

# Preface

When I was in my second year of undergraduate studies, I read a book by Fred Hoyle called “*Frontiers of Astronomy*”. Before reading this book, I had an idea that astronomy involved observing the skies and monitoring celestial events. From Hoyle’s book, I realized that modern astronomy is much more than just observations. It is about applying our knowledge of physics to understand the Universe. As a result, I changed my major from engineering to physics with the goal of becoming an astronomer. As a graduate student at the University of Minnesota, I had the good fortune to witness the beginning of infrared spectroscopy. The mid-infrared detectors developed at Minnesota allowed the exploration of the sky in the infrared, and the unexpected discovery of infrared emissions from old stars led to the first positive identification of a mineral in stardust - silicates.

This book is about 40 years of history of the search for an understanding of the nature of stardust. No one predicted the existence of organic stardust, and certainly no one foresaw the wide spread of organic matter in the Universe. This is a fascinating story that ought to be told.

In the early 1990s I began writing a series of popular articles for the *Sky and Telescope*, *Astronomy*, and *Mercury* magazines. These writings got me interested in writing about science for the general public. This led to my first popular science book *Cosmic Butterflies* published by Cambridge University Press in 2001. The subsequent book tours and invitations to speak in USA and Canada allowed me to meet face to face with many of the readers. The strong interest and thirst for information by the public have convinced me of the need for the communication of the latest scientific results in an authoritative but understandable manner.

When we read about significant discoveries of the past, we often don’t appreciate how difficult the path has been. Accounts are often sanitized and simplified. But the reality of science is that success occurs after many errors, detours, and dead ends and is never straightforward. My own participation in the research on this subject has also allowed me to witness first-hand how things happened and I hope to relay these events in this book.

Since science is a human endeavor, personalities are an integral part of the process. In this book, I benefited from the personal accounts of many people

involved in the research on stardust, in particular those who related to me their personal experiences on the road to discovery.

Unlike most popular science books, this book is more than a report of discoveries. Through the reading of the primary literature and personal interactions with the scientists who do the work, I was able to evaluate the evidence, form my own critical assessment of the work, and determine how it fit into the overall picture of the development of the field.

On the personal side, I am grateful to NASA and ESA who allowed me access to their telescopes through the policy of open competition for telescope time. Without this generous policy, it would not have been possible for me to contribute to this field.

Both astrochemistry and bioastronomy are new scientific disciplines. My service as a member of the executive committees in the International Astronomical Union astrochemistry and bioastronomy commissions gave me the opportunity to meet other scientists in the field and to promote these two subjects in the general scientific community. This book gives me a way to “wave the flag” and hopefully encourage more young people to pursue research in these areas.

I started the earliest draft of this book more than 10 years ago. Due to my administrative duties, I have only been able to write in bits and pieces of spare time that I can find. I want to thank the people and organizations in different parts of the world who have invited me to give talks on the subject of stardust, which gave me confidence that this subject is indeed of wide public interest.

I want to thank Agnes Lam who kindly gave permission to me to include her beautiful poem in this book, as well as giving valuable comments on an earlier draft of the book. I would like to thank my editor Ramon Khanna of Springer who took an interest in this project. I would also like to express my gratitude to Arturo Manchado for his hospitality during my stay at the Instituto de Astrofísica de Canarias. Anisia Tang, my friend and colleague, helped in the production of some of the drawings used in this book. I want to thank my wife, Emily, and my daughter, Roberta who have read various drafts of this book and gave me valuable feedback and comments.

Hong Kong,  
People's Republic of China  
December 2012

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Stardust

The Cosmic Seeds of Life

Kwok, S.

2013, XXII, 267 p. 74 illus., 50 illus. in color., Softcover

ISBN: 978-3-642-32801-5