

COMMITTEE ON CENTRES

GENERAL

1. Name of the Center : **Centre for Theoretical Physics**
(as per the Statute/Ordinance)

2. Year of establishment : **2006**

3. If it an Academic/Research : **Research**

4. Major Objectives of the Center :
(As per the Proposal/Ordinance)
 - Promote scientific research, advanced teaching and training areas of theoretical physics particularly Cosmology and High Energy Physics.
 - Provide a forum for interaction among scientists, research workers, teachers and students involved in these disciplines with each other and also among national and international experts in those areas.
 - Provide research facilities to individual workers or research groups, especially to those who are deprived of such facilities for extended periods.
 - Create an atmosphere of scientific awareness, motivation for new ideas and interdisciplinary research.
 - To disseminate knowledge of recent advances in Theoretical Physics on a popular level among students and general public with a view to inculcate scientific temper which is essential to build a modern society in India.

5. Are the objectives for which the Centre was established judiciously follows : **YES**

6.
 - i. If No, Please specify the deviations.
 - ii. Kindly note the reference if any approval obtained for the deviations.

ADMINISTRATIVE ASPECTS

1. Administrative positions with the Center

<i>S.No.</i>	<i>Name of the Position</i>	<i>Actual Position(s) at Present</i>	<i>No. of Positions Sanctioned by UGC</i>	<i>Positions provided by the University other than Sanctioned by the UGC</i>
1.	Assistant Registrar	--	--	--
2.	Section Officer	--	--	--
3.	Senior PA	--	--	--
4.	Office Assistant	--	--	--
5.	PA	--	--	--
6.	UDC	1	--	--
7.	Stenographer	--	--	--
8.	LDC	--	1	--
9.	Peon/Farrash	--	--	1

ACADEMIC ASPECTS

3. Types of Activities (Teaching/Research) : **Research & Post Graduate Teaching**

A. TEACHING

4. Courses offered, if any

a. Name of the course

i. **Ph.D - Two semester Graduate School Course**

b. Objective

At present there is a large gap between current research in frontline areas and level of university curriculum. This two semester course is intended to bridge this gap.

c. When was first batch admitted? **2007**

d. Duration of each course **4 – 5 years**

e. Teaching hours (per week) **15 hours/week**

f. Is the course sanctioned by UGC/CDE* **UGC**

g. Name the Courses which are Regular/Self-financing? **Regular**

h. If PG course, is it recognized as a course for NET? **N.A.**

5. Faculty Positions

<i>S.No.</i>	<i>Faculty Positions</i>	<i>Sanctioned by UGC</i>	<i>Others (As provided by Jamia)</i>
1.	Chair	--	--
2.	Visiting Professors	--	--
3.	Professors	2	--
4.	Associate Professors	2	--
5.	Assistant Professors	1	--
6.	Research Assistants	--	--
7.	System Administrator	1	--
8.	Computer Operator	1	--

6. Teaching work load, if any (hours/week):

Total 15 hours/week (9 hours lecture / 6 hours tutorials)

7. Academic Contributions (after joining Jamia)

a. Number of Books/Monographs published: **NIL**

- i. Title(s)
- ii. Publisher

b. Number of Research Paper Published, in

- i. International Journals **35**
- ii. National Journals **1**
- iii. Edited Books **Nil**
- iv. Monographs **Nil**

c. International/National Conferences/Seminars/Workshops organized by Centre

S.No.	Major Theme	Duration	National/International	Collaborative/Funding Agency(ies)	Number of Participants
1.	Inaugural Day Seminar	1 day	National	Jamia	30
2.	The 24th IAGRG Meeting	4 days	International	Jamia & IUCAA(UGC)	150
3.	One-day Meeting on Perspectives in High Energy Physics & Cosmology	1 day	National	Jamia & DST	20
4.	Two-days Meeting on Prospects and Problems in Gravitation & Cosmology	2 days	National	Jamia & HRI	25
5.	Workshop (HEPCOS - 2008) High Energy Physics & Cosmology	2 days	National	Jamia	30
6.	Indo-Japan Workshop on Cosmology	1 day	International	JSPS & Jamia	20
7.	1st V.V. Narlikar Memorial Lecture	1 day	National	Jamia	50

List of seminars organized by Centre from 2006 till date are attached

d. International/National Conferences/Seminars/Workshops attended
(Attach individual sheet for each faculty member under following heads)

Individual Sheets for each faculty member are attached

- i. Title of the Conference/Seminar/Workshop attended
- ii. Nature of the Conference/Seminars, i.e. National/International
- iii. Name of the organizing agency/institution
- iv. Nature of participation
- v. Title of the Paper, if presented
- vi. Funding agency for attending the event

B. RESEARCH

7. Field/area of Research : **Gravitation, Cosmology & High Energy Physics**

8. Contributions made in the field of Research

- i. Books published **Nil**
- ii. Research papers published
 - a. In International Journals **35**
 - b. In National Journals **1**
- iii. Monographs

C. Linkage Between the Centre & Departments

- I. Faculty members of the Centre are involved in teaching theoretical physics courses in the physics departments.
- II. We also organize regular seminars by experts which benefit faculty and students of the physics department.
- III. Activities under science-outreach program attracts much wider audience from various departments.

9. Number of teachers of the Centre engaged in teaching in allied areas in University Departments with number of teaching hours shared

Sanjay Jhingan	2006-2007	Two Courses (MSc. & B.Sc.)	Physics Department
	2007-2008	One Course (M.Sc.)	Physics Department
	2008-2009	Two Courses (M.Sc.)	Physics Department
Anjan A. Sen	2008-2009	One Course (M.Sc.)	Physics Department
Somasri Sen	2008-2009	One Course (M.Sc.)	Physics Department

10. Status of Join Research carried out with the Staff of the Centre & the other Departments

- 1. Title of the Research Project: “Particle Physics Models of Inflation and Dark Energy and Their Observational Constraints”

	INDIAN SIDE	JAPANESE SIDE
Principal Investigators	M. Sami Centre for Theoretical Physics Jamia Millia Islamia, New Delhi	S. Nojiri Nagoya University Japan
Other Co-Investigators	S. Panda Harish-Chandra Research Institute Allahabad	S. Mizuno Tokyo University Japan
Other P. Co-Investigators	T.R. Seshadri Deptt. of Physics & Astrophysics University of Delhi	T. Shrimizu Tokyo Technical Institute Japan
Other Co-Investigators	N. Dadhich IUCAA, Pune	S. Tsujikawa Gunma Technical Institute Japan

Other Co- Investigators	A.S. Majumdar S.N. Bose Centre, Kolkata	
Other Co- Investigators	Sanjay Jhingan Centre for Theoretical Physics Jamia Millia Islamia, New Delhi	

2. Title of the Research Project: “Brane world cosmology with Quintessence, Phantom fields Dark matter and Dark energy described by non-linear Sigma models”

	INDIAN SIDE	RUSSIAN SIDE
Principal Investigators	M. Sami Centre for Theoretical Physics Jamia Millia Islamia, New Delhi	Chervon Sergey Viktorovich Department of Theoretical Physics, Ulyanovsk State University,
Other Co- Investigators	S. Jhingan Centre for Theoretical Physics Jamia Millia Islamia, New Delhi	S. S. Vladimirovich Ulyanovsk State University
Other P. Co- Investigators	T.R. Seshadri Deptt. of Physics & Astrophysics University of Delhi	Y. A. Valerianovich Ulyanovsk State University
Other Co- Investigators	N. Dadhich IUCAA, Pune	F. I. Vladimirovich Ulyanovsk State University

3. Title of the Research Project: DST Project on Theoretical Cosmology

Principal Investigators	M. Sami Centre for Theoretical Physics Jamia Millia Islamia, New Delhi
Other Co-Investigators	S. Jhingan Centre for Theoretical Physics Jamia Millia Islamia, New Delhi
Other Co-Investigators	Deepak Jain (DU), Abha Dev (DU)

4. Title of the Research Project: UGC Major Research Project on “Accelerating Universe and its observational signatures”

Principal Investigator	Dr. Anjan Ananda Sen
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5. Foreign Collaborations

Indian Side	International Side
Dr. M Sami	Prof. S. Nojiri Department of Physics Nagoya University Nagoya, Japan
Dr. M. Sami	Prof. S. Tsujikawa Department of Physics Tokyo University of Science Tokyo, Japan
Dr. M. Sami	Prof. T. Shiromizu Department of Physics University of Tokyo Tokyo, Japan

Dr. Sanjay Jhingan	Prof. Takahiro Tanaka Yukawa Institute for Theoretical Physics Kyoto University Kyoto, Japan
Dr. Sanjay Jhingan	Prof. Jesus Ibanez Department of Theoretical Physics University of Basque Country Bilabo, Spain
Dr. Sanjay Jhingan	Prof. S. Nojiri Department of Physics Nagoya University Nagoya, Japan
Dr. Anjan Ananda Sen	Prof. Robert Scherrer Deptt. of Physics Vanderbilt University Nashville – USA
Dr. Anjan Ananda Sen	Prof. Diego Pavon Statistical Physics Group Autonomous University of Barcelona Barcelona, Spain
Dr. Anjan Ananda Sen	Dr. Emmanuel Sarikadis University of Athens Greece

6. Future Plans for Collaborative research:

- i. Prof. M. Sami, Prof. S.G. Ghosh & Prof. Mitskievich from Maxico – Project Submitted to DST
- ii. Prof. S.G. Ghosh, Prof. M. Sami – Submitted to UGC
- iii. Bharat Ratra, Kansas University, US – proposed exchange program of faculty & research scholars
- iv. Dr. Sanjay Jhingan has applied for a Project under Indo-US Frontier of Science Programme (Prof. T. Souradeep is Principal Investigator)
- v. Dr. Anjan Ananda Sen of Centre for Theoretical Physics, Jamia Millia Islamia, Prof. Debasish Ghoshal of J.N.U. and Prof. Debajyoti Choudhury of Delhi University submitted to Department of Science & Technology (DST) – Project Submitted
- vi. Future collaboration plan of Centre for Theoretical Physics with Indian Neutrino Observatory Project, TIFR, Mumbai under guidance of Dr. Rathin Adhkari of Centre for Theoretical Physics, Jamia Millia Islamia.

FINANCIAL ASPECTS

1. Budget allocation during X Plan

i.	Non-recurring (in Rs.)		
	a.	Staff	10,00,000
	b.	Buildings	60,00,000
	c.	Equipments	18,00,000
ii.	Recurring		17,00,000

2. Utilization of the Budget allocated during X Plan

i.	Non-recurring (in Rs.)		
	a.	Staff	10,00,000
	b.	Buildings	60,00,000
	c.	Equipments	18,00,000
ii.	Recurring		17,00,000

3. Budget allocation during XI Plan

i.	Non recurring (in Rs.)		
	a.	Staff	
	b.	Building	
	c.	Equipments	14,00,000
ii.	Recurring (Others)		14,00,000

4. Utilization of the Budget allocated during XI Plan

i.	Non-recurring (in Rs.)		
	a.	Staff	
	b.	Building	
	c.	Equipments	5,01,911
ii.	Recurring (Others)		9,43,978

M. Sami

Conference/Seminar/Workshop Participations:

1. Invited talk on “Workshop on Brane Worlds” held in Portsmouth from 18 September to 30 September, 2006.
(International)
2. Invited talk on “Cosmological relevance of scaling solutions”, delivered at Titech, Japan on June 28, 2007.
(International)
3. Invited talk on “Dark Energy” delivered at Deptt. Of Physics, University of Nagoya, Japan on 7th May, 2008.
(International)
4. Invited talk on “Dark Energy” at ‘DAE High Energy Physics Symposium’ held at Banaras Hindu University in October 2008
(National)
5. Invited talk on “Dark Energy: What could it be?” at IPMU international conference on dark energy, Japan from June 22 to June 26, 2009
(International)
6. Invited talk on “Dark Energy and its possible alternatives” on First IUCAA Reunion Meeting – 2009 on Gravitation and Astronomy: Frontiers in Theory and Observation from August 11 - 14, 2009, at IUCAA, Pune.
(National)
7. Invited talk on “Understanding the cosmic acceleration” on 17th September, 2009 at HRI, Allahabad.
(National)

Dr. Sanjay Jhingan

Conference Participation:

- 1. International Conference on Gravitation and Cosmology, IUCAA, Pune**
(International) [**Workshop chairman**]
Title of Seminar: Problems in Classical General Relativity and Gravitational Waves: A review
Funding: UGC
- 2. Scientific Advisory Council meeting of Inter-University Centre for Astronomy and Astrophysics, Pune**
(International)
Title of Seminar: Recent developments in Gravitation and Cosmology
Funding: UGC
- 3. Gravitation and Astronomy : Frontiers in Theory and Observation (July 2008)**
(International)
Title of Seminar: Measuring statistical isotropy violation of CMB
Funding: UGC
- 4. Indian GW experimental effort -- Scope & feasibility, Pune**
(International)
Title: It was a discussion meeting and I presented feasibility report on developing theoretical studies related to space Based gravitational wave experiment (LISA) in India
Funding: UGC
- 5. Indo-US symposium of frontiers of science, Agra**
(International)
Title of Seminar: It was a discussion meeting and I participated in the Astrophysics and Cosmology session.
Funding: National Science Foundation, USA.

Invited Seminars

1. Delivered a seminar titled “Singularities and horizons” at Yukawa Institute for Theoretical Physics, Japan
2. Delivered a seminar titled “Scaling solutions in cosmology” at Deptt. of Theoretical Physics, University of Basque Country, Spain

Dr. Anjan Ananda Sen

Conference/Seminar/Workshop Participations:

1. i) Workshop on Cosmology and Strings
 ii) Nature of Conference: International.
 iii) Name of the organization: I.C.T.P, Trieste, Italy
 iv) Nature of participation: Invited.
 v) Funding agency: I.C.T.P, Trieste Italy.

2. i) Research Visit
 ii) Nature of Visit: International.
 iii) Name of the Institution: Statistical Physics Group, University of Barcelona, Spain.
 iv) Nature of Participation: Invited as Visiting Professor.
 v) Funding Agency: University of Barcelona at Bellaterra, Spain

3. i) Workshop on Cosmology and Strings
 ii) Nature of the Conference: National.
 iii) Name of the institution: I.I.T. Kharagpur.
 iv) Nature of the participation: Invited.
 v) Title of the Paper: Brane World Inflation.
 vi) Funding Agency: I.I.T. Kharagpur.

4. i) CMB-LSS Workshop.
 ii) Nature of Conference: International.
 iii) Name of the Institute: IUCAA, Pune, India.
 iv) Nature of Participation: Invited.
 v) Title of the paper presented: Nonminimally Coupled K-Field.
 vi) Funding Agency: IUCAA, Pune, India

5. i) Research Visit (Theoretical Physics Seminar Circuit, DST, Govt of India)
 ii) Nature of visit: National.
 iii) Name of the Institute: P.R.L. Ahmedabad, India
 iv) Nature of participation: Invited
 v) Title of presentation: Thawing Model with nearly flat potential
 vi) Funding Agency: P.R.L. Ahmedabad.

6. i) Research Visit (Theoretical Physics Seminar Circuit, DST, Govt of India)
 ii) Nature of visit: National.
 iii) Name of the Institute: S.N. Bose Center for Basic Sciences, Kolkata
 iv) Nature of participation: Invited.
 v) Title of presentation: Thawing Model with nearly flat potential
 vi) Funding Agency: S.N. Bose Center, Kolkata

7. i) Research Visit
 ii) Nature of Visit: International.
 iii) Name of the Institute: CERN, Geneva, Switzerland
 iv) Nature of participation: Invited.
 v) Funding Agency: CERN, Geneva, Switzerland.

8. i) Research Visit.

- ii) Nature of Visit: International
 - iii) Name of the Institution: I.C.T.P., Trieste, Italy.
 - iv) Nature of participation: Invited.
 - v) Title of the paper presented: Thawing Quintessence with nearly flat potential.
 - vi) Funding Agency: I.C.T.P. Trieste, Italy.
- 9.
- i) Teaching Assignment.
 - ii) Nature of visit: National.
 - iii) Name of the institution: S.G. Khalsa College, Delhi University
 - iv) Nature of participation: Guest Faculty for S.E.R.C School in High Energy physics,
Organised by D.S.T. Govt of India.
 - v) Title of the Course: General Relativity and Cosmology
 - vi) Funding Agency: D.S.T., Govt. of India.
- 10.
- i) Invited Lecture at Delhi University Physics Dept, Visitor's Program..
 - ii) Nature of lecture: National.
 - iii) Name of the institution: Delhi University.
 - iv) Nature of Participation: Invited.
 - v) Title of the paper: Dark Energy and Late time acceleration of universe.
 - vi) Funding Agency; Delhi University.

Dr. Rathin Adhikari

1.
 - i. “Meeting on Indian Neutrino Observatory (INO)” [9-10 Mar, 2009]
 - ii National
 - iii Department of Atomic Energy & Deptt. of Physics, University of Delhi
 - iv Discussion & Collaboration
 - v Possible Collaboration of Jamia Millia Islamia with INO
 - vi Jamia Millia Islamia

2.
 - i. “Indian neutrino Observatory - Collaboration meeting” [13-14 Apr, 2008]
 - ii National
 - iii Department of Atomic Energy, Govt. of India
 - iv Discussion
 - v N.A
 - vi Jamia Millia Islamia

3.
 - i. “Workshop on Nu-Horizons” [13-15 Feb, 2008]
 - ii International
 - iii Harish-Chandra Research Institute (HRI), Allahabad & Other DAE Institutes
 - iv attended
 - v N.A
 - vi HRI

4.
 - i. “International conference - Strong Frontier 2009” [January 12-18, 2009]
 - ii International
 - iii Poornaprajna Institute of Scientific Research (PISR), Bidalur, Bangalore & Centre for High Energy Physics (CHEP), IISc., Banaglore
 - iv attended
 - v N.A
 - vi PISR & CHEP

5.
 - i. “International conference - ‘NuHoRIzons-09’” [6-9 January, 2009]
 - ii International
 - iii HRI, Allahabad
 - iv Delivered lecture
 - v Seesaw Neutrino Mass & New U(1) Symmetry
 - vi HRI, Allahabad

6.
 - i. “International conference ‘NuGoa09’ on aspects of neutrino” [8-15 April, 2009]
 - ii International
 - iii Department of Atomic Energy, TIFR
 - iv Delivered lecture
 - v Seesaw Neutrino Mass & Extra U(1) Symmetry
 - vi Department of Atomic Energy, TIFR

SEMINARS GIVEN BY THE VISITORS IN PAST THREE YEARS

Current Session	05
2008-2009	24
2007-2008	18
Total	47

Current:

1. **The Standard Model of Cosmology ... and Open Questions**
PROF. BHARAT RATRA, Kansas State University, U.S.A
2. **Warped compactification & the quest for a realistic cosmology**
Ishwaree Neupane University of Canterbury, New Zealand
3. **International Astronomy Year Celebration [How thick is our galaxy?]**
Prof. Sabyasachi Chatterjee India Institute of Astrophysics, Bangalore
4. **Warped braneworld models -- some key issues**
Soumitra SenGupta, Department of Theoretical Physics Indian Association for the Cultivation of Science, Kolkata
5. **On Geometry, Topology and Physics**
S. Afsar Abbas, Centre for Theoretical Physics, Jamia Millia Islamia

During 2008-2009

1. **Molecules in Cool Cosmic Objects**
Suresh Chandra
2. **Inhomogeneous Perfect Fluid Universe with electromagnetic field in Lyra's manifold.**
Dr. Anirudh Pradhan, Hindu Post-Graduate College, Ghazipur, U.P
3. **Self Similarity and Nucleon Structure Function at Small Bjorken x**
Prof. Dilip K. Choudhury, Deptt. of Physics, Gauhati University, Guwahati
4. **Neutrino masses: from present knowledge to questions for the future**
Dr. Silvia Pascoli, University of Durham, U.K.
5. **Reliable predictions from Quantum Cosmology ?**
Golam M Hossain, Institute for Gravitation and The Cosmos, Penn State University, USA
6. **Lightest supersymmetric Neutral Higgs in the extra dimensional scenario**
Dr. Swarup Majee, Harish-chandra Research Institute, Allahabad
7. **A Solution to the Puzzle of Magnetars**
Prof. Vikram Soni, National Physical Laboratory, New Delhi

8. **Nonuniform Circular Ensembles**
Sandeep Kumar, School of Physical Sciences, JNU, New Delhi
9. **A New Fundamental Duality in Quantum Mechanics**
Prof. S. Afsar Abbas, Centre for Theoretical Physics, JMI
10. **Local fermionic dark matter with mass dimension one**
D. V. Ahluwalia, Cheng-Yang Lee, D. Schritt, University of Canterbury, New Zealand
11. **Universal Forces and the Dark Energy Problem**
Prof. S. Afsar Abbas, Centre for Theoretical Physics, JMI
12. **Black Hole Evaporation and Information loss**
Dr. Madhavan Varadarajan, Raman Research Institute, Bangalore
13. **Hologravity**
Prof. Stefan Theisen, Albert Einstein Institute, Potsdam, Germany
14. **Black Holes in Higher Derivative AdS Gravity**
Dr. Dumitru Astefanesei, Albert Einstein Institute, Potsdam, Germany
15. **Gravitino Production in an Inflationary Universe and Implications for Leptogenesis**
Dr. Raghavan Rangarajan, Physical Research Laboratory, Ahmedabad
16. **Why do we live in four dimensions?**
Prof. Naresh Dadhich Inter-University Centre for Astronomy & Astrophysics, Pune
17. **Physics of Time Travel**
Prof. Deshdeep Sahdev, Department of Physics, IIT Kanpur
18. **Parity Violation to Nobel 2008**
Prof. Sandip Pakvasa, Dept. Of Physics and Astronomy, University of Hawaii, USA
19. **Abelian 2-Form Gauge Theory: Recent Developments**
Prof. R.P. Malik, Department of Physics, BHU
20. **Exact Inflation and Cosmological Parameters**
Sergey Chevron, Ulyanovsk State University, Russia
21. **New Physics at the LHC: Prejudice and Prospects**
Prof. Biswarup Mukhopadhyaya, Harish-Chandra Research Institute, Allahabad
22. **Non-Gaussianity of the CMB temperature fluctuations**
Pravabati Chingambam, Korea Institute for Advanced Study, Seoul, South Korea
23. **Cosmic Microwave Background Radiation & Relativistic Heavy Ion Collisions**
Ajit M. Srivastava, Institute of Physics, Bhubaneswar
24. **Geometric Tachyons**
Prof. S. Panda, Harish-Chandra Research Institute, Allahabad

During 2007-2008

1. **String Cosmology**
Prof. J. Maharana, Institute of Physics, Bhubaneswar
2. **Slow-fast-slow role transitions during inflation and their signatures in the power spectrum.**
Dr. P. Chinganbam
3. **Gravity: A 100 years after Einstein's happiest thought**
Prof. S. Wadia, TIFR, Mumbai
4. **From Newton's Laws to Feqnmán's Dream**
A.N. Mitra
5. **Gravity and Higher Dimensions**
N. Dadhich, IUCAA, Pune
6. **Probing New Physics at the International Linear Collider With Polarized Beams**
Dr. B. Ananthanarayan, Centre for High Energy Physics, IISc, Bangalore
7. **Kinematical formalism of elementary spinning particles**
Prof. Martin Rivas, Department of Theoretical Physics, University of The Basque Country, Spain
8. **Can we see naked singularities?**
Dr. Shrirang Deshingkar, HRI, Allahabad
9. **Einstein's Gravity Under Pressure**
Prof. Ram Gopal Vishwakarma, Universidad Autónoma de ZacatecasZAC (MEXICO)
10. **"Accelerating Universes and String Theory"**
Prof. Ishwaree Neupane, University of Canterbury, New Zealand
11. **Inflationary Universe & String Theory**
Dr. Jaydeep Majumder, Helsinki Institute of Physics, University of Helsinki, Finland
12. **Supermassive Black Holes**
Prof. Ajit Kembhavi, IUCAA, Pune
13. **Core Nucleus Dynamics in \bar{U} - Hypernuclei**
Prof. Q.N. Usmani
14. **Testing Dark Matter with Neutrino**
Dr. Sergio Palomares - Ruiz, University of Durham, United Kingdom
15. **Utility of a Special Second Scalar Doublet**
Prof. Ernest Ma, Physics & Astronomy Deptt., University of California, Riverside, USA
16. **A_4 Symmetry and Neutrinos**
Prof. Ernest Ma, Physics & Astronomy Deptt., University of California, Riverside, USA
17. **The Large Hadron Collider - New Challenges in a New Era**
Prof. Biswarup Mukhopadhyaya, Harish-Chandra Research Institute, Allahabad
18. **"The Culture of Non-Commutativity in Mathematics and Physics"**
Prof. Tulsi Dass, ISI, Delhi