

Tapas Kumar Das

Research Summary:

During 2006 - 2007, I have been working mainly on the following areas:

1. Topological Hamiltonian dynamics.
2. Analogue gravity.
3. Accretion phenomena as an autonomous dynamical system.
4. Chaotic features of black hole accretion.
5. Galactic centre astrophysics.
6. Microblazers.

Publications:

1. Das, Tapas Kumar, Bilić, Neven, & Dasgupta, Surajit, *Black-Hole Accretion Disc as an Analogue Gravity Model*, *Journal of Cosmology & Astroparticle Physics*, **06**, 009, (2007)
2. Goswami, Sanghamitra, Khan, Saba Nasreen, Ray, Arnab Kumar, & Das, Tapas Kumar, *Axisymmetric black hole accretion in the Kerr metric as an autonomous dynamical system*, *Monthly Notices of the Royal Astronomical Society*, **378**, 1407, (2007)
3. Mandal, Ipsita, Ray, Arnab Kumar, & Das, Tapas Kumar, *Critical properties of spherically symmetric black hole accretion in Schwarzschild geometry*, *Monthly Notices of the Royal Astronomical Society*, **378**, 1400, (2007)
4. Barai, Paramita & Das, Tapas Kumar, *Characterizing general relativistic transonic astrophysical accretion in Kerr black holes*, *Proceedings of the XXIII Texas Symposium on Relativistic Astrophysics*, Melbourne, Australia, 11th - 15th December, 2006, **To Appear**, (2007)
5. Chaudhury, Soumini, Ray, Arnab Kumar, & Das, Tapas Kumar, *Critical properties and stability of stationary solutions in multi-transonic pseudo-Schwarzschild accretion*, *Monthly Notices of the Royal Astronomical Society*, **373**, 146, (2006)

Preprints:

1. Bilić, Neven, Das, Tapas Kumar, & Ray, Suhrita, *Analogue gravity effects in pseudo-Schwarzschild shocked accretion disc*, (Submitted).
2. Bhattacharaya, Atri, Ray, Arnab Kumar, Bhattacharjee, Jayanta Kumar, Das, & Tapas Kumar, *Critical dynamics of quasi-viscous transonic black hole accretion*, (In preparation).
3. Moscibrodzka, Monica, Das, Tapas Kumar, & Czerny, Bozena, *On determination of the spin of the Galactic centre black hole*, (In preparation).
4. Dasgupta, Surajit, Das, Tapas Kumar, & Rao, A. R., *Possible identification of Cygnus X-3 as a Galactic microblazar*, (In preparation).
5. Das, Tapas Kumar, & Czerny, Bozena, *Chaotic features of multi-transonicity and its effects on microvariability*, (In preparation).

Visits to other Institutes:

1. Presidency College, Calcutta, India, February, 2007.
2. PRL, India, August - September, 2006 & February, 2007.
3. IACS, India, December, 2006.
4. Visva Bharati University, India, December, 2006.
5. Burdwan University, India, December 2006.
6. TIARA, Taiwan, March - May 2006.
7. NCU, Taiwan, April, 2006.

Invited Lectures/Seminars:

1. *Accretion processes onto astrophysical black holes*, Presidency College, Calcutta, February, 2007.
2. *Black hole accretion as dynamical systems*, a multi-lecture course in the Third SERC School on Non-linear Dynamics, December 4th - 23rd, 2006, Indian Association for Cultivation of Science, Calcutta, India.
3. *On the current trend in research in astrophysical science*, orientation course at Burdwan University, Burdwan, India, December, 2006.

4. *What is black hole accretion?*, popular science lecture at Burdwan University, Burdwan, India, December, 2006.
5. *Astrophysics around black hole*, popular science lecture at Visva Bharati University, Santiniketan, India, December, 2006.
6. *Transonic Properties of Relativistic Accretion*, PRL, India, August, 2006.
7. *Black Hole Astrophysics*, colloquium at National Central University, Taiwan, April, 2006.
8. *Transonic properties of astrophysical accretion*, colloquium at Academia Sinica, Taiwan, April, 2006.
9. *Dependence of relativistic accretion on black hole spin*, Academia Sinica, Taiwan, April, 2006.

Other Activities:

1. Mentoring project students:

(a) May - June 2006

- i. Saba Nasreen Khan, M.Sc. 1st year, IIT Delhi.
- ii. Atri Bhattacharya, M.Sc. 1st year, IIT Bombay.
- iii. Suhrita Ray, M.Sc. 1st year, IIT Bombay.
- iv. Sanghamitra Goswami, M.Sc. 1st year, IIT Bombay.

(b) Sept - Oct. 2006:

- i. Tanushree Basu, M.Sc. 1st year, Calcutta University.

Several manuscripts, co-authored with the above students, are accepted/ submitted/ under preparation, see list of publications for further detail.

2. Teaching & Lecture Course:

- (a) Taught 'Classical Mechanics' at HRI graduate school (Aug. - Dec.) in 2006. I developed this course as 'Mechanics on manifold', which deals with a study of Lagrangian and Hamiltonian dynamics on manifold, using the framework of differential geometry and topology.
- (b) A lecture course on *Black hole accretion as dynamical systems*, a multi-lecture course in the Third SERC School on Non-linear Dynamics, December 4th - 23rd, 2006, Indian Association for Cultivation of Science, Calcutta, India.

3. Reviewing papers: Served as the referee for the following papers:
 - (a) Two papers submitted to the Classical and Quantum Gravity.
 - (b) Two papers submitted to the Astrophysical Journals.
 - (c) One paper submitted to the Monthly Notices of the Royal Astronomical Society.

4. Journal Club Review Talk & HRI Internal Seminar:
 - (a) *See a black hole on a shoestring*, Journal Club talk, November, 2006.
 - (b) *Analogue Gravity Phenomena*, HRI internal symposium, March, 2007.

5. HRI Internal Duty:
 - (a) Served as a member in the computer committee (till 31st July, 2006).
 - (b) Serving as a member of the Sports and Entertainment Committee and the Medical Committee from 1st August, 2006.