

Galactic Encounters



Frontispiece. Comet Lovejoy, projected against the southern Milky Way. Image by John Drummond at Gisborne, New Zealand, with a 20mm f2.8 Canon lens. *Courtesy: John Drummond.*

Galactic Encounters

Our Majestic and Evolving
Star-System, From the Big Bang
to Time's End

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 Springer

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ISBN 978-0-387-85346-8 ISBN 978-0-387-85347-5 (eBook)
DOI 10.1007/978-0-387-85347-5
Springer New York Heidelberg Dordrecht London

Library of Congress Control Number: 2014949181

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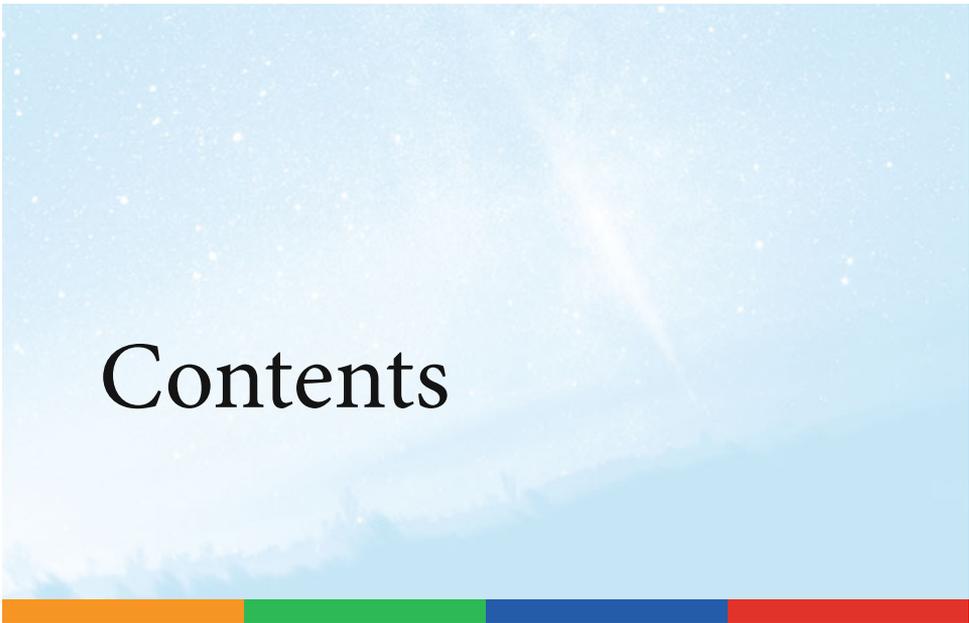
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to the brightest stars in our firmament,
Debb and Estelle.

* * *



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Acknowledgments

This book has been an effort spanning more than a decade. At the beginning, the authors never guessed that it would take that long. However, the fact that it did bears out the truth of something Dr. Johnson said in his “Life of Pope”:

“The distance is commonly very great between actual performances and speculative possibility. It is natural to suppose that as much as has been done to-day may be done to-morrow; but on the morrow some difficulty emerges, or some external impediment obstructs. Indolence, interruption, business, and pleasure, all take their turns of retardation; and every long work is lengthened by a thousand causes that can, and ten thousand that cannot, be recounted. Perhaps no extensive and multifarious performance was ever effected within the term originally fixed in the undertaker’s mind. He that runs against Time has an antagonist not subject to casualties.”

Many people have contributed significantly to the book, and without their counsel and assistance it would have taken much longer to complete than it did—if indeed it would have been written at all.

When W.S. embarked on his biography of E. E. Barnard, *The Immortal Fire Within*, he found a tremendous mentor in the late Donald E. Osterbrock, and much of what is best in the following pages is thanks to the assistance and counsel, freely and generously rendered, of “DEO.” Given that Barnard was the great pioneer of the wide-angle photography of the Milky Way and discoverer of the dark nebulae, work on Barnard began to lead to plans for further investigations of the Galaxy, and a Guggenheim Fellowship in 2001 for the “structure and evolution of the Galaxy” allowed time (and travel) away from professional commitments and a chance to begin work in earnest. Among those whose strong support at this stage was much appreciated were Michael Crowe, Steven J. Dick, and Owen Gingerich. Also, look-



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ing back across decades, mention should be made of Robert Burnham, Jr. and Helen Horstman of the Lowell Observatory, who encouraged a fledgling interest that could as easily have been quashed as encouraged.

In 2001, W.S. spent a productive six weeks at the Cosmic Dust Laboratory at the University of the Witwatersrand with David Block, whose work on infrared imaging of galaxies is internationally known. He also learned much at the Conference on Galactic Bars, especially from David Block and Ken Freeman, held at the Pilanesberg Game Reserve in South Africa during the transit of Venus in 2004. At that time he began conversations with Chris Conselice, whom he had first met when he was at Yerkes emulating E.E. Barnard's feat of observing an eclipse of Iapetus by Saturn's rings in 1993, and who was now a professional astronomer interested in galaxies in the early universe. It was as a result of that contact that Chris first became involved in the project.

W.S. thanks Robert W. Smith, Michael Hoskin and Tony Simcock—and above all the late Peter Hingley, of the Library of the Royal Astronomical Society—for help and advice with the Herschels; also the Herschel Society, for permission to use pictures taken at the William Herschel Museum at 19 New King Street, Bath; Andrew Stephens and Brendan, the seventh Earl of Rosse, for the third Earl; C. Robert O'Dell on Barnard and the Orion Nebula; Michael Sims, who helped with the Barnard papers at the Joseph Heard Library at Vanderbilt University; Alison Doane and Owen Gingerich with G.P. Bond and archives the Harvard College Observatory; Irene Osterbrock and Dorothy Schaumberg for helping to access manuscripts in the Mary Lea Shane archives of the Lick Observatory; Dimitri Mihalas, Bob Garrison, Richard Kron, and Lewis Hobbs on W.W. Morgan, and members of the Morgan family for granting me access to private Morgan letters and notebooks; Eric Hillemann of Carleton College on Edward Fath; William Lowell Putnam, III, Kevin Schindler, Antoinette Beiser, Joe Tenn, and Deidre Hunter on V.M. Slipher and dwarf galaxies; the late Gale E. Christianson for his views on Edwin Hubble. An old physics lab partner (at University of Minnesota) Curtis Struck offered excellent advice on galaxy collisions. Andy Young offered astute insights on astronomical spectroscopy and galaxies. For insights into interstellar matter and French astronomy, thanks are due to James Lequeux and Françoise Launay.

For help with illustrations, Laurie Hatch, Rem Stone, Kyle Cudworth, Richard Dreiser, Judy Bausch, Tony Misch, John Drummond, Marilyn Head, Tony Simcock, Mike Hatcher, Terry Dickinson, Klaus Brasch, and Stephen Leshin, John Grula of the Carnegie Observatories—Carnegie Institution for Science, Dan Lewis of the Huntington Library, San Marino, California, and Alar Toomre of the Massachusetts Institute of Technology. All performed yeoman service. A special thanks to a special high school friend, Mike Conley, who has remained actively involved for forty years in

pursuit of astronomical “game.” He helped get the small observatory at the North Fork of the Crow River up and running, and helped to obtain many of the images featured herein.

Drafts of the manuscript were improved immeasurably through the efforts of Mary Cain Buzzell, Jan Millsapps, Carl Pennypacker, Lee T. Macdonald, Parke Kunkle, and above all Bob O’Dell and David Sellers. Not all of them were professional astronomers, but those who were not were intelligent and perceptive lay readers. Long ago W.S. learned to heed Priscilla Bok’s advice to her husband Bart, that it was wise to involve non-astronomers in reading manuscript materials, unless the book was meant for only experts. (She mentioned Jan Oort.) Heeding this advice, Bart and Priscilla produced the classic book *The Milky Way*, which set a standard all other books on the subject published since must heed and aspire to.

There were many others who contributed to the book over many years. The editors at Springer were efficient and professional, but one person stood out for special recognition, Joe Piliero, master book-designer, who produced the design and with patient and gentle prodding helped us fully realize our vision in what can be the most harrowing stage of the process for authors. (There are good reasons Dickens never looked at any of his books after they were published!) Not least deserving acknowledgement are the members of W.S.’s family: wife Debb, sons Brendan and Ryan, and Cavalier King Charles spaniels Brady and Ruby, all of whom graciously granted hours of solitude, allowing the concentration that such a work demands.

C.C. would like to thank Bill Sheehan for inviting him to collaborate on this book, and for his patience over the years while it was being written. He also thanks colleagues, staff and students at the University of Nottingham, and especially Estelle Derclaye, for their support during the writing of this book.

* * *

— William Sheehan, Willmar, Minnesota

— Christopher Conselice, Nottingham, U.K.

February 17, 2014



Preface

Welcome to a masterful telling of a wonderful story. Man has a natural curiosity that extends to our place in the Universe. Satisfying that curiosity is the goal of this remarkable book by William Sheehan and Christopher Conelice.

Their historical approach to the tale is not only interesting in its own right, but also because it helps the reader to understand “why” we know what we do, not simply “what”. The enterprising Italian Galileo Galilei’s exploitation of the development of the telescope is an appropriate place to start, because the story is about the modern view of the Universe and the modern picture only began with the telescope.

There are heroes aplenty—the driven brother-sister collaborators William and Caroline Herschel; the pioneer of large telescopes, William Parsons Earl of Rosse; the self-educated Edward Emerson Barnard; and the morphologist W. W. Morgan, to mention only a few. There are entrepreneurs, con artists, and a considerable number of big egos. I’ll leave it to the reader to identify them.

Lead author Sheehan draws on his multiple talents and areas of expertise. From his lifelong interest in astronomy, he shows his pleasure in observing things himself, not simply using the results obtained by others. As a historian of considerable stature, he has studied the lives and work of astronomers from the seventeenth through twentieth centuries. He is also a Doctor of Medicine, specializing in psychiatry, which informs his depictions of the personalities through the centuries in an insightful, informed, and wonderfully entertaining narrative.

Conelice is a practitioner of our shared craft, conducting original research on galaxy formation in the early universe. His description of the rapidly evolving picture of the large-scale Universe is told with remarkable clarity and an obvious depth of knowledge.

The last chapters delve into our totally unexpected present view, that we live in a Universe that defies expectation in that it expands ever



faster through the action of mysterious dark energy and that our substance and everything that we see is but a few percent of all the material that is out there.



Solving today's problems continues, and it is a wise scientist indeed who recognizes that what he is saying and what his contemporaries believe may not be true. We know from studying the past that understanding comes in jumps, often by pursuing new directions, and that the term "the fog of war" also applies when we are trying to advance the frontiers of science.

* * *

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