

Table of Contents

Table of Contents	v
Preface	xi
Organizing Committee	xii
List of Participants	xiii

Introduction

D. Sugimoto	
The First Ten Years of GRAPE	1
J. Makino	
The GRAPE project: Current Status and Future Outlook	13

Planetary Formation

S. Ida, E. Kokubo, and J. Kominami	
N-body Simulations of Planet Formation	25
E. Kokubo and S. Ida	
Lunar Accretion from an Impact-Generated Disk	37
E. Griv, E. Liverts, M. Gedalin, and C. Yuan	
Modeling of the Saturnian Ring System	45
M. M. Shara and J. R. Hurley	
Type Ia Supernovae and Planets in Star Clusters	53

Star Formation

R. S. Klessen	
Star Formation from Turbulent Fragmentation	61
A. Whitworth	
Impulsively triggered star formation	71

Star Clusters

D. C. Heggie	
The Gravitational Million-Body Problem	81
R. Spurzem, E. Kim, and H. M. Lee	
The interplay of rotation and relaxation in star clusters and galactic nuclei	93

Stellar Dynamics and Stellar Evolution

D. C. Heggie	
Two collaborative experiments in star cluster evolution	103
J. R. Hurley	
Cluster CMDs from N-body Simulations: Stellar and Binary Evolution on GRAPE	113
R. A. Mardling	
A New Formalism for Studying Three-Body Interactions	123

S. L. W. McMillan Star Cluster Simulations Including Stellar Evolution	131
S. F. Portegies Zwart The formation of intermediate mass black holes	145
Galactic Nuclei	
T. Ebisuzaki Missing Link Found? — The “runaway” path to supermassive black holes	157
D. Richstone Black Holes for Computational Astrophysicists	167
Galactic Dynamics	
E. Athanassoula Isolated and Interacting Galaxies: Simulations with GRAPE	177
M. Bartelmann, K. Dolag, and H. Lesch The Evolution of Magnetic Fields in Galaxy Clusters	189
Y. Funato Evolution of Galaxies in Clusters	199
K. V. Johnston, D. N. Spergel, and C. Haydn Constraining the Distribution of Dark Matter Lumps Around the Milky Way Using Tidal Debris	209
M. D. Weinberg Investigating the long-term evolution of galaxies: Noise, cuspy halos and bars	215
Cosmology	
H. M. P. Couchman and R.J. Thacker The Angular Momentum Problem in CDM Cosmolgies: The End of the Beginning?	227
J. Dubinski, D. Koranyi, and M. Geller The Evolution of Galaxies in Clusters	237
C. S. Frenk Connecting cosmological simulations to the real world	245
J. F. Navarro The Inner Structure of Cold Dark Matter Halos	261
V. Springel and L. Hernquist A multi-phase model for simulations of galaxy formation	273
M. Steinmetz Numerical studies of galaxy formation using special purpose hard- ware	283

Algorithms

S. J. Aarseth	
Regularization tools for binary interactions	295
A. Kawai and J. Makino	
High-Accuracy Treecode Based on Pseudoparticle Multipole Method	305
H. Martel and P. R. Shapiro	
Cosmological Simulations with Adaptive Smoothed Particle Hydrodynamics	315
H. Susa and M. Umemura	
A Simulation of Galaxy Formation by Radiation-SPH	323

Hardware and Software Environments

P. Hut	
The Starlab Environment for Dense Stellar Systems	331
S. Levy	
Interactive 3-D visualization of particle systems with Partiview	343
T. Narumi	
A Special-purpose Computer for Molecular Dynamics Simulations: MDM	349
P. Teuben	
Simulation Software: Then, Now and Virtual Observatory	359

Panel Discussion

D. Sugimoto, E. Athanassoula, and D. C. Heggie	
Panel Discussion	369

Posters

H. Arakida and T. Fukushima	
Long-term integration error of KS regularized orbital motion	375
H. Baumgardt	
Evolution of star clusters moving on elliptic orbits	377
H. M. J. Boffin, N. Francis, and A. P. Whitworth	
High resolution simulations of star formation	379
C. B. Brook, D. Kawata, and B. K. Gibson	
Simulating a White Dwarf dominated Halo	381
G. Carraro, L. Portinari, and C. Lia	
Coupling Chemical Evolution with SPH	383
D. Chakrabarty, J. Murray, G. A. Wynn, and A. R. King	
Warped Accretion Discs	385
H. Daisaka	
<i>N</i> -body Simulations of Planetary Rings	387
D. Fanelli, E. Aurell, and A. Noullez	
Heap-based algorithm and one-dimensional expanding Universe	389

A. S. Font and J. F. Navarro	
Cold Dark Matter Substructure and the Heating of Galactic Disks	391
M. Giersz	
Monte Carlo Simulations of Million Body Star Clusters	393
S. P. Goodwin, A. P. Whitworth, and D. Ward-Thompson	
The evolution of triaxial molecular cores	395
A. Habe and C. Hanyu	
The differential energy distribution of the universal density profile of dark halo	397
T. Hamana, N. Yoshida, and Y. Suto	
Are cosmological N -body simulations reliable on scales below the mean separation length of particles?	399
Y. Hashimoto and J. Makino	
The orbital evolution of satellite galaxies	401
E. Hayashi and J. F. Navarro	
Structural Evolution of Substructure	403
M. Hemsendorf, N. Dorband, and D. Merritt	
Dynamics of supermassive black holes	405
J. Hidaka	
A regularized N-body algorithm for gravitational collapse clustering	407
M. Ideta	
Dynamical Friction between Lopsided Disks and Spherical Halos	409
Y. Imaeda and S. Inutsuka	
The Local Mass Conservation in SPH	411
D. Kawata and B. K. Gibson	
A Numerical Study of the Chemo-Dynamical Evolution of Elliptical Galaxies	413
S. J. Kenyon and B. C. Bromley	
Evolution of Planetesimals in Planetary Debris Disks	415
T. Kitayama, H. Susa, M. Umemura, and S. Ikeuchi	
Radiation-Hydrodynamical Simulations of Primordial Galaxy Formation in the UV Background	417
C. Kobayashi, N. Nakasato, and K. Nomoto	
Chemodynamical Evolution of the Milky Way	419
T. S. Kozhanov and K. A. Omarkulov	
On The Dynamics of Non-Stationary Stellar Cluster in Galaxy	421
A. D. Mackey, M. I. Wilkinson, G. F. Gilmore, and J. R. Hurley	
Core Evolution of Rich Stellar Clusters in the LMC	423
T. Matsuda, H. Mizutani, and H. M. J. Boffin	
Application of DSMC method to astrophysical flows	425
D. Molteni, F. Fauci, G. Gerardi, and M. A. Valenza	
Simulations of disks in binary systems using parallelized SPH to reach extreme spatial resolution	427

M. Nagasawa	
Monopole Evolution in the Early Universe	429
N. Nakasato	
Origin of the galaxy morphology	431
P. M. S. Namboodiri	
The relaxation time in spherical galaxy simulations	433
T. Okamoto and M. Nagashima	
Environmental Effects on Evolution of Cluster Galaxies	435
P.A. Patsis, Ch. Skokos, and E. Athanassoula	
Peanuts in barred analytic potentials	437
I. Pelupessy, V. Icke, and P. van der Werf	
Supernova Feedback in SPH Simulations of Galaxies	439
T. Saitou, A. Habe, and T. Okamoto	
Cloud mass function in a gas rich dwarf galaxy	441
B. Semelin and F. Combes	
Galactic disc formation from cold fractal gas	443
M. Shimada, M. Y. Fujimoto, S. Yamada, and D. Sugimoto	
Surface Abundance Anomalies of Main Sequence Stars in Globular Clusters — A Probe into Interactions between Stars	445
T. Suwa, A. Habe, K. Yoshikawa, and T. Okamoto	
Substructure of Galaxy Clusters and Cosmological Constant	447
K. Takahashi, T. Sensui, Y. Funato, and J. Makino	
Collisional Evolution of Galaxy Clusters: Fokker–Planck and <i>N</i> -body models	449
T. Takeda and S. Ida	
N-body Simulation of the Evolution of a Protolunar Disk	451
M. Takizawa	
SPH Simulations of Galaxy Cluster Mergers	453
J. Tinker and B. Ryden	
Evolution of Merger Remnants with Supermassive Black Holes	455
T. Tsuchiya	
Effect of LMC on the Galactic Warp	457
T. Uenishi, K. Nomoto, and I. Hachisu	
Evolution of Rotating White Dwarfs in Close Binaries and Diversity of Type Ia Supernovae	459
H. Umeda, K. Nomoto, T. G. Tsuru, and T. Nakamura	
Abundance Ratios of M82 and Nucleosynthesis of Hypernovae	461
K. Wada and C. A. Norman	
The Starburst-AGN Connection: 3-D Structure of the Massive Gas Disk around the Nucleus	463
H. Yahagi and Y. Yoshii	
<i>N</i> -body Code with Adaptive Mesh Refinement	465

N. Yoshida, T. Hamana, Y. Suto, and A. Evrard	
Clustering of dark halos on the lightcone	467
K. Yoshikawa	
Stochastic Biasing of Galaxies and Dark Halos in Cosmological	
Hydrodynamic Simulations	469
Author Index	471