

CURRICULUM VITAE

Alak K. Ray

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Education

Ph.D. (Physics)	Columbia University	1979
M.A. (Biology)	Columbia University	1975
M.S. (Physics)	University of Delaware, Newark	1973
B.Sc. (Physics Honours)	Presidency College, Calcutta	1970

Membership of Professional Societies

Member of the International Astronomical Union	since 1985
Life Member, Astronomical Society of India	since 2001

Academic Positions

Senior Professor, T.I.F.R.	2011-
Professor, Associate Professor, Reader, Fellow, Visiting Fellow, T.I.F.R.	1981-2011
Visiting Scholar, Harvard Smithsonian Center for Astrophysics	Fall 2010
Visiting Professor, West Virginia University	Spr 2011
NAS/NRC Senior Research Associate, NASA/GSFC	1996-1998
Postdoctoral Research Associate, Univ California, Irvine	1979-1981

Fellowships, Grants, Telescope Time allocations etc

Principal Investigator (PI) and Co-PI of Astrophysics grants to TIFR during Five Year Plans (VIII to XII Plans) 1992-2016

PI and Co-I of Guest Observer programs for projects on SNe & pulsars with Chandra X-ray Observatory (2011); Gemini North Telescope (8m optical) (2011); XMM Newton Observatory; Rossi X-ray Timing Explorer; Advanced Satellite for Cosmology and Astrophysics; ESO Very Large Telescope (8.2m optical); Giant Metrewave Radio Telescope (2001-2013); Very Large Array & Expanded Very Large Array (2011)

Co-investigator: NSF project under the India-US Science Cooperation (TIFR & Univ. Chicago) Investigations on Supernova Physics 1987-1992
I.A.U. Travel Fellowship: Exchange of Astronomers 1986
National Science Talent Search Scholar (Govt of India) 1967-1971

Mentoring Students & Postdoctoral Scholars

Postdoctoral:

Dr. Manjari Bagchi (Postdoctoral scholar, TIFR), Postdoctoral Research Associate, West Virginia University, USA; ICTS-TIFR, Bangalore 2007-2013

Ph.D:

N. Rathnasree (Director, Nehru Planetarium, New Delhi) PhD: 1992
F. K. Sutaria (Reader, Indian Institute of Astrophysics, Bangalore; Postdoctoral Fellow, Penn State Univ; formerly Humboldt Fellow, TU Munich, Germany) PhD: 1997
P. Chandra (Reader, National Centre for Radio Astrophysics, TIFR, Pune, Jansky Postdoctoral Fellow NRAO, Virginia, 2005-2008) PhD: 2005
S. Chakraborti (Junior Fellow, Harvard Soc of Fellows 2012-15) PhD: 2012
N. Yadav (PhD student at TIFR) Exp. date of completion: mid 2014

“Trajectories of students”:

All former students continued professional astronomy after their doctoral degree winning international postdoctoral fellowships. FKS was offered Japan Society of Promotion of Science Fellowship at Univ of Tokyo, apart from Humboldt Fellowship. PC was offered Bolton Fellowship at Australia Telescope National Facility apart from the Jansky Fellowship of the National Radio Astronomical Observatory tenable at any U.S. academic institution. She was awarded the 2006 Young Scientist Award (for scientists under the age of 35) of the Indian National Science Academy for research work carried out in India, and the Young Scientists Prize of the International Union of Pure and Applied Physics (IUPAP Commission on Astronomy) in 2010. Sayan Chakraborti is a Junior Fellow (Postdoctoral appointment) at the Harvard Society of Fellows from August 2012. Naveen Yadav is the recipient of the Shyama Prosad Mukherjee Fellowship (doctoral stage) of the Council of Scientific & Industrial Research 2009-2014.

Summer Students (VSRP):

Ranjit Gadgil, (M.Sc. Phys), Indian Inst. Technology, Kanpur	1992
Roshan Kamat, (B.E. Electrical Engg) Bombay University	1995
Shweta Sundararajan, (M.Sc. Physics), IIT Madras	2001
Disha Sawant (M.Sc. Physics) Bombay University	2010
Nalini Krishna (Integrated BSc-MSc) Pondicherry University	2013

Teaching: Graduate courses at TIFR, Joint Astronomy Program of Indian Inst Sci, Bangalore & MSc (Physics) Bombay Univ 1985-2010

Introductory Astronomy & Astrophysics
Topical Course on First Stars & First Galaxies in the Epoch of Reionization
Electrodynamics (and Electricity and Magnetism)
Statistical Mechanics
High Energy Astrophysics

Undergraduate course at West Virginia University: Spring 2011
Descriptive Astronomy 106 (science & non-science majors Freshman to Grad students)

Invited Lectures at Advanced Schools:

School on synthesis of elements in stars: Kodaikanal Observatory	Apr 2008
School & Workshop: Low Energy Nucl Astroph, Saha Inst, Kolkata	Jan 2006
Einstein Symposium, Physics Dept, Visva Bharati, Santiniketan	Jan 2006
5th SERC School on Nuclear Physics at Panjab Univ, Chandigarh	Feb 2002
SERC School: Stellar Astrophysics, Vainu Bappu Obs, Kavalur	1994

Member, Subject Board of Physics 2005–2007
Coordinator, Student Admission: Ph.D Program 2004–2006

Organization of Professional Meetings & Conference

International Astronomical Union Symposium 296: “Supernova Environmental Impacts” at Raichak on Ganges near Calcutta	Jan 2013
School & Workshop on “Supernovae & Gamma-Ray Bursts at low z & in the Epoch of Reionization”, Darjeeling	May 2008
Scientific Organizing Committee member “Supernova 1987A: Twenty Years After: SNe and GRBs” Aspen, Colorado	Feb 2007
Int. Workshop on Supernovae, Pulsars & GRBs, Bombay	Jan 2004
Organized School & Workshop: Supernovae & Stellar Evolution, Goa	1989

Other Professional Activities and Experience

Science reviewer of proposals for time on a space-borne X-ray Telescope and ground-based radio and optical telescopes.

Referee for an AAS journal and other astronomy journals.

I have written, maintained & updated computer codes (Fortran) to simulate stellar collapse, neutrino matter interactions and other weak-interaction processes in supernovae. I have experience of analyzing data from X-ray astronomy satellites.

Member, Faculty search committee, Dept. of Astron & Astrophys, TIFR 2004-2006

Member Nominating Committee, Exec Council of Astronomical Society of India 2003

Public Understanding of Science:

“New stars and cosmic explosions early in the last millennium” in “Mother India”, -- Alak Ray, Monthly Review of Culture, Sri Aurobindo Ashram, Pondicherry, Sept. & Oct., p 741 and p 814 (2000). See also website:

http://www.tifr.res.in/~akr/crab_webtifr.html

Our group’s work have been reported by the media in:

CERN Courier, 24 Feb, 2010 “SN 2009bb: where are the gamma rays?”

Indian Express, March 6, 2011

http://epaper.indianexpress.com/IE/IEH/2011/03/06/ArticleHtmls/06_03_2011_017_015.shtml

Deccan Herald, March 6, 2011

www.deccanherald.com/content/141766/einsteins-still-right.html

Scientific Publications (in Journals, February 2014):

1. **Electron Cooling in a Young Radio Supernova: SN 2012aw** – Naveen Yadav, Alak Ray, Sayan Chakraborti et al., 2014 ApJ, 782, 30
2. **The progenitor of SN 2011ja: Clues from circumstellar interaction** – S. Chakraborti; A. Ray; R. Smith et al., 2013 ApJ 774, 30
3. **A Reverse Shock in GRB 130427A** – T. Laskar, et al., 2013 ApJ, 776, 119
4. **X-ray emission from SN 2004dj: A Tale of Two Shocks** – S. Chakraborti, N. Yadav, A. Ray, R Smith & P Chandra 2012, ApJ, 761, 100
5. **Radio Detection of Green Peas: Implications for Magnetic Fields in Young Galaxies** – S. Chakraborti, N. Yadav, C. Cardamone, A. Ray, 2012, ApJ, 746, L6
6. **Mapping the galactic center with gravitational wave measurements using pulsar timing** – B. Kocsis, A. Ray & S. Portegies Zwart, 2012, ApJ, 752, 67
7. **Ultra High Energy Cosmic Ray Acceleration in Engine-driven Relativistic Supernovae** – S. Chakraborti, A. Ray, A. Soderberg, A. Loeb & P. Chandra 2011, Nature Comm. 2:175 DOI:10.1038/ncomms1178
8. **Baryon Loaded Relativistic Blast Waves in Supernovae** – S. Chakraborti & A. Ray 2011, ApJ 729, 57

9. **An Expanding Neutral Hydrogen Supershell Evacuated by Multiple Supernovae in M101** –*S. Chakraborti & A. Ray* 2011, ApJ 728, 24
10. **A relativistic type Ibc supernova without a detected γ -ray burst**—*A. M. Soderberg, S. Chakraborti, et al.*, 2010, Nature 463, 513
11. **The High-metallicity Explosion Environment of the Relativistic Supernova 2009bb** –*E. M. Levesque, A. M. Soderberg et al.* 2010, ApJ 709, L26
12. **Ruling out Kozai resonance in highly eccentric galactic binary millisecond pulsar PSR J1903+0327**—*A. Gopakumar, M. Bagchi & A. Ray*, 2009, MNRAS 399, L123
13. **Radio Pulsar Binaries in Globular Clusters: Their Orbital Eccentricities and Stellar Interactions** –*M. Bagchi & A. Ray*, 2009, ApJ 701, 1161
14. **X-rays from the Explosion Site: 15 Years of Light Curves of SN 1993J** –*P. Chandra, V. Dwarkadas, A. Ray, S. Immler, D. Pooley*, 2009, ApJ 699, 381
15. **Orbital Eccentricity of Binary Radio Pulsars in Globular Clusters and the Interaction Between Stars** –*M. Bagchi & A. Ray*, 2009, ApJ 693, L91
16. **Eleven Years of Radio Monitoring of the type II_n Supernova SN 1995N** –*P. Chandra, C. Stockdale, et al.*, 2009, ApJ 690, 1839
17. **Results from an Extensive Simultaneous Broadband Campaign on the Underluminous Active Nucleus M81*: Further Evidence for Mass-scaling Accretion in Black Holes** –*S. Markoff et al*, 2008, ApJ 681, 905
18. **Type IIP supernova SN 2004et: a multiwavelength study in X-ray, optical and radio** –*K. Misra, et al.*, 2007, MNRAS 381, 280
19. **Chandra's Tryst with SN 1995N** -- *P. Chandra, A. Ray, E. Schlegel, F.K. Sutaria, & W. Pietsch*, 2005, Ap J., 629, 933
20. **Detection of a radio counterpart to the 27 December 2004 giant flare from SGR 1806 - 20** -- *P. B. Cameron, P. Chandra, A. Ray et al.*, 2005, Nature, 434, 1112
21. **Baby Supernovae through the looking glass at long wavelengths** – *P. Chandra & A. Ray* 2004, Bull. Astr. Soc. India, 32, 223
22. **The late time radio emission from SN 1993J at meter wavelengths** -- *P. Chandra, A. Ray & S. Bhatnagar*, 2004, Ap J., 612, 974
23. **Synchrotron Aging and the Radio Spectrum of SN 1993J** -- *P. Chandra, A. Ray & S. Bhatnagar*, 2004, Ap J, 604, L97
24. **Deep optical observations of the fields of two nearby millisecond pulsars with the VLT** -- *F. K. Sutaria, A. Ray, A. Reisenegger, G. Hertling, H. Quintana and D. Minniti*, 2003 A & A, 406, 245
25. **The nature of prompt X-ray and radio emission from SN 2002ap** -- *F. Sutaria, P. Chandra, S. Bhatnagar & A. Ray*, 2003, A & A 397, 1011
26. **Radio studies of young core collapse supernovae** -- *P. Chandra, A. Ray & S. Bhatnagar*, 2002, Bull. Astr. Soc. India, 30, 755
27. **Chandra and ASCA X-ray observation of Supernova 1979C in NGC 4321** -- *A. Ray, R. Petre, and E. Schlegel*, 2001, Astron. J, 122, 966

28. **Oscillation effects on Neutrinos from the early phase of a nearby Supernova** -- *D. Majumdar, et al.*, 2000, *Int. J. Mod. Phys. A* 15, 2105
29. **Deep optical observations at the position of PSR 1706-44 with the VLT** -- *P. Lundqvist, J. Sollerman, A. Ray, B. Leibundgut & F. Sutaria*, 1999, *A & A*, 345, L15
30. **Nuclear properties in early stages of stellar collapse** -- *F. K. Sutaria, A. Ray, J.A Sheikh & P. Ring*, 1999, *Astron & Astrophys* 349, 135
31. **Centroids of Gamow-Teller transitions at finite temperature in fp-shell neutron-rich nuclei** -- *O. Civitarese & A. Ray* 1999 *Phys Scr*, 59, 352
32. **RXTE observation of PSR1706-44 and implications for theoretical models of pulsar emission** -- *A. Ray, A.K. Harding, & M. Strickman*, 1999, *ApJ*, 513, 919
33. **Half-lives and pre-supernova weak interaction rate for nuclei far away from the stability line**-- *K.Kar, S.Chakravarti, A.Ray & S.Sarkar*, 1998, *J. Phys G*, 24, 1641
34. **Neutrino Spectroscopy of the Early Phase of Nearby Supernovae** -- *F.K. Sutaria and A. Ray*, 1997, *Phys. Rev. Lett.*, 79, 1599
35. **Relativistic Mean Field calculations of nuclear properties in early stages of stellar collapse** -- *F. K. Sutaria, J. A. Sheikh, & A. Ray*, 1997, *Nucl. Phys.*, A621, 375c
36. **Gamow-Teller strength distributions for nuclei in presupernova stellar cores** -- *F. K. Sutaria and A. Ray*, 1995, *Phys. Rev C* 52, 3460
37. **Circulation of matter and evolution of the internal magnetic field in neutron stars** -- *V. Urpin & A. Ray*, 1994, *MNRAS*, 267, 1000
38. **Beta decay rates of fp shell nuclei with $A > 60$ in massive stars at presupernova stage** -- *K. Kar, A. Ray & S. Sarkar* 1994, *Ap. J.*, 434, 662
39. **The bolometric light curve of SN1993J and the nature of its progenitor** -- *A. Ray, K. P. Singh & F. K. Sutaria*, 1993, *J. Astrophys Astron* 14, 53
40. **Evolution of massive binary stars in the LMC and its implications for radio pulsar population** -- *N. Rathnasree & A. Ray*, 1992, *J. Astrophys Astron* 13, 3
41. **Neutral and charged current mediated neutrino heating of supernova shocks and Supernova 1987A** -- *A. Ray & K. Kar*, 1992, *Astrophys Lett. & Comm*, 28, 271
42. **Beta decay rates of fp shell nuclei in advanced evolutionary stages of presupernova stars** -- *K. Kar, S. Sarkar & A. Ray*, 1991, *Phys Lett B* 261, 217; erratum: 1992, *Phys Lett B* 277, 528
43. **Evolution of binary stars in the LMC with helium enrichment** -- *A. Ray and N. Rathnasree*, 1991, *M.N.R.A.S.*, 250, 453
44. **The formation and detection of strongly magnetic white dwarf binaries in Globular Clusters** -- *G. Chanmugam, A.Ray and K. P. Singh*, 1991, *Ap J.*, 375, 600
45. **Strongly magnetic white dwarf binaries in globular clusters** -- *A. Ray & G. Chanmugam*, 1990, *Ap J. Letters*, 350, L9
46. **Genesis of globular cluster pulsars** -- *A Ray & W Kluzniak* 1990 *Nature* 344, 415
47. **Preheating of unshocked material by electron neutrino burst in core bounce supernovae** -- *A. Ray & K. Kar*, 1989 *Phys Rev Lett*, 63, 2435

48. **Formation of millisecond pulsars in the Globular Clusters** -- *A. Ray & A. Kembhavi*, 1988, *Mod. Phys. Lett.*, A3, 229
49. **Evolution of tidal capture binaries** -- *A. Ray, A. Kembhavi & H.M. Antia*, 1987, *Astron. Astrophys.*, 184, 164
50. **Late time neutrino heating and energetics of stalled shocks in type-II Supernovae** -- *A. Ray & K. Kar*, 1987, *Astrophys. J.*, 319, 143
51. **Thermal regeneration of neutron star magnetic fields in binary radio and X-ray pulsars?** -- *A. Ray & A. Kembhavi*, 1985, *MNRAS*, 217, 753
52. **General relativistic effects of rotation on the structure and surface redshifts of fast pulsars** -- *B. Datta, R.C. Kapoor & A. Ray*, 1984, *BASI*, 12, 343
53. **Electron capture supernovae: One zone collapse calculation for stars with masses 10 Msun and 15 Msun** -- *A. Ray, S.M. Chitre & K. Kar*, 1984, *Ap. J.*, 285, 766
54. **Rotating neutron star structure: implications of the millisecond pulsar PSR 1937+214** -- *A. Ray & B. Datta*, 1984, *ApJ*, 282, 542
55. **Rotational and orbital evolution of cataclysmic binaries containing magnetic white dwarfs** -- *G. Channugam & A. Ray*, 1984, *ApJ*, 285, 252
56. **Lower bounds of neutron star mass and moment of inertia implied by the millisecond pulsar** -- *B. Datta & A. Ray*, 1983, *MNRAS*, 204, 75p
57. **Electron capture during gravitational collapse of a type II Supernova** -- *K. Kar and A. Ray*, 1983, *Phy. Lett.*, A96, 322
58. **Some characteristics of a rapidly rotating, magnetised neutron star** -- *A. Ray and S.M. Chitre*, 1983, *Nature*, 303, 409
59. **Sufficient condition for the weak minimum of a functional depending on n functions and their derivatives** -- *A. Ray*, 1983, *J. Math. Phys.*, 24, 1395
60. **A boundary coupled generalization of the Newcomb stability criterion** -- *A. Ray and G. Van Hoven*, 1982, *Phys. Fluids*, 25, 1355
61. **Hydromagnetic stability of solar coronal arcades: effects of photospheric line-tying** -- *A. Ray & G. Van Hoven*, 1982 *Solar Phys*, 79, 353
62. **Electron-Positron Cascades in pulsar outer-gaps**-- *A. Ray & G. Benford*, 1981, *Phys. Rev. D*23, 2142
63. **Thermal conduction across neutron star crusts and cooling of young neutron stars** -- *A. Ray*, 1981, *Nucl. Phys.* A356, 523
64. **An unstable solution of hydromagnetic equations in an infinite plasma cylinder and pulsar magnetic fields** -- *A. Ray*, 1980, *Phys. Fluids*, 23, 898
65. **Conformational flexibility and Protein folding** -- *B. Honig, A. Ray and C. Levinthal*, 1976, *Proc. Nat. Acad. Sci. (USA)* 73, 1974