIb SN 2011dh	Naveen Yadav
p-22	The optical studies of Type IIb supernova SN 2011dh	D. K. Sahu
p-30	The luminous Type Ib/c Supernova 2010as	Gaston Folatelli
p-02	The strange case of SN 2011ja and its host	Sayan Chakraborti
p-12	Type Ib Supernova 2007uy – a multiwavelength perspective	Rupak Roy
s-03 : SNe - Type IIn and superluminous SNe		
p-21	The double plateau interacting type IIn supernova 2011A	Thomos De Jaeger
p-23	Optical evolution of plateau Type IIn supernova SN 2005kd	G. C. Anupama
s-04 : SNe - surveys, ensemble properties and multiwaveband observations		
p-03	Spectral analysis of type II supernovae from the Carnegie Supernova Project (CSP)	Claudia Gutierrez
p-19	Using the environment to understand SNe properties	Luis Galbany
p-28	The multi-band optical light curve behavior of core-collapse supernovae	Brijesh Kumar
s-05 : SNe - progenitors and distances		
p-08	GRB Supernova connection	Resmi Lekshmi
p-40	GRBs as luminosity indicator	Rupal Basak

s-06 : SNRs - Gamma-rays		
p-04	On the hadronic gamma-rays from Tycho's SNR	Xiao Zhang
s-07 : SNRs - X-rays		
p-09	An XMM-Newton study of mixed morphology SNR W28	Ping Zhou
p-10	The spatially resolved structures of over-ionized plasma in supernova remnant IC 443	Bing Jiang
p-13	Interpretation of overionized plasma in the supernova remnant W49B	Xin Zhou
p-20	The northwestern ejecta knot of SN1006	Sjors Broersen
s-08 : SNRs - UV, optical, IR and radio		
p-32	First GMRT observations towards the SNR G15.4+0.1/Hess J1818-154 System	Mayuresh Surnis
p-26	Infrared observations of supernova remnant G349.7+0.2	Ho-Gyu Lee
p-05	Near-Infrared Study of Iron Knots in Cassiopeia Supernova Remnant	Yong-Hyun Lee
	Supernova Remnants in the UWISH2/UWIFE Survey	Yong-Hyun Lee
p-35	Kinematic distances of SNRs W44 and W51 and their interaction with interstellar medium	Hongquan Su
s-09 : SNRs - surveys, progenitors, distances		
p-34	X-ray and follow-up multi-wavelength observations of supernova remnants in the Large Magellanic Clouds	Marie-Helene Grondin
p-38	Distances of Galactic supernova remnants	Hui Zhu
p-39	Multi-wavelength modeling of the Young shell-type SNRs using recent Radio, X- and Gamma-ray data	Lab Saha
p-29	RS Oph and the Type Ia supernova connection	Richard Booth
s-10 : SNRs - environments		
p-14	Outer shock interaction with progenitor winds in young core-collapse SNRs	Jae-Joon Lee
p-	Identification of Ambient Molecular Clouds Associated with Galactic Supernova Remnant IC 443	Jae-Joon Lee
p-33	Fast-expanding HI shells associated with supernova remnants in the I-GALFA survey	Bon-Chul Koo

s-11 : SNe - star formation and dust		
p-27	The role of massive stars to the enrichment of carbon in the early Galaxy	Thirupathi Sivavrani
p-31	Heavy elements produced during supernova explosion and their propulsion in the interstellar medium	Rulee Baruah
p-07	IR and submm fluxes of SNe and SNRs revisited : when moderate dust masses suffice	Arkaprabha Sarangi
s-12 : SNe shocks and particle acceleration		
p-01	Relativistic supernovae, their blast waves and particle acceleration	Alak Ray
p-16	Clumping of ejecta and back-reaction of accelerated cosmic rays in the evolution of Type Ia supernova remnants	S. Orlando
p-41	Ultra-high energy particle collisions in curved spacetimes	Mandar Patil
s-13 : SNe and galactic scale dynamics		
p-36	Contribution of pair-instability supernovae (PISN) to the early Galaxy	Susmita Rani Antony
p-42	Galactic winds and the fate of heavy elements in dwarf galaxies – the role of mass and geometry	Gerhard Hensler
s-14 : Historical records of SNe		
p-44	Astronomical significance of an ancient rock art in Kashmir : its supernova significance	Naseer Iqbal
p-45	Indian record for Keplers supernova : Evidence from Kashmir Valley	Tabasum Masood

IAUS 296- Poster Discussions

Order of appearance

Toby Potter
Joseph Anderson
Subhas Bose
Gaston Folatelli
Rupak Roy
Thomas de Jaeger
Claudia Gutierrez
Lluís Galbany
Ping Zhou
Bing Jiang
Xin Zhou
Sjors Broersen
Mayuresh Surnis (G Castelleti)
Ho-Gyu Lee
Yong-Hyun Lee x 2
Marie-Helene Grondin
Richard Booth
Jae-Joon Lee x 2
G Park
Rulee Baruah
Arkaprabha Sarangi
Dipanjan Mitra
A C Pradhan
S Orlando

Posters presented orally also

STATEMENT OF EXPENDITURE FOR IAU GRANT					
HOTEL SUPPORT					
Sr. No.	Name	Amount in Rs.	Country		
1	Birnan Nath	19495	India		
2	Marie Helen Grondin	19495	France		
3	Jinlin Han	19495	China		
4	Somak Ray Chaudhary	19495	India		
5	Gerhard Hensler	19495	Austria		
6	Kenichi Normoto	19495	Japan		
7	Mayuresh Surnis	19495	India		
8	Daniel Q. Wang	19495	USA		
9	Ping Zhou	19495	China		
10	Xin Zhou	19495	China		
11	Lab Saha	19495	India		
12	Firoza Sutaria	19495	India		
13	Subhasish Roy	19495	India		
14	Rulee Baruah	19495	India		
A		272930			

HOTEL SUPPORT			
Sr. No.	Name	Amount in Rs.	Country
1	Bocchino Febrizio	19495	Italy
2	Richard Booth	19495	UK
3	Sjors Broersoen	19495	The Netherlands
4	Alexandros Chiotellis	19495	The Netherlands
5	Thomas De Jaeger	19495	Chile
6	Lluís Galbany	19495	Portugal

2	Paid for Travel Support C	733950	1389131						
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