

Cambridge University Press

978-0-521-17533-3 - The Local Group as an Astrophysical Laboratory: Proceedings of the Space Telescope Science Institute Symposium, held in Baltimore, Maryland May 5-8, 2003

Edited by Mario Livio and Thomas M. Brown

Frontmatter

[More information](#)

SPACE TELESCOPE SCIENCE INSTITUTE

SYMPOSIUM SERIES: 17

Series Editor S. Michael Fall, Space Telescope Science Institute

THE LOCAL GROUP AS AN ASTROPHYSICAL LABORATORY

The Local Group of galaxies consists of the Milky Way and all of its neighbors. The proximity of these galaxies allows for detailed studies of the processes that have led to the formation of these galaxies, their structures, and their evolution. In particular, studies of the Local Group can test predictions of structure formation that are based on dark energy and cold dark matter. This book presents a collection of review papers, written by world experts, on some of the most important aspects of Local Group Astrophysics. It is an invaluable resource for both professional researchers and graduate students in this cutting-edge area of research.

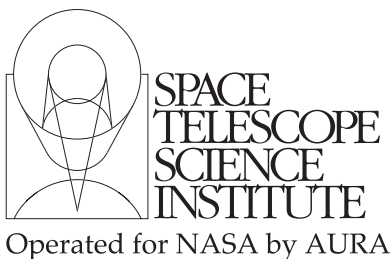
Cambridge University Press

978-0-521-17533-3 - The Local Group as an Astrophysical Laboratory: Proceedings of the Space Telescope Science Institute Symposium, held in Baltimore, Maryland May 5-8, 2003

Edited by Mario Livio and Thomas M. Brown

Frontmatter

[More information](#)



Other titles in the Space Telescope Science Institute Series.

- 1 Stellar Populations
Edited by C. A. Norman, A. Renzini and M. Tosi 1987 0 521 33380 6
- 2 Quasar Absorption Lines
Edited by C. Blades, C. A. Norman and D. Turnshek 1988 0 521 34561 8
- 3 The Formation and Evolution of Planetary Systems
Edited by H. A. Weaver and L. Danly 1989 0 521 36633 X
- 4 Clusters of Galaxies
Edited by W. R. Oegerle, M. J. Fitchet and L. Danly 1990 0 521 38462 1
- 5 Massive Stars in Starbursts
Edited by C. Leitherer, N. R. Walborn, T. M. Heckman and C. A. Norman
1991 0 521 40465 7
- 6 Astrophysical Jets
Edited by D. Burgarella, M. Livio and C. P. O'Dea 1993 0 521 44221 4
- 7 Extragalactic Background Radiation
Edited by D. Calzetti, M. Livio and P. Madau 1995 0 521 49558 X
- 8 The Analysis of Emission Lines
Edited by R. E. Williams and M. Livio 1995 0 521 48081 7
- 9 The Collision of Comet Shoemaker-Levy 9 and Jupiter
Edited by K. S. Noll, H. A. Weaver and P. D. Feldman
1996 0 521 56192 2
- 10 The Extragalactic Distance Scale
Edited by M. Livio, M. Donahue and N. Panagia 1997 0 521 59164 2
- 11 The Hubble Deep Field
Edited by M. Livio, S. M. Fall and P. Madau 1998 0 521 63097 5
- 12 Unsolved Problems in Stellar Evolution
Edited by M. Livio 2000 0 521 78091 8
- 13 Supernovae and Gamma-Ray Bursts
Edited by M. Livio, N. Panagia and K. Sahu 2001 0 521 79141 3
- 14 A decade of *Hubble Space Telescope* science
Edited by M. Livio, K. Noll and M. Stiavelli 2002 0 521 82459 1
- 15 The Dark Universe: Matter, Energy, and Gravity
Edited by M. Livio 2003 0 521 82227 0
- 16 Astrophysics of life
Edited by M. Livio, I. Neill Reid and William B. Sparks
2005 0 521 82490 7

Cambridge University Press

978-0-521-17533-3 - The Local Group as an Astrophysical Laboratory: Proceedings of the Space Telescope Science Institute Symposium, held in Baltimore, Maryland May 5-8, 2003

Edited by Mario Livio and Thomas M. Brown

Frontmatter

[More information](#)

The Local Group as an astrophysical laboratory

Proceedings of the
Space Telescope Science Institute Symposium,
held in Baltimore, Maryland
May 5–8, 2003

Edited by

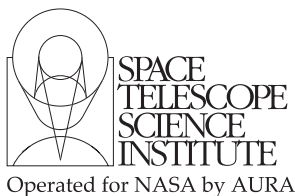
MARIO LIVIO

Space Telescope Science Institute, Baltimore, MD 21218, USA

THOMAS M. BROWN

Space Telescope Science Institute, Baltimore, MD 21218, USA

Published for the Space Telescope Science Institute



 **CAMBRIDGE**
UNIVERSITY PRESS

Cambridge University Press

978-0-521-17533-3 - The Local Group as an Astrophysical Laboratory: Proceedings of the Space Telescope Science Institute Symposium, held in Baltimore, Maryland May 5-8, 2003

Edited by Mario Livio and Thomas M. Brown

Frontmatter

[More information](#)

CAMBRIDGE UNIVERSITY PRESS
Cambridge, New York, Melbourne, Madrid, Cape Town,
Singapore, São Paulo, Delhi, Tokyo, Mexico City

Cambridge University Press
The Edinburgh Building, Cambridge CB2 8RU, UK

Published in the United States of America by Cambridge University Press, New York

www.cambridge.org
Information on this title: www.cambridge.org/9780521175333

© Cambridge University Press 2006

This publication is in copyright. Subject to statutory exception and to the provisions of relevant collective licensing agreements, no reproduction of any part may take place without the written permission of Cambridge University Press.

First published 2006
First paperback edition 2011

A catalogue record for this publication is available from the British Library

ISBN 978-0-521-84759-9 Hardback
ISBN 978-0-521-17533-3 Paperback

Cambridge University Press has no responsibility for the persistence or accuracy of URLs for external or third-party internet websites referred to in this publication, and does not guarantee that any content on such websites is, or will remain, accurate or appropriate.

Cambridge University Press

978-0-521-17533-3 - The Local Group as an Astrophysical Laboratory: Proceedings of the Space Telescope Science Institute Symposium, held in Baltimore, Maryland May 5-8, 2003

Edited by Mario Livio and Thomas M. Brown

Frontmatter

[More information](#)

Contents

<i>Participants</i>	<i>page</i> vii
<i>Preface</i>	xi
History of the Local Group	
<i>S. van den Bergh</i>	1
Primordial nucleosynthesis	
<i>G. Steigman</i>	16
Galactic structure	
<i>R. F. G. Wyse</i>	33
The Large Magellanic Cloud: Structure and kinematics	
<i>R. P. van der Marel</i>	47
The Local Group as an astrophysical laboratory for massive star feedback	
<i>M. S. Oey</i>	72
Hot gas in the Local Group and low-redshift intergalactic medium	
<i>K. R. Sembach</i>	86
Stages of satellite accretion	
<i>M. E. Putman</i>	100
The star formation history in the Andromeda halo	
<i>T. M. Brown</i>	111
Bulge populations in the Local Group	
<i>R. M. Rich</i>	127
The Local Group as a laboratory for the chemical evolution of galaxies	
<i>D. R. Garnett</i>	140
Massive stars in the Local Group: Star formation and stellar evolution	
<i>P. Massey</i>	164
Massive Young Clusters in the Local Group	
<i>J. Maíz-Apellániz</i>	178
Magellanic Cloud planetary nebulae as probes of stellar evolution and populations	
<i>L. Stanghellini</i>	196
The old globular clusters: Or, life among the ruins	
<i>W. E. Harris</i>	208
Chemical evolution models of Local Group galaxies	
<i>M. Tosi</i>	215

Cambridge University Press

978-0-521-17533-3 - The Local Group as an Astrophysical Laboratory: Proceedings of the Space Telescope Science Institute Symposium, held in Baltimore, Maryland May 5-8, 2003

Edited by Mario Livio and Thomas M. Brown

Frontmatter

[More information](#)

Participants

Aloisi, Alessandra	The Johns Hopkins University
Avera, Randy	Randolph Publishing/NASA
Babiuc, Maria Cristina	Technical University “Gh. Asachi” Iasi
Beckwith, Steve	Space Telescope Science Institute
Bennett, David	University of Notre Dame
Bergeron, Pierre	Université de Montréal
Bianchi, Luciana	The Johns Hopkins University
Blair, William	The Johns Hopkins University
Blitz, Leo	Radio Astronomy Laboratory, University of California
Bresolin, Fabio	Institute for Astronomy
Brown, Thomas	Space Telescope Science Institute
Bullock, James	Harvard-Smithsonian Center for Astrophysics
Cacciari, Carla	INAF – Osservatorio Astronomico di Bologna
Chaname, Julio	Chaname Ohio State University
Chandar, Rupali	Space Telescope Science Institute
Christian, Carol	Space Telescope Science Institute
Crowther, Paul	University College London
de Grijs, Richard	University of Cambridge
De Marchi, Guido	Space Telescope Science Institute
Drozdovsky, Igor	University of Pittsburgh
Durrell, Patrick	Penn State Univeristy
Evans, Christopher	Isaac Newton Group of Telescopes
Flint, Kathleen	Carnegie Institution of Washington – DTM
Forestell, Amy	University of Texas at Austin
Freeman, Ken	Mount Stromlo Observatory
Fruchter, Andrew	Space Telescope Science Institute
Fullerton, Alex	The Johns Hopkins University
Gallagher, Jay	University of Wisconsin – Madison
Garnett, Donald	Steward Observatory, University of Arizona
Gebhardt, Karl	University of Texas at Austin
Ghex, Andrea	University of California, Los Angeles
Gieles, Mark	Sterrekundig Institut
Godon, Patrick	Space Telescope Science Institute
Goudfrooij, Paul	Space Telescope Science Institute
Grebel, Eva	Max Planck Institute for Astronomy
Greyber, Howard	
Grocholski, Aaron	University of Florida
Guhathakurta, Puragra	University of California at Santa Cruz, Lick Observatory
Hanes, Dave	Queen’s University
Harris, Jason	Space Telescope Science Institute
Harris, William	McMaster University
Hartnett, Kevin	NASA/Goddard Space Flight Center
Hauser, Mike	Space Telescope Science Institute
Heap, Sara	NASA/Goddard Space Flight Center
Heckman, Timothy	The Johns Hopkins University
Holtzman, Jon	New Mexico State University
Hopp, Ulrich	Universitäts-Sternwarte Munich

Cambridge University Press

978-0-521-17533-3 - The Local Group as an Astrophysical Laboratory: Proceedings of the Space Telescope Science Institute Symposium, held in Baltimore, Maryland May 5-8, 2003

Edited by Mario Livio and Thomas M. Brown

Frontmatter

[More information](#)

viii

Hornschemeier, Ann
 Jeletic, James
 Joglee, Shardha
 Kalirai, Jason
 Kepley, Amanda
 Kratsov, Andrey
 Lamers, Henny
 Landsman, Wayne
 Leckrone, David
 Lee, Myung Gyoong
 Leisy, Pierre

Livio, Mario
 Lockman, Felix
 Macri, Lucas
 Maíz, Jesús
 Majewski, Steven
 Margon, Bruce
 Massa, Derck
 Massey, Philip
 Mateo, Mario
 McLean, Brian
 Nanduri, Vidyarthi
 Neill, Don
 Niedner, Mal
 Nota, Antonella
 Oey, Sally
 Onken, Christopher
 Palma, Christopher
 Panagia, Nino
 Peng, Eric
 Points, Sean
 Profitt, Charles
 Putman, Mary
 Rasmussen, Andrew
 Ree, Chang Hee
 Regan, Michael
 Reid, Neill
 Reitzel, David
 Rejkuba, Marina
 Rey, Soo-Chang
 Rhee, George
 Rich, Michael
 Richer, Harvey
 Romaniello, Martino
 Sahu, Kailash
 Salim, Samir
 Sarajedini, Ata
 Sellwood, Jerry
 Sembach, Kenneth

Participants

The Johns Hopkins University
 NASA/Goddard Space Flight Center
 Space Telescope Science Institute
 University of British Columbia
 University of Wisconsin – Madison
 University of Chicago
 Astronomical Institute, Utrecht University
 NASA/Goddard Space Flight Center/SSAI
 NASA/Goddard Space Flight Center
 DTM/CIW and Seoul National University
 IAC/ING Daniel Lennon Isaac Newton Group
 of Telescopes

Space Telescope Science Institute
 NRAO
 NOAO
 Space Telescope Science Institute
 University of Virginia
 Space Telescope Science Institute
 NASA/Goddard Space Flight Center
 Lowell Observatory
 University of Michigan
 Space Telescope Science Institute
 Cosmology Research Center
 Columbia University
 NASA/Goddard Space Flight Center
 Space Telescope Science Institute
 Lowell Observatory
 Ohio State University
 Penn State University
 Space Telescope Science Institute
 Rutgers University
 Northwestern University
 CSC/CUA/STScI
 University of Colorado – CASA Center
 Columbia University
 Yonsei University of Korea/Caltech
 Space Telescope Science Institute
 Space Telescope Science Institute
 University of California at Los Angeles
 European Southern Observatory
 Yonsei University of Korea/Caltech
 NMSU
 University of California at Los Angeles
 University of British Columbia
 European Southern Observatory
 Space Telescope Science Institute
 University of California – Los Angeles
 University of Florida
 Rutgers University
 Space Telescope Science Institute

Cambridge University Press

978-0-521-17533-3 - The Local Group as an Astrophysical Laboratory: Proceedings of the Space Telescope Science Institute Symposium, held in Baltimore, Maryland May 5-8, 2003

Edited by Mario Livio and Thomas M. Brown

Frontmatter

[More information](#)

Participants

ix

Shaya, Ed	NASA/Goddard Space Flight Center
Shen, Juntai	Rutgers University
Siegel, Michael	Space Telescope Science Institute
Sjouwerman, Lorant	NRAO
Soderblom, David	Space Telescope Science Institute
Stanghellini, Letizia	Space Telescope Science Institute
Steigman, Gary	Ohio State University
Steinmetz, Matthias	Astrophysikalisches Institut Potsdam
Susa, Hajime	Rikkyo University
Swaters, Rob	JHU/Space Telescope Science Institute
Sweigart, Allen	NASA/Goddard Space Flight Center
Thilker, David	The Johns Hopkins University
Tosi, Monica	INAF – Osservatorio Astronomico di Bologna
van den Bergh, Sidney	Dominican Astrophysical Observatory
van der Marel, Roeland	Space Telescope Science Institute
Verner, Ekaterina	Goddard Space Flight Center/CUA
Villaver, Eva	Space Telescope Science Institute
Vladilo, Giovanni	Osservatorio Astronomico di Trieste – INAF
Walborn, Nolan	Space Telescope Science Institute
Wesemael, Francois	Université de Montréal
Whitmore, Brad	Space Telescope Science Institute
Wyse, Rosemary	The Johns Hopkins University
Young, Teresa	
Zeas, Andreas	Harvard-Smithsonian Center for Astrophysics

Cambridge University Press

978-0-521-17533-3 - The Local Group as an Astrophysical Laboratory: Proceedings of the Space Telescope Science Institute Symposium, held in Baltimore, Maryland May 5-8, 2003

Edited by Mario Livio and Thomas M. Brown

Frontmatter

[More information](#)

Preface

The Space Telescope Science Institute Symposium on “The Local Group as an Astrophysical Laboratory” took place during 5–8 May 2003.

The Local Group is in some sense the universe in a nutshell. The processes of galaxy mergers and interactions are the bread and butter of hierarchical structure formation. These processes can be studied in unsurpassed detail in the Local Group. Starburst regions in the LMC provide spectacular local versions of their high-redshift counterparts. While black holes are believed to reside at the centers of most galaxies, the best determination of the mass of a central black hole has been achieved in our own Galaxy (through the orbits of individual stars). In addition, the Local Group provides a rich census of star formation histories and of stellar populations. In short, before we attempt to understand the Universe, understanding our own backyard is a good start.

These proceedings represent only a part of the invited talks that were presented at the symposium. We thank the contributing authors for preparing their manuscripts.

We thank Sharon Toolan of ST ScI for her help in preparing this volume for publication.

Mario Livio
Thomas M. Brown
*Space Telescope Science Institute
Baltimore, Maryland*