

Preface

Like many textbooks, this one originated from lectures delivered over a number of years to undergraduate students at my home institution – Queen’s University in Kingston, Canada. These students had already taken a first year (or two) of physics and one introductory astronomy course. Thus, this book is aimed at an intermediate level and is meant to be a stepping stone to more sophisticated and focussed courses, such as stellar structure, physics of the interstellar medium, cosmology, or others. The text may also be of some help to beginning graduate students with little background in astronomy or those who would like to see how physics is applied, in a practical way, to astronomical objects.

The astronomy prerequisite is helpful, but perhaps not required for students at a more senior level, since I make few assumptions as to prior knowledge of astronomy. I *do* assume that students have some familiarity with celestial coordinate systems (e.g. Right Ascension and Declination or others), although it is not necessary to know the details of such systems to understand the material in this text. I also do not provide any explanation as to how astronomical distances are obtained. Distances are simply assumed to be known or not known, as the case may be. I provide some figures that are meant to help with ‘astronomical geography’, but a basic knowledge of astronomical scales would also be an asset, such as understanding that the Solar System is tiny in comparison to the Galaxy and rotates about the Galactic centre.

As for approach, I had several goals in mind while organizing this material. First of all, I did not want to make the book too ‘object-oriented’. That is, I did not want to write a great deal of descriptive material about specific astronomical objects. For one thing, astronomy is such a fast-paced field that these descriptions could easily and quickly become out of date. And for another, in the age of the internet, it is very easy for students to quickly download any number of descriptions of various astronomical objects at their leisure. What is more difficult is finding the thread of physics that links these objects, and it is this that I wanted to address.

Another goal was to keep the book practical, focussing on how we obtain information about our Universe from the signal that we actually detect. In the process, many equations are presented. While this might be a little intimidating to some students, the point should be made that the equations are our ‘tools of the trade’. Without these tools, we would be quite helpless, but with them, we have access to the secrets that astronomical signals bring to us. With the increasing availability of computer algebra or other software, there is no longer any need to be encumbered by mathematics. Nevertheless, I have kept problems that require computer-based solutions to a minimum in this text, and have tried to include problems over a range of difficulty.

Astrophysics – Decoding the Cosmos will maintain a website at <http://decoding.phy.queensu.ca>. A Solutions manual to the problems is also available. I invite readers to visit the website and submit some problems of their own so that these can be shared with others. It is my sincere desire that this book will be a useful stepping-stone for students of astrophysics and, more importantly, that it may play a small part in illuminating this most remarkable and marvelous Universe that we live in.

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