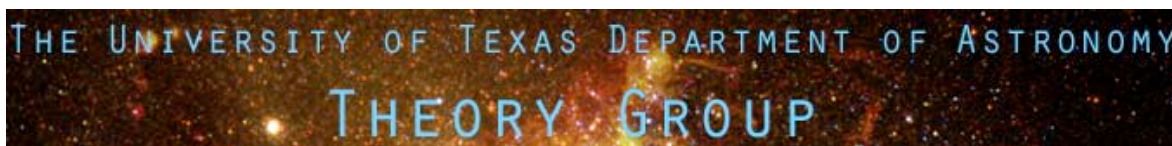


Last Updated: February 20, 2009



The **Theory Group** consists of faculty, research scientists, postdoctoral fellows and graduate and undergraduate students working on a broad range of problems in theoretical astrophysics and cosmology, such as:

- **Stellar Astrophysics**
 - Supernovae J.C. Wheeler
 - Gamma-ray Bursts P. Kumar
 - White Dwarfs D. Winget
 - Neutron Stars R. Duncan
 - Asteroseismology P. Kumar & D. Winget
- **Planetary Sciences**
 - Planet Formation S. Dodson-Robinson & J. Scalo
 - Astrobiology J. Scalo & J.C. Wheeler
- **Cosmology**
 - Structure Formation P.R. Shapiro & E. Komatsu
 - First Stars & Galaxies V. Bromm & P.R. Shapiro
 - Early Universe E. Komatsu & P.R. Shapiro
 - Fundamental Physics S. Weinberg
- **Extragalactic Astrophysics**
 - Active Galactic Nuclei G. Shields & M. Milosavljevic
 - Clusters of galaxies M. Milosavljevic
 - Sup-massive Blackholes M. Milosavljevic
- **Galactic Evolution**
 - Milky Way Evolution J. Scalo, P.R. Shapiro & J.C. Wheeler
 - ISM & Star Formation V. Bromm, J. Scalo & P.R. Shapiro

The group has weekly events to discuss current research of its members and interesting research problems in the astronomical community.

- **Theory Seminars**
 - Scientific talks given by the group members and visitors
- **Astrophysics Lunches**
 - Informal lunch-time discussion meetings

FACILITIES

The members of the Theory Group have access to the state-of-the-art supercomputing facilities at the Texas Advanced Computing Center (TACC).

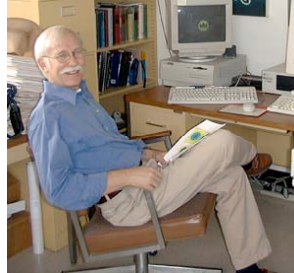
- **RANGER** (ranger.tacc.utexas.edu)
 - 3,936 nodes with 4 quad-core AMD Opteron processors
 - $3,936 \times 4 \times 4 = 62,976$ compute cores
 - 32GB memory per node (125TB total)
 - Primary storage shared by all nodes = 1.73PB
 - Local storage per node = 8GB (31.4TB total)

- **LONESTAR** (lonestar.tacc.utexas.edu)
 - 1,460 nodes with 2 dual-core Xeon processors (Dell PowerEdge)
 - $1,460 \times 2 \times 2 = 5,840$ compute cores
 - 8GB memory per node (11.6TB total)
 - Local storage per node = 73GB (106.5TB total)
 - Global storage = 70TB

- **STAMPEDE** (stampede.tacc.utexas.edu)
 - 217 nodes with 2 quad-core Intel Clovertown processors
 - $217 \times 2 \times 4 = 1,736$ compute cores
 - 8GB memory per node (1.74TB total)
 - Shared storage = 536GB
 - Local storage = 520GB (total)
 - Global storage = 68TB

STELLAR ASTROPHYSICS

SUPERNOVAE



J. Craig Wheeler, Professor

Current Research Activities

- Theory and Observations of Supernovae
- Numerical Simulations of Supernova Explosions
- Stellar Evolution
- Astrobiology

Members

- Jozsef Vinko (Visiting Research Fellow); Dave Pooley (Visiting Research Fellow); Howie Marion (Part-time Research Fellow)
- Sean Couch (Graduate student); Manos Chatzopoulos (Graduate student); Daniel Kagan (Graduate student); Vincent Johnson (Undergraduate student)

GAMMA-RAY BURSTS



Pawan Kumar, Professor

Current Research Activities

- Theory of Gamma-ray Bursts
- Helioseismology
- Tidal Interaction
- Accretion Disks

Members

- Rongfeng Shen (Graduate student); Rodolfo Barniol Duran (Graduate student)

WHITE DWARFS



Donald Winget, Professor

Current Research Activities

- Asteroseismology of White Dwarfs
- Extra-solar Planetary Systems around White Dwarfs
- Cosmochronology
- Whole Earth Telescope

Members

- Mike Montgomery (Research scientist)
- Elizabeth Jeffery (Graduate student); Steve DeGennaro (Graduate student); Ross Falcon (Graduate student)

NEUTRON STARS & MAGNETARS



Robert Duncan, Research Scientist

Current Research Activities

- Theory of Neutron Stars & Magnetars
- Soft Gamma-ray Repeater Outbursts
- Pulsars
- Dynamos and Astrophysical Magnetic Fields
- Quasar Absorption Lines

PLANETARY SCIENCES

ASTROBIOLOGY



John Scalo, Professor

Current Research Activities

- Galactic Evolution & Interstellar Medium
- Turbulence
- Cosmic-ray Transport
- Astrobiology
- Planetary Atmospheric Evolution; Habitable Planets

PLANET FORMATION



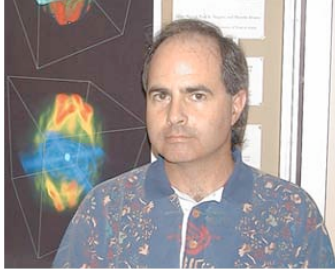
Sarah Dodson-Robinson, Assistant Professor

Current Research Activities

- Planet Formation and Solar Nebula Chemistry
- Planet Discoveries
- Composition of Extra-solar Planet Hosts

COSMOLOGY

STRUCTURE FORMATION



Paul R. Shapiro, Professor

Current Research Activities

- Cosmic Dark Ages & Reionization of the Universe
- Computational and Analytical Studies of Gas Dynamics and Radiative Transfer
- Numerical Simulations of Galaxy and Large-Scale Structure Formation
- Nature of Dark Matter
- Physical Processes in the Interstellar & Intergalactic Media

Members

- Yi Mao (Postdoctoral Fellow)
- Jun Koda (Graduate student)

FIRST STARS & GALAXIES



Volker Bromm, Associate Professor

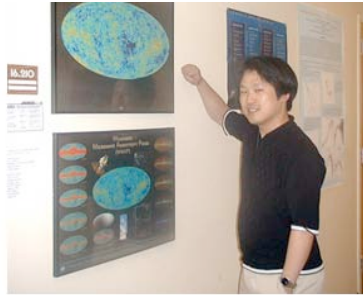
Current Research Activities

- Computational Astrophysics
- Formation and Evolution of the First Generation of Stars, Quasars & Supernovae
- Numerical Simulations of Star Formation and Reionization of the Universe
- Chemical Enrichment in the Intergalactic Medium
- Supermassive Black Holes & Globular Clusters

Members

- Jarrett Johnson (Graduate student); Athena Stacy (Graduate student)

EARLY UNIVERSE



Eiichiro Komatsu, Associate Professor

Chair of the Theory Group

Current Research Activities

- Physics of the Early Universe
- Cosmic Microwave Background
- Nature of Dark Energy & Dark Matter

Members

- Yuki Watanabe (Graduate student); Donghui Jeong (Graduate student); Masatoshi Shoji (Graduate student)

FUNDAMENTAL PHYSICS



Steven Weinberg, Professor

Chair of the Theory Group in the Department of Physics

Current Research Activities

- Physics of Elementary Particles and Unification of Fundamental Interactions
- Quantum Field Theory
- Cosmology

Members

- Raphael Flauger (Graduate student); Joel Meyers (Graduate student)

EXTRAGALACTIC ASTROPHYSICS

ACTIVE GALACTIC NUCLEI



Gregory Shields, Professor

Current Research Activities

- Theory and Observations of Active Galactic Nuclei
- Ionized Nebulae
- Chemical Evolution of Galaxies
- Quasars & Black Holes

Members

- Krista Smith (Undergraduate student)

SUPERMASSIVE BLACKHOLES



Milos Milosavljevic, Assistant Professor

Current Research Activities

- Theory of Active Galactic Nuclei
- Formation and Evolution Supermassive Blackholes
- High-energy Astrophysics
- Clusters of Galaxies

Members

- Meghann Agarwal (Graduate student); Chris Lindner (Graduate student)