

ANGULAR MEASUREMENTS IN THE SKY

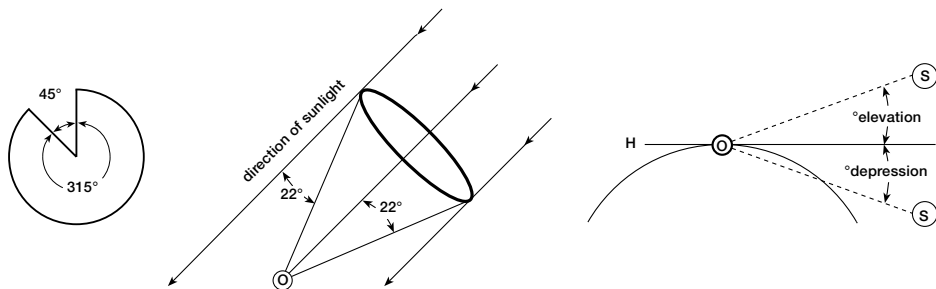
THE CELESTIAL SPHERE

The celestial sphere is the sky map used to identify directions, locations, and points of light sources and optical phenomena.

OBSERVER: You are the center of this universe. Throughout the illustrations in this book, the observer's position is depicted by this symbol: ©

COMPASS DIRECTIONS: north (0°), east (90°), south (180°), and west (270°) define the reference points on the horizon.

The **HORIZON** is the distant line along which the Earth and sky appear to meet.



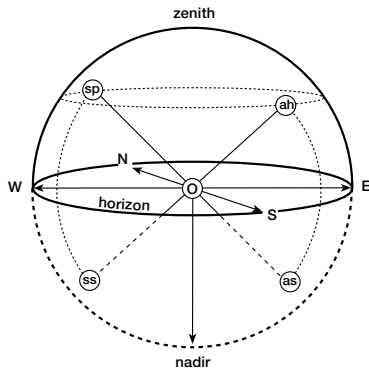
Left to right: **CIRCLE** with a 45° wedge shown. One degree ($^\circ$) = $1/360$ of a circle's circumference.

OPTICAL PHENOMENA of arcs and rings are expressed as the angles they form with respect to the original direction of sunlight. Primary and secondary rainbows are found at 42° and 51° , coronas vary from 5° to 10° , and halos form at 22° and 46° . The complete widths of arcs and bows as viewed in the sky are twice that size. (Note particularly that a rainbow is not identified as the angle it forms from the horizon to the top of the bow, since the elevation of the bow varies as the Sun does.)

SOLAR ALTITUDE is expressed as the angle above the horizon (H) as elevation or below the horizon as depression.

The **ZENITH** is the point directly overhead, at 90° elevation; the **NADIR** is the point directly below with a depression angle of -90° .

The **SOLAR POINT (sp)** is wherever the Sun is. The **ANTISOLAR POINT (as)** is the point on the celestial sphere directly opposite the Sun (180° away). The **SUBSOLAR POINT (ss)** is the point below the Sun, as far below the horizon as the Sun is above it. The **ANTHELIC POINT (ah)** is the point opposite the Sun (180°) at the same altitude. All of these points may be above or below the horizon, depending on the Sun's altitude.



OBSERVING LIGHT AND COLOR

Observing the world around us—and in particular the sky—reveals a wondrous spectacle of light, color, and action, especially if we acquaint both our eyes and our minds with what is normal and what is possible. Because we often do not recognize that with which we are unfamiliar, we may, without study and practiced observations, miss what nature has to offer. This book is therefore an introduction to what our eyes may see and to that at which our minds may marvel.

Our eyes are extraordinary sensors of our environment. Each eye has a range of view of about 200° , a response to wavelengths from 400–760 nm, and the ability to detect as little as one-hundred-billionth as bright a light as the brightest light it can endure. Our remarkable visual sensors can resolve one arc

HANDY ANGULAR GAUGE One's own hand can be used to estimate angular widths in the sky.
Hold at arm's length, palm outward:

Width of:	Approximate degree of arc
little finger	1
index, middle, and ring fingers	5
fist	10
little and index fingers stretched apart	15
little finger and thumb stretched apart	25