

Patrick Moore's Data Book of Astronomy

Packed with up-to-date astronomical data about the Solar System, our Galaxy and the wider universe, this is a one-stop reference for astronomers of all levels.

It gives the names, positions, sizes and other key facts of all the planets and their satellites; discusses the Sun in depth, from sunspots to solar eclipses; lists the dates for cometary returns, close-approach asteroids, and significant meteor showers; and includes 88 star charts, with the names, positions, magnitudes and spectra of the stars, along with key data on nebulae and clusters.

Full of facts and figures, this is the only book you need to look up data about astronomy. It is destined to become the standard reference for everyone interested in astronomy.

PATRICK MOORE CBE, FRS, is an astronomer and author. He has received numerous awards and prizes in recognition of his work, including the CBE in 1988 and knighthood in 2001 'for services to popularisation of science and to broadcasting'. A former President of the British Astronomical Association, he is now honorary Life Vice President, and is the only amateur ever to have held an official post at the International Astronomical Union.

ROBIN REES, FRAS, is Director of Canopus Publishing and has produced a number of best-selling astronomy books, and under the Canopus Academic Publishing imprint he publishes academic physics titles.

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Foreword

Patrick Moore has inspired generations of astronomers. He has done unparalleled service, through his handbooks, lectures and articles – not to mention his BBC programme *The Sky at Night*.

Over his prolific career, Patrick has witnessed, recorded and expounded a huge enlargement of our cosmic knowledge. To see this, one need only compare the present book with one of its precursors: the *Guinness Book of Records in Astronomy* published more than 50 years ago, at the dawn of the space age.

We owe this progress to sophisticated telescopes on the ground, and to a flotilla of instruments launched into space. The planets and moons of our Solar System are now better mapped than some parts of our Earth were before the twentieth century. An unsuspected population of *trans-Neptunian objects* has been revealed – telling us that the Solar System is more complex and extensive than thought hitherto. Even more important, planets have been detected around hundreds of other stars. The study of 'extra-solar' planets is proceeding apace: within a decade we will have discovered thousands of planetary systems, and will for the first time have evidence on just how unusual our Solar System is.

Novel technology has not only led to more powerful optical telescopes, but also to space telescopes that observe the cosmos in other wavebands out to distances exceeding 10 billion light years. We inhabit a much vaster Universe than was envisaged 50 years ago; we understand a surprising amount about how it evolved and what it contains.

This latest *Data Book of Astronomy* conveys the fascination and vibrancy of our subject – and the wonder of the skies. All astronomers should be grateful to Patrick Moore, to his co-author Robin Rees and to their team of consultants, for the immense labour that went into this book: it is surely unique in gathering such a wide and eclectic range of information into a single volume.

It will be an invaluable reference work for serious observers – but it is equally suitable for armchair browsers, and indeed for anyone who is curious about what lies beyond the Earth.

Martin Rees
Professor of Cosmology and Astrophysics,
University of Cambridge

Preface

The ancestor of this book was published more than half a century ago as the *Guinness Book of Records in Astronomy*. It went through five editions, and was then transformed into the *Astronomy Data Book* published by the Institute of Physics. By this time it had ceased to be merely lists of facts and had become much more general, and many observatories began using it as a book of quick reference. Now, 10 years later, there has been another transformation. The essential basic plan has been retained, but the text has been largely rewritten with all new data, and the tables have been

enlarged and brought up to date. I pay tribute here to Robin Rees without whom I am quite certain that this book would never have seen the light of day. Invaluable help has also been given by Iain Nicolson who read the entire manuscript very carefully – though I hasten to add that any remaining errors are entirely my own.

So far as bringing the text up to date is concerned, the cut-off date is 1 December, 2010. I hope that will be acceptable.

Patrick Moore, Selsey, 1 December, 2010

Acknowledgements

Quite apart from Robin Rees and Iain Nicolson, I have had help from many friends in the preparation of this book, and none more so than from Peter Cattermole. Especial thanks to Chris Dascalopoulos for stepping in at short notice to help with the final proofs. Very valuable administrative help has been provided by Ian Makins, and the help and encouragement of the staff at Cambridge University Press has been unfailing.

My most grateful thanks are due to the Astronomer Royal, Lord Rees of Ludlow, for writing a Foreword to the book, it is indeed a great honour for me.

The various chapters have also been read by astronomical friends who specialise in particular subjects. I am truly grateful to all to those listed below.

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Notes about units

The Celsius temperature scale is due to the Swedish astronomer Anders Celsius in 1741. The Fahrenheit scale was due to the German physicist Daniel Fahrenheit in 1724. There are other scales, now virtually obsolete. One of these is the Réaumur, due to Rene Réaumur in 1730; another is the Rankine, due to the British engineer and physicist William Rankine in 1859. The Kelvin scale is named in honour of the great British physicist Lord Kelvin.

	Réaumur (°Ré)	Kelvin (K)	Celsius (°C)	Fahrenheit (°F)	Rankine (°R)
Absolute zero		0	-273.5	-459.67	0
Water freezes	0	273.15	0	32	491.67
Water boils	80	373.14	99.98	211.97	671.64

$$1\text{ }^{\circ}\text{C} = 2.25\text{ }^{\circ}\text{F} = 1\text{ K}$$

Convenient equivalents:

By definition the triple point of water is $273.6\text{ K} = 0.01\text{ }^{\circ}\text{C} = 32.018\text{ }^{\circ}\text{F}$.

Temperature conversions are as follows:

to find $^{\circ}\text{C}$ from K: $^{\circ}\text{C} = \text{K} - 273.15$;

to find K from $^{\circ}\text{C}$: $\text{K} = ^{\circ}\text{C} + 273.15$;

to find $^{\circ}\text{F}$ from K: $^{\circ}\text{F} = (\text{K} \times 1.8) - 459.67$;

to find K from $^{\circ}\text{F}$: $\text{K} = (^{\circ}\text{F} + 459.67)/1.8$;

to find $^{\circ}\text{F}$ from $^{\circ}\text{C}$: $^{\circ}\text{F} = (9/5)^{\circ}\text{C} + 32$;

to find $^{\circ}\text{C}$ from $^{\circ}\text{F}$: $^{\circ}\text{C} = (5/9)(^{\circ}\text{F} - 32)$.

The old Centigrade scale is equal to the Celsius to within a degree. The Celsius and Kelvin scales are always used in science.

In everyday life the Fahrenheit scale is used in the United States. Efforts by the European Union to bully Britain into changing from Fahrenheit to Celsius for civil use have so far been mainly unsuccessful.

THE METRIC CONVERSION TABLE

The current practice of giving lengths in metric units rather than Imperial ones has been followed. To help in avoiding confusion, the following table may be found useful.

Centimetres	To	Inches	Kilometres	To	Miles
2.54	1	0.39	1.61	1	0.62
5.08	2	0.79	3.22	2	1.24
7.62	3	1.18	4.83	3	1.86
10.16	4	1.58	6.44	4	2.49
12.70	5	1.97	8.05	5	3.11
15.24	6	2.36	9.66	6	3.73
17.78	7	2.76	11.27	7	4.35
20.32	8	3.15	12.88	8	4.97
22.86	9	3.54	14.48	9	5.59
25.40	10	3.94	16.09	10	6.21
50.80	20	7.87	32.19	20	12.43
76.20	30	11.81	48.28	30	18.64
101.6	40	15.75	64.37	40	24.86
127.0	50	19.69	80.47	50	31.07
152.4	60	23.62	96.56	60	37.28
177.8	70	27.56	112.7	70	43.50
203.2	80	31.50	128.7	80	49.71
228.6	90	35.43	144.8	90	55.92
254.0	100	39.37	160.9	100	62.14