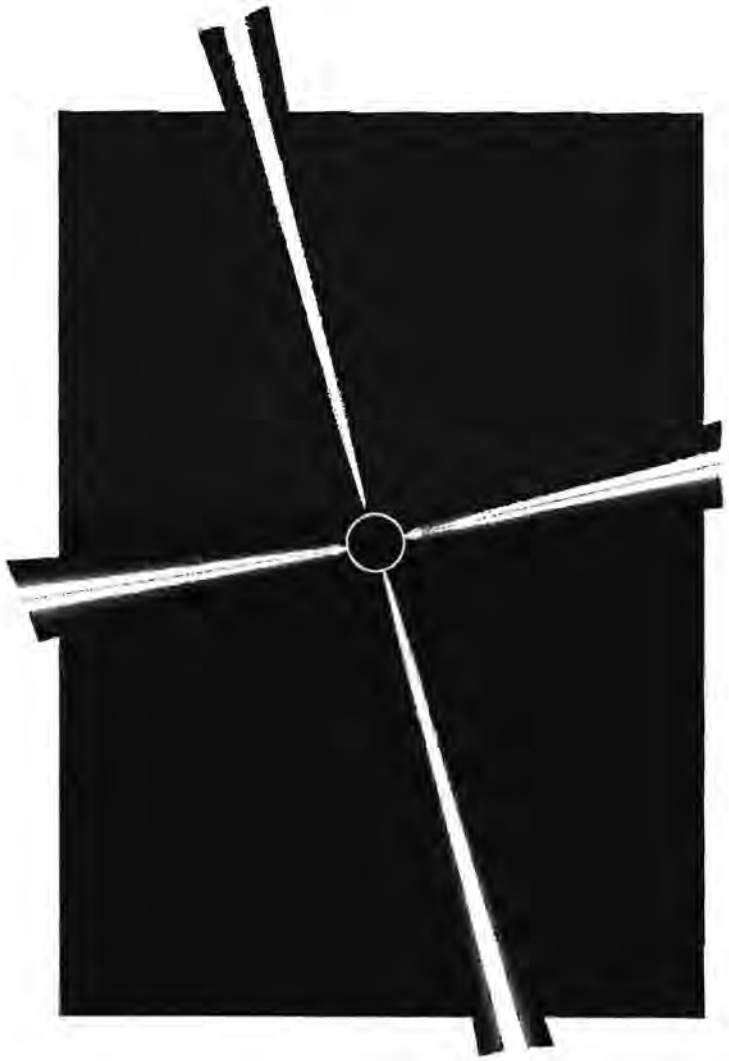
WORKSHOP ON PHYSICS OF ACCRETION DISKS AROUND COMPACT AND YOUNG STARS



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Lunar and Planetary Institute 3600 Bay Area Boulevard Houston TX 77058-1113

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WORKSHOP ON

PHYSICS OF ACCRETION DISKS

AROUND COMPACT AND YOUNG STARS

Edited by

E. Liang and T. F. Stepinski

Held at
Houston, Texas

April 8–10, 1994

Sponsored by
Lunar and Planetary Institute
Rice University

Lunar and Planetary Institute 3600 Bay Area Boulevard Houston TX 77058-1113

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Preface

On April 8–10, 1994, the two-day Workshop on Physics of Accretion Disks Around Compact and Young Stars was held at the Lunar and Planetary Institute. The purpose of the workshop was to bring together workers on accretion disks in the western Gulf region (Texas and Louisiana). Accretion disks are believed to surround many stars. Some of these disks form around compact stars, such as white dwarfs, neutron stars, or black holes that are members of binary systems and reveal themselves as a power source, especially in the X-ray and gamma regions of the spectrum. On the other hand, protostellar disks are believed to be accretion disks associated with young, pre-main-sequence stars and manifest themselves mostly in infrared and radio observations. These disks are considered to be a natural outcome of the star formation process. Historically, these two classes of accretion disk have been studied by two distinct scientific communities, despite the fact that most unsolved problems and shortcomings of accretion disk theory are generic and independent of particular application. Furthermore, there has not been much technical communication between those two communities, and an interdisciplinary exchange of original ideas, specific for each community, becomes very desirable.

The focus of this workshop included theory and observations relevant to accretion disks around compact objects and newly forming stars, with the primary purpose of bringing the two communities together for intellectual cross-fertilization. The nature of the workshop was exploratory, to see how much interaction is possible between distinct communities and to better realize the local potential in this subject. A critical workshop activity was identification and documentation of key issues that are of mutual interest to both communities. Two invited speakers gave review presentations: M. Abramowicz talked about accretion disks around black holes and S. Ruden talked about the theory of protostellar accretion disks. In addition, 26 contributed talks were presented, and Part 1 of this report contains abstracts of these talks. It is likely that most of the participants left the meeting with a new understanding of the commonality of problems facing researchers working on accretion disks in the environments of both compact and young stars.

Program

Friday evening, April 8, 1994

6:00–8:00 p.m. Reception and Registration—Great Room, LPI

Saturday morning, April 9, 1994

8:15 a.m. Registration

8:45–10:15 a.m. **SESSION I**

C. R. O'Dell*
Circumstellar Material Around Young Stars in Orion

P. Hartigan*
Observations of Accretion and Angular Momentum Regulation in Young Circumstellar Disks and the Implications for Planetary Formation

M. Reyes-Ruiz* and T. F. Stepinski
Evolution of Protoplanetary Disks with Dynamo Magnetic Fields

10:15–10:35 a.m. Coffee Break

10:35 a.m.–12:05 p.m. **SESSION II**

J. C. Wheeler*, S.-W. Kim, M. D. Moscoso, and S. Mineshige
The Physics of Black Hole X-Ray Novae

E. P. Liang*
Observational Constraints on Black Hole Accretion Disks

C. Luo*
Nonlinear Calculations of the Time Evolution of Black Hole Accretion Disks

12:05–1:15 p.m. Lunch

* Denotes speaker

Saturday afternoon, April 9, 1994

1:15–3:05 p.m. **SESSION III**

S. Ruden*
Invited Talk—The Theory of Protostellar Accretion Disks

J. E. Tohline*
Gravitational Instabilities in Protostellar Disks

T. F. Stepinski*
Evolution of Dynamo-generated Magnetic Fields in Accretion Disks Around Compact and Young Stars

3:05–4:00 p.m. Coffee Break

4:00–5:30 p.m. **SESSION IV**

M. Tavani* and E. Liang
Nonthermal Accretion Disk Models Around Neutron Stars

P. McCormick*
Evolution of Vaporizing Pulsars

A. M. Rajasekhar*
A Study of Angular Momentum Loss in Binaries Using the Free Lagrange Method

Sunday morning, April 10, 1994

8:45–10:35 a.m. **SESSION V**

M. A. Abramowicz*
Invited Talk—Accretion Disks Around Black Holes

H. Li* and C. D. Dermer
Time-dependent Behavior of Active Galactic Nuclei with Pair Production

H. Vath*
Three-dimensional Radiative Transfer Calculations on an SIMD Machine Applied to Accretion Disks

10:35–11:00 a.m. Coffee Break

11:00 a.m.–12:30 p.m. **SESSION VI**

E. T. Vishniac* and R. C. Duncan
The Dynamics of Flux Tubes in Accretion Disks

J. Cazes*
A Heterogeneous Computing Environment for Simulating Astrophysical Fluid Flows

H. Cohl*
An Efficient Three-dimensional Poisson Solver for SIMD High-Performance Computing Architectures

12:30–1:45 p.m. Lunch

Sunday afternoon, April 10, 1994

1:45 p.m. **SESSION VII**

G. A. Shields* and H. H. Coleman
Thermal Continua of AGN Accretion Disks

K. Barker*
A Twisted Disk Equation that Describes Warped Galaxy Disks

P. Fisher*
The Dynamical Settling of Warped Disks and Angular Momentum Transport in Galaxies

R. Whitehurst*
Gas Dynamics for Accretion Disk Simulations

M. Abramowicz* and S. Ruden*
Concluding Comments

POSTER PRESENTATIONS

C. Meirelles Filho and M. Reyes-Ruiz
Convective Solar Nebula

C. Meirelles Filho and E. P. Liang
Can a Variable Alpha Induce Limit Cycle Behavior and Exponential Luminosity Decay in Transient Soft X-Ray Sources?

M. D. Moscoso and J. C. Wheeler
A Constraint on the Pair Density Ratio (Z_+) in an Electron-Positron Pair Wind

S.-W. Kim, J. C. Wheeler, and S. Mineshige
Disk Irradiation and Light Curves of X-Ray Novas

S.-W. Kim, J. C. Wheeler, F. C. Bruhweiler, M. Fitzurka, K. Beuermann, K. Reinsch, and S. Mineshige
Disk Instability and the Spectral Evolution of the 1992 Outburst of the Intermediate Polar GK Persei

C. Meirelles Filho, M. Reyes-Ruiz, and C. Luo
Rotational Effects in Turbulence Driven by Convection

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