

# Preface

Eta Carinae is well known to astronomers for its many superlatives. It is the most massive, most luminous star in our region of the Milky Way. During its “Great Eruption” 170 years ago it ejected  $10 M_{\odot}$  or more, creating its famous Homunculus Nebula. We now know that its Great Eruption was the energetic, non-terminal explosion of a very massive star nearing the end of its short life. But  $\eta$  Car and its Great Eruption may not be unique, some weird event, only observed once.

In 1965 Fritz Zwicky proposed a class of supernova events he called “Type V”, relatively faint at maximum with long durations. There were only two members of his Type V group,  $\eta$  Car and SN1961v. These stars were not true supernovae and today we recognize several stars that had giant eruptions in which they increase their total luminosity and become bright enough to be mistaken for underluminous supernovae. In addition to  $\eta$  Car, examples include SN1961v, SN1954j, P Cyg 400 years ago, V1 in N2363 and probably the “Pistol star” near the Galactic Center. The modern supernova surveys are producing a growing list of sub-luminous outbursts from objects in other galaxies. These “supernova impostors” are apparently very massive stars undergoing eruptions similar to  $\eta$  Car and other unstable stars such as the Luminous Blue Variables (LBVs). Hence the title of this book. These stars are very rare, however, and most have been observed only sparsely.

The most massive stars are at the intersection of several critical areas of modern astrophysics including the chemical evolution of galaxies via their high mass loss episodes, as the likely progenitors of gamma-ray bursters and the most luminous supernovae, and as candidates for the “first stars” in the Universe. Extremely luminous supernovae, like SN2006gy, may be the terminal explosions of very massive stars surrounded by extensive circumstellar material from previous eruptions. The role of high mass loss events like that of  $\eta$  Car on the pre-supernova state of these stars is clearly of increasing interest in astrophysics.

Our understanding of this remarkable object has benefited from the work and insight of numerous astronomers over the past century many of whom are now deceased. Due to the limitations on the size of this volume, it was not possible to invite all current researchers for a contribution. The editors therefore gratefully acknowledge the contributions of Patricia Whitelock and Michael Feast,

Chris Sterken and Antonin Van Genderen, Roberto Viotti, Augusto Damineli, Ted Gull, John Meaburn, Otmar Stahl, Noam Soker, and Bob Gehrz.

The contributed chapters in this volume provide a comprehensive review of  $\eta$  Car, including its Great Eruption, historical evolution and recovery, its wind and ejecta and its relation to other very massive unstable stars, the origin of their instabilities and eventual fate. The contributions are written by experts in their fields and hence are intended for professional astronomers, graduate students in astrophysics, and physicists interested in the final stages of stellar evolution. These reviews are based on the most recent observations from space and ground-based telescopes and the current state of our theoretical understanding, nevertheless, we must emphasize that  $\eta$  Car never ceases to surprise us.

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