Right now, a comet is heading towards the inner Solar System. This visitor from the frozen cosmic depths—an ‘icy dirtball’ the diameter of a small town—has every chance of becoming bright enough to be seen with the unaided eye as the increasing heat of the Sun turns its ices to gas and its dust grains are freed into space. Indeed, the comet is likely to develop spectacular gas and dust tails that stretch across the sky. One of nature’s most sublime sights, its appearance is set to be indelibly impressed upon the long-term memories of everyone who sees it.

This was by no means an exaggerated statement. It has always applied, since before the first human set eyes upon a comet. There’s little chance that the supply of comets from the far-frozen depths of space will ever dry up. There’s always a comet heading our way, and really bright ones dazzle us by surprise every few decades or so.

Between June 1872 and April 1910 Halley’s Comet (1P/Halley) was on the inbound leg of its 75-year orbit, having passed its furthest point from the Sun (aphelion). Astronomers knew enough then to be able to predict the comet’s path with a good degree of accuracy and were able to confidently claim—based on the past performance of Halley’s Comet—that it would present quite a stunning sight in the skies. But how can astronomers predict that any newly discovered comet is likely to dazzle?

Our opening paragraph applies to my main prompt for writing this book—the discovery of a potentially spectacular comet by the official designation C/2012 S1 (ISON), which will be introduced presently.

First, though, a few words of caution. Having had a deep fascination with the beauty of the night skies since I can remember, my introduction to “space” was doubtless much like that experienced by many readers of this book—initially arising from a notable celestial event that was publicized in print, on television or radio. Comets are beloved by the media, and they often hit the headlines because they are
sometimes predicted to grow into spectacular sights. You may be old enough to have had your interest piqued by the media hype surrounding Comet Kohoutek (C/1973 E1). Your interest in astronomy may have snowballed from a far more recent event, say the multiple impacts on the giant planet Jupiter of fragments of Comet Shoemaker-Levy 9 (D/1993 F2) in July 1994, or by the magnificent showing of Comet Hale-Bopp (C/1995 O1) in 1997. Perhaps your curiosity about astronomy resulted from an altogether different space event, say, watching the late Neil Armstrong plant his size 11 Moon boot on the Sea of Tranquility in July 1969, or just by having seen pictures from the Hubble Space Telescope. Maybe this is the first astronomy book you’ve ever read, in which case I hope to do a good job in kindling the flames of cosmic and cometic enquiry within you.

It’s my intention that this book will stand as a handy guide to comets in general, long after C/2012 S1 has come and gone. We’ll take a look at what astronomers have learned about comets throughout history, discovering what comets are and where they come from. Our journey will take us on a whistle-stop tour of Great Comets and remarkable comets of the past, some recent comets and the prospects of comets to come. And we’ll go out together under the dark, starry skies, to talk about how you can enjoy observing comets, whether you’re a casual stargazer or serious amateur astronomer with a desire to “capture” a comet for yourself.

Since May 1983 I have observed and sketched 27 different comets, all of which have been bright enough to be seen through binoculars. Nevertheless, 27 comets in 30 years isn’t a particularly impressive tally to the truly serious comet observer; in reality, the number of comets that could have been glimpsed in this period from my location in the UK with the instruments that I had available is perhaps double this number, but most of these extra ones would have appeared pretty faint.

These experiences in stargazing have stood me in good stead, not only in knowing what to reasonably expect to see through the eyepiece but also to expect the unexpected. Comets are often fickle, and they have absolutely no knowledge of how bright astronomers have predicted they will become. Some exceed all expectations by outshining brightness predictions and developing detailed structure in their heads and tails. Some behave in remarkable ways by flaring suddenly, developing anti-tails, by breaking up or even dashing themselves to smithereens on planets. Those who remember the hyperbole surrounding Comet Kohoutek that was promulgated in the media also know what disappointment means. This has tempered my approach in writing this book.

Stand By for Action

As an astronomical editor and writer I try to keep abreast of what’s happening in space; neglecting to flag-up a particularly rare or spectacular astronomical event, such as a prospective naked-eye comet, would do little to enamor myself to my readers.

On September 24, 2012, an electronic circular issued by the Minor Planet Center (MPC) flashed up in my inbox. MPC Electronic Circulars (MPECs) detail
discoveries and observations of small Solar System objects, such as comets, asteroids and errant satellites. They are, however, issued frequently—at least once a day—and, quite frankly, most are of little relevance to my target readership.

**MPEC 2012-S3** was, like all the others, chiefly a list detailing an object’s discoverers/observers, along with various data and orbital parameters for that object. A scientific document, it contained no hyperbole; there was no friendly editorial commentary, and it featured no charts or images. Just the facts. **MPEC 2012-S3** detailed a newly discovered comet, designated C/2012 S1 (ISON), which had first been spotted on September 21 by astronomers Vitali Nevski and Artyom Novichonok using the 0.4-m (16-in.) reflector of the International Scientific Optical Network (ISON) near Kislovodsk, Russia. Images taken from other observatories prior to and after the discovery had enabled its orbit to be determined with some accuracy.

It soon became clear to me that the numbers suggested something extraordinary about this comet, and after a little more investigation the hair on the back of my neck began to stand up. Doubtless thousands of the *MPEC*’s recipients—even the most impassionate of astronomers—experienced a similar visceral thrill on realizing how special this newly discovered comet was. Incredibly far away on discovery, C/2012 S1 was already bright enough to be imaged through relatively modest amateur equipment. Pulled by the Sun’s gravity it was coming in from deep space—probably on its first visit to the inner Solar System since its formation 4.6 billion years ago. Brightening as it plunged into the heart of the Solar System, it was predicted to swing very closely around the Sun in November 2013. In September 2012 I reported:

A new comet has been discovered that is predicted to blaze incredibly brilliantly in the skies during late 2013. With a perihelion passage of less than two million kilometres from the Sun on 28 November 2013, current predictions are of an object that will dazzle the eye at up to magnitude −16. That’s far brighter than the full Moon. If predictions hold true then C/2012 S1 will certainly be one of the greatest comets in human history, far outshining the memorable Comet Hale-Bopp of 1997 and very likely to outdo the long-awaited Comet Pan-STARRS (C/2011 L4) which is set to stun in March 2013. Its near-parabolic orbit suggests that it has arrived fresh from the Oort Cloud, a vast zone of icy objects orbiting the Sun, pristine remnants of the formation of the Solar System.

C/2012 S1 currently resides in the northwestern corner of Cancer. At magnitude +18 it is too dim to be seen visually, but it will be within the reach of experienced amateur astronomers with CCD equipment in the coming months as it brightens. It is expected to reach binocular visibility by late summer 2013 and a naked eye object in early November of that year. Northern hemisphere observers are highly favoured. Following its peak brightness in late November it will remain visible without optical aid until mid-January 2014.

Comet brightness predictions sometimes exceed their performance. Amateur astronomers of a certain age may remember the Comet Kohoutek hype of 1973 – not quite the ‘damp squib’ it has been portrayed, since it reached naked eye visibility! Even if C/2012 S1 takes on the same light curve as Kohoutek it is certain to be spectacular, quite possibly a once-in-a-civilisation’s-lifetime event.

Now writing in June 2013, I stand by the above, even though it may to some appear to wander perilously near to hyperbole. But there’s no harm in being given
ample warning of a coming astronomical event, and “Be Prepared” is as good a motto for the amateur astronomer as it is the Boy Scout. Some amateur astronomers had prepared observing plans for Halley’s Comet several years before it became visible through the telescope in 1985; indeed, the International Halley Watch was endorsed by the International Astronomical Union (IAU) as far back as 1982.

As we shall see, newly discovered comets—particularly those on their first visit to the inner Solar System—can behave unpredictably, and astronomers are at pains to offer the caveat that brightness predictions rely upon a range of assumptions. Some new comets, such as Comet Kohoutek, ticked all the right boxes for becoming a dazzling object, but failed to live up to optimistic predictions; 3 years later, however, Comet West exceeded all expectations and became a brilliant object in February 1976. Sure, some comets can be fickle, and we’ll be taking a look at some of the reasons why.

In *Julius Caesar*, Shakespeare wrote:

When beggars die, there are no comets seen;  
The heavens themselves blaze forth the death of princes.

In the same play, Shakespeare gave these lines to his eponymous hero:

But I am constant as the northern star,  
Of whose true-fixed and resting quality  
There is no fellow in the firmament.

I humbly suggest a few lines from my own (as yet unpublished and probably never to be published) play *Caligula*, after the style of the immortal Bard:

Inconstant as the comet’s luster,  
My mind like Luna waxes-wanes.  
Let my reason recede that my passions flare!  
Let them hate me, so that they will but fear me  
As, hairs on end they fear the comet yet do its hairy tail admire.  
(apologies to all true lovers of the Bard of Avon)

St Dennis, Cornwall, UK

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