

INSTRUCTION MANUAL

★ Star and Planet LOCATOR



TURN DIAL TO PUT
DATE OPPOSITE
TIME. STARS WILL
APPEAR IN SKY
THE SAME AS
SHOWN ON CHART.
EXAMPLE SHOWN
IS FOR JULY 15
AT 9 O'CLOCK

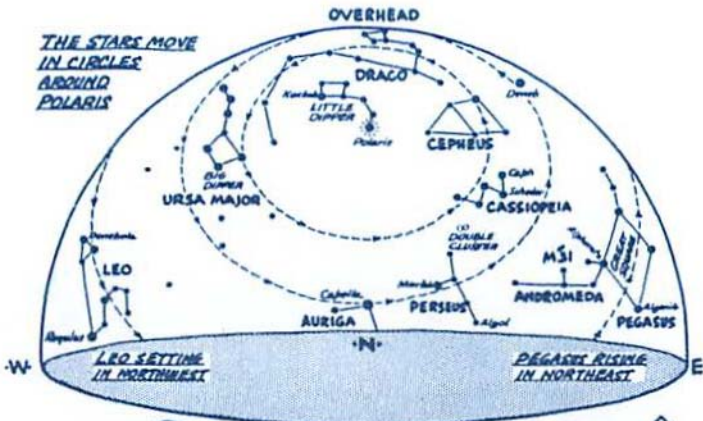
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*THE STARS MOVE
IN CIRCLES
AROUND
POLARIS*



①

LOOKING NORTH FROM LATITUDE 50°, JULY 25, 9 P.M. FACE NORTH AND HOLD CHART WITH NORTH AT BOTTOM →



Dubhe ... DOOB-ee
Merak ... MEE-rack
Phecda ... FEK-da
Megrez ... MEE-grez
Alioth ... AL-i-oth
Mizar ... MEE-zar
Alkaid ... al-KAID

*THE HORSE (MIZAR) AND
RIDER (ALCOR) ARE
SEPARATED BY 11 MIN.
OF ARC - POPULAR
NAKED-EYE DOUBLE*

②

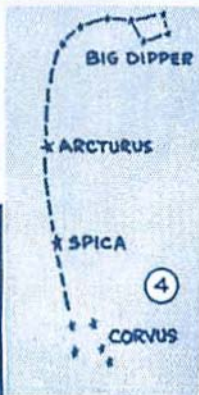
THE BIG DIPPER



Millions of stars but only largest telescopes can see them

Distance to M31 is now known to be 2.4 million light-years.

③



④

HOW TO
USE



Star and Planet LOCATOR

You will find star-gazing with the aid of the Star and Planet Locator a fascinating pastime, with each passing night adding something to your knowledge of the big show in the skies. Using the chart is simple: If you want to locate a star in the southern sky, sit or stand facing south and hold the chart overhead with South at the bottom, as shown on front cover. The bottom of the chart opening will then correspond to your southern horizon. When facing south in this way, Polaris, the North Star, is behind you in the sky, and you must imagine the chart as also curving backwards over your head. However, if you want to identify northern constellations, it is simpler to face north and hold the chart with North at the bottom, Fig. 1. Note in both cases that East on the chart corresponds to actual east, and West is west.

When you go outdoors to locate the real stars and constellations, you won't find it quite as easy as finding them on the chart. Remember, there are clouds and haze in the night sky just the same as in the daytime and you may not be able to see the fainter stars of a constellation. You can study the chart with a pen flashlight, but avoid any bright light which would spoil your night vision.

Most beginners identify the Big Dipper first, and by its "pointers" locate the pole star, Polaris. Across the pole from the Dipper and at about the same distance is the zig-zag W marking the constellation Cassiopeia. Follow the curve of the Dipper handle and you will come to Arcturus and Spica, Fig. 4. During winter months, the mighty hunter, Orion, "tallest and most handsome of men," dominates the southern sky and is easily identified together with such bright stars as Aldebaran, Castor and Pollux, and brilliant Sirius, brightest of all the stars. Naked-eye double stars provide an interesting test for sharp vision; most persons can make out the rider, Alcor, Fig. 2, on a clear night, but it takes perfect vision to resolve the near companion of Epsilon in Lyra (see chart on inside back cover). Try this with binoculars and you will find the separation quite wide; with a telescope at 100x or better, each star of the pair is again split--and you get the whole picture of the famous "double double." A nice double for low power is Albireo in Cygnus, which shows as a gold star and a blue one at 25 to 40-power.

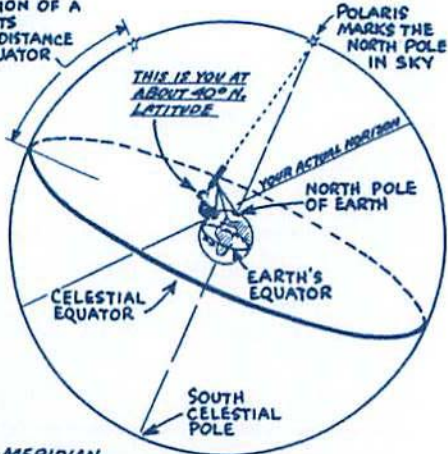
Each star or constellation you identify acts as a sort of signpost to lead you to other stars and constellations by the simple system of "star hopping." Other sky signposts which are useful are the meridian, zenith, and celestial equator. Fig. 6 shows the approximate location of the celestial equator. To determine its angular position exactly for your location, you should fill in the blank diagram, Fig. 9, starting with your latitude, which can be obtained from any

DECLINATION OF A STAR IS ITS ANGULAR DISTANCE FROM EQUATOR

POLARIS MARKS THE NORTH POLE IN SKY

5

THE CELESTIAL SPHERE IS A BIG IMAGINARY BALL WITH THE EARTH AT ITS CENTER. IT HAS AN EQUATOR AND POLES CORRESPONDING TO THE SAME POSITIONS ON EARTH. ALL OF THE STARS ARE SEEN AS IF PERMANENTLY ATTACHED TO THE INSIDE OF THE CELESTIAL SPHERE - THEY APPEAR TO MOVE ONLY BECAUSE THE WORLD GOES AROUND



THE MERIDIAN IS YOUR NORTH-SOUTH LINE IN SKY

ZENITH IS POINT OVERHEAD

NORTH (OR PLUS) DECLINATION OF STAR A

SOUTH (OR MINUS) DECLINATION OF STAR B

EQUATOR IS 90° FROM POLARIS

POLARIS (90° NORTH DECLINATION)

THIS ANGLE IS SAME AS YOUR LATITUDE

S

CELESTIAL EQUATOR

N

6

IE

3

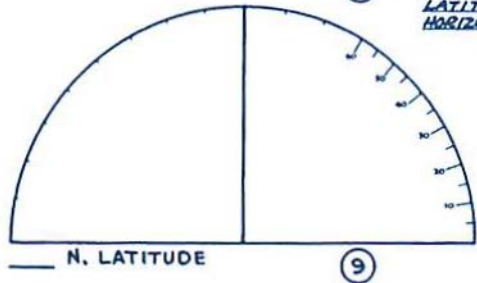
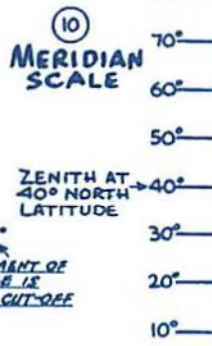
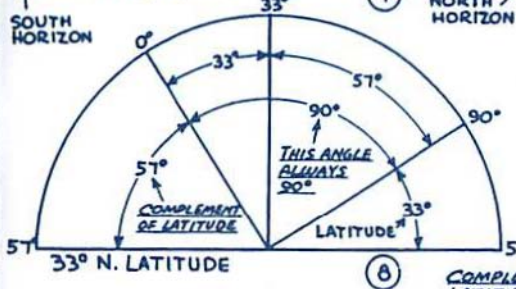
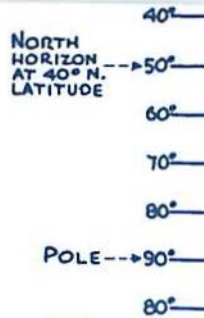
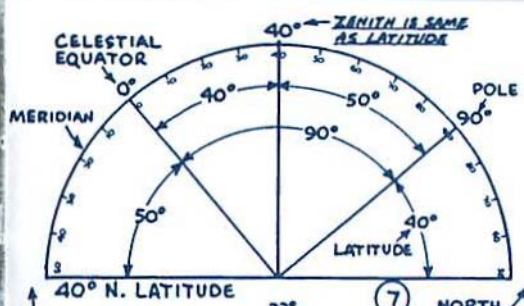
ANGLES ON CELESTIAL SPHERE ARE SET OFF FROM EQUATOR

atlas, or it may be listed in the tables of cities shown on another page. Note from Figs. 7 and 8 that your zenith distance from the celestial equator is the same as your latitude, and the celestial equator is the same angle above the south horizon as the celestial pole is from your zenith.

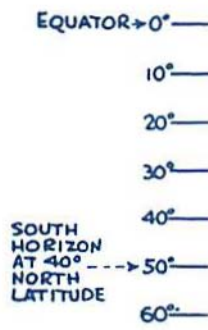
The meridian scale, Fig. 10, is used to locate stars by angular position. Place it over the star chart, Fig. 11; up from the equator as many degrees as your latitude and you will locate your zenith. It is helpful to draw (lightly) on the chart, Fig. 12, the position of your zenith circle—any star on this circle will be directly overhead when it is on the meridian and south of the pole. In general, if you use the star-hopping system, you locate an unknown star by the way it “bears” from a star you already know. In the angular system, you observe only on or near the meridian, and you locate a star by its angular distance from the equator, or, its distance south or north of your zenith, or, for low stars, the angular distance above the horizon. Of course you have to estimate by eye the angular distance in the sky, but with a little practice you will be able to do this with considerable accuracy.

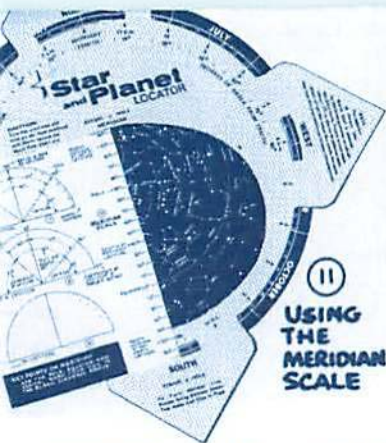
The opening in the Star and Planet chart shows stars to 45 degrees below the equator and 55 degrees below the pole.* If you are located at 40° north latitude, you can see stars to 50° south declination if you have a clear south horizon; you can see all of the Scorpion during the summer months.

* A little more than an observer at latitude +50 would see.

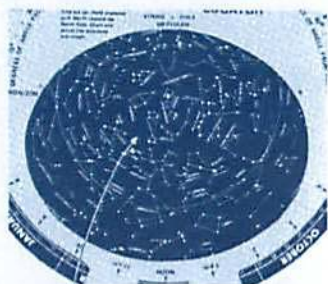


KEY POINTS ON MERIDIAN
 ... ARE THE POLE, EQUATOR AND ZENITH. MARK YOUR OWN IN THE BLANK DIAGRAM ABOVE





11
**USING
 THE
 MERIDIAN
 SCALE**



12
**ZENITH CIRCLE... DRAW
 WITH COMPASS. EXAMPLE
 IS FOR 40° N. LATITUDE**

Your north cutoff line would then be 50° (descending from the pole: 90-80-70-60-50) which places Capella in Auriga below the horizon when it is on your meridian below the pole. However, Capella is very nearly circumpolar and can be seen practically the year round; it is a circumpolar star for observers at 50° north latitude. At the other extreme, if you live in southern Florida or Texas, you can see many southern stars not even shown on the Star and Planet chart, but Capella will be below the horizon throughout the summer.

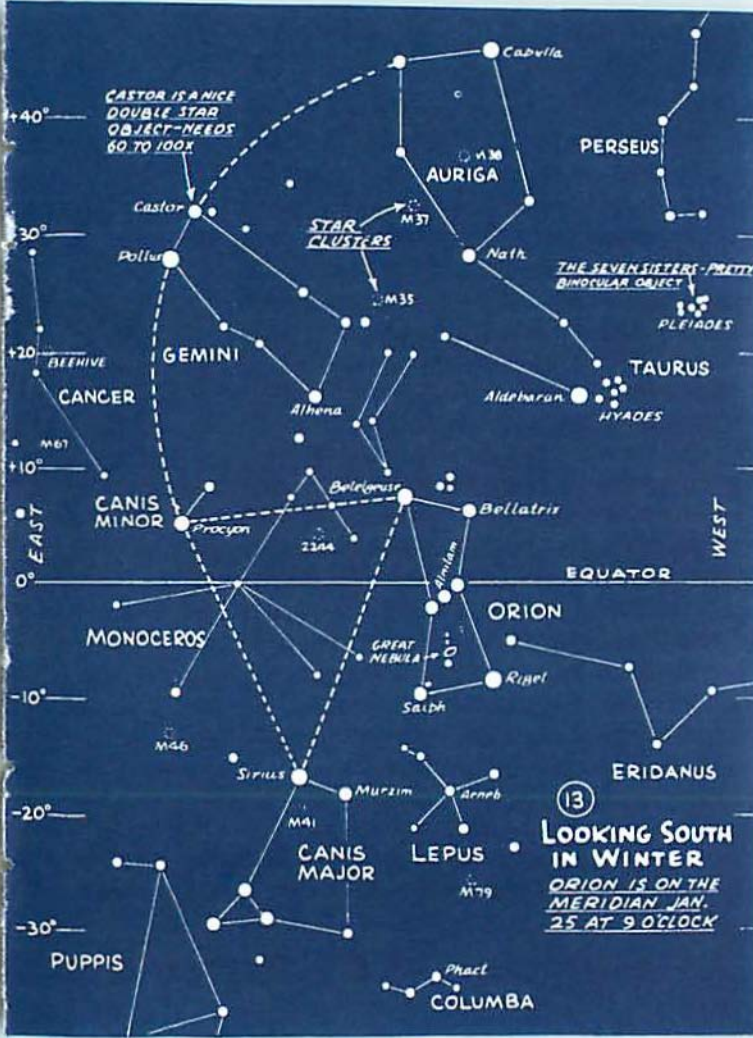
Do a little experimental "dialing" on the Star and Planet chart and you will find stars can be seen considerably "out of season." Orion (see Fig. 13) is a typical winter constellation, but you can see the mighty hunter rising in the east as early as July if you care to stay up until 4 o'clock in the morning.

CASTOR IS A NICE
DOUBLE STAR
OBJECT-NEEDS
60 TO 100X

STAR
CLUSTERS

THE SEVEN SISTERS - PRETTY
BINOCULAR OBJECT

(13)
**LOOKING SOUTH
IN WINTER**
ORION IS ON THE
MERIDIAN JAN.
25 AT 9 O'CLOCK

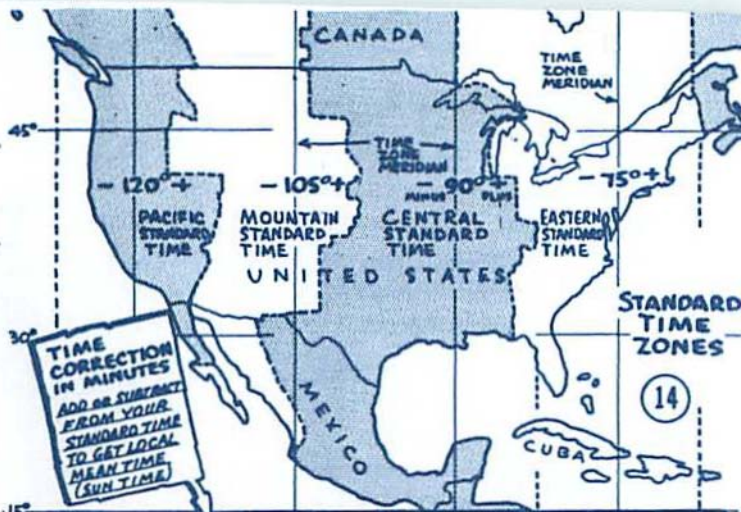


TIME CORRECTION

If you want to be scientifically correct in using the Star and Planet chart, you should set it according to local mean sun time. If you live in or near any of the cities listed in the table on opposite page, you can find mean sun time by adding or subtracting the time correction given from your standard time. For other locations, you must first find your longitude from an atlas. Then, if you are west of your time zone meridian, your time correction is minus four minutes for each degree you are west. If you are east of your zone meridian the time correction is plus.

Example: Cleveland, Ohio, is at $81\frac{3}{4}$ degrees longitude. Cleveland keeps Eastern standard time but is $6\frac{3}{4}$ degrees west of the zone meridian. Therefore, the time correction is $6\frac{3}{4}$ times 4, equaling 27 minutes. You can call it about 30 minutes. This is a minus correction—if your standard clock reads, say, 8:30, your mean sun time is 8:00 (8:03 to be exact). You then set the star dial at 8:00 and the stars will be in proper position for 8 o'clock sun time or 8:30 standard time at Cleveland. If you are lucky enough to live on or near a time zone meridian, you have no problem at all—mean sun time is standard time.

When you have the problem of Daylight-saving time, the simplest solution is to turn back the D.S.T. clock one hour so that it reads standard time. Then, apply the time correction as before.



PLACE	T.C.	LAT.	LONG.	PLACE	T.C.	LAT.	LONG.
AKRON	E -26	41° 05'	81° 31'	MILWAUKEE	C +08	43° 02'	87° 54'
ATLANTA	E -38	33 45	82 24	MINNEAPOLIS	C -13	44 59	93 16
BALTIMORE	E -06	39 17	76 37	NASHVILLE	C -13	36 10	86 47
BIRMINGHAM	C +13	33 21	86 49	NEWARK	C +03	40 44	74 10
BOSTON	E +18	42 21	71 03	NEW ORLEANS	C 00	29 57	90 04
BUFFALO	E -15	42 53	78 52	NEW YORK	E +04	40 45	74 00
CHICAGO	C +09	41 52	87 38	NORFOLK	E -05	36 51	76 17
CINCINNATI	E -38	39 06	84 31	OAKLAND	P -09	37 48	122 16
CLEVELAND	E -27	41 30	81 42	OKLAHOMA CITY	C -30	35 28	97 31
COLUMBUS	E -32	39 58	83 00	OMAHA	C -24	41 16	95 56
DALLAS	C -27	32 47	96 48	PHILADELPHIA	E -01	39 57	75 09
DAYTON	E -37	39 46	84 12	PITTSBURGH	E -20	40 26	80 00
DENVER	M 00	39 45	104 59	PORTLAND	P -11	45 31	122 41
DES MOINES	C -14	41 25	93 37	PROVIDENCE	E +14	41 50	71 25
DETROIT	E -32	42 20	83 03	RICHMOND	E -10	37 32	77 26
EL PASO	C -66	31 46	106 29	ROCHESTER	E -10	43 10	77 36
FORT WORTH	C -29	32 45	97 20	ST. LOUIS	C -01	38 38	90 12
GRAND RAPIDS	E -43	42 58	85 40	ST. PAUL	C -12	44 57	93 06
HARTFORD	E +09	41 46	72 41	SALT LAKE CITY	M -28	40 45	111 53
HOUSTON	C -21	29 45	95 22	SAN ANTONIO	C -34	29 26	98 29
INDIANAPOLIS	C +15	39 46	86 10	SAN DIEGO	P +11	32 43	117 09
JACKSONVILLE	E -27	30 20	81 40	SAN FRANCISCO	P -10	37 47	122 25
JERSEY CITY	E +04	40 44	74 04	SEATTLE	P -09	47 37	122 20
KANSAS CITY	C -18	39 05	94 35	SYRACUSE	E -05	43 03	76 09
LONG BEACH	P +07	33 46	118 11	TOLEDO	E -34	41 39	83 33
LOS ANGELES	P +07	34 03	118 14	TULSA	C -24	36 09	96 00
LOUISVILLE	C +17	38 15	85 46	WASHINGTON	E -08	38 54	77 01
MEMPHIS	C 00	35 09	90 03	WORCESTER	E +13	42 16	71 48
MIAMI	E -21	25 47	80 12	YOUNGSTOWN	E -23	41 06	80 39

FINDING THE PLANETS

Planets are ideal telescope objects and the quartet of Venus, Mars, Jupiter and Saturn has thrilled thousands of telescope observers. With unaided eye, you see them only as bright stars, but with a telescope working at 20x or more you can see the fascinating ring system of Saturn, the moons of Jupiter and the brilliant crescent of Venus.

Planets are much closer than stars and are seen against a background of stars. Referring to the table on the back of the Star and Planet chart, you can find what constellation will be the background for any planet for any month of the year. For example, suppose you want to observe Saturn and find it appears in the constellation, Scorpius. Rotate the star dial and note if you can place Scorpius in the chart opening at some hour of darkness. If you can see the Scorpion, you will also be able to see Saturn, but if the Scorpion is in the daytime sky, Saturn too will be invisible. You can narrow the location somewhat by the fact that the bright planets as well as the sun and moon never appear outside the zodiac. The zodiac is a band 8 degrees wide on each side of the ecliptic; the ecliptic itself marks the apparent yearly journey of the sun among the stars. Now, you know Saturn is in Scorpius and also inside the zodiac, so it must be somewhere in the area shown in Fig. 15. The bright star, Antares, will be your guide. When you get outdoors, you simply locate Antares, and, sure enough,

PLANETS ARE NEVER FOUND OUTSIDE THE ZODIAC

ABOUT 90% OF STAR BIRTH CHART

OPHLUCIUS

SCORPIO

ANTHONY

SCORPIUS

...NOT IN THE ZODIAC (SAGITTARIUS)

...NOT IN LIBRA

...MUST BE SOMEWHERE IN THIS AREA

15 LOCATING A PLANET IN SCORPIUS ON STAR CHART

2



☿ MERCURY

♀ VENUS

♁ EARTH

♂ MARS

♃ JUPITER

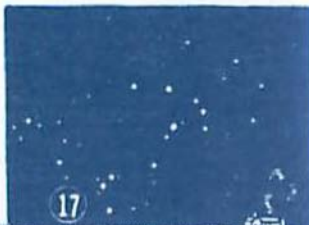
♄ SATURN

♅ URANUS

♆ NEPTUNE

♇ PLUTO

16 OUR SOLAR SYSTEM



17

SOUTH HORIZON

STARS TWINKLE ... PLANETS SHINE WITH A STEADY LIGHT

VENUS POSITION A
SHE TRAILS THE SUN AND WILL BE SEEN AS AN EVENING STAR AFTER SUN HAS SET

SUN

ORBIT OF VENUS

19

POSITION B
... SETS BEFORE SUN BUT IS UP BEFORE SUN IN MORNING

18

LAST HORIZON
AS A MORNING STAR

MERCURY AND VENUS ARE SEEN EAST OR WEST OF THE SUN

WEST HORIZON



20
**JUPITER AND HIS
MOONS IN TELESCOPE**



1995



2002



2009



2017



2025

21
**SATURN
SHOWING 30-
YEAR CYCLE OF
TELESCOPE VIEWS**

there's another bright star in the sky near it - and that you know is ringed Saturn. In the 30-year orbit of Saturn, there are two intervals when the rings are "open" or plainly seen and two times when they are "closed" edge-on and invisible (Fig 21).

The planets - Mars, Jupiter and Saturn - are seen at times to the south from southeast to southwest, but they are not always so favorably placed and you may have to catch them rising in the east or setting in the west. Venus and Mercury can never be seen far from the sun. If you study Fig. 19 you will discover why Venus is sometimes seen as an evening star and again as a morning star. At her brightest, Venus is some thirteen times brighter than Sirius and is a beautiful telescope object. Big Jupiter with his four bright moons always puts on a good show, while Mars is a constant challenge if you wonder "what's up there?"

The Locator is useful in observing satellites. Satellites can cross the sky from any quarter and can vary in the angular height above the horizon. The magnitude or brightness of a satellite can range from invisible to that which is brighter than the stars. Also, its magnitude can appear to change as it travels across the sky.



HOW TO SAY IT

STARS

ACHERNAR... A-ker-nar	<i>Erid</i>
ALBIRO... AL-bir-a-oh	<i>Cygn</i>
ALDEBARAN... al-DEB-a-ran	<i>Taur</i>
ALGENIB... al-GEE-nib	<i>Pegs</i>
ALGOL... AL-gol	<i>Pers</i>
ALNILAM... al-ni-LAM	<i>Orio</i>
ALPHERATZ... al-FEE-rats	<i>Andr</i>
ALTAIR... al-TAIR	<i>Aqil</i>
ANTARES... an-TAY-rees	<i>Scor</i>
ARCTURUS... ark-TOO-rus	<i>Boot</i>
BELLATRIX... be-LAY-triks	<i>Orio</i>
BETELGEUSE... BET-el-jooz	<i>Orio</i>
CANOPUS... ka-NOE-bus	<i>Cari</i>
CAPELLA... ka-PELL-a	<i>Auri</i>
CAPH... KAFF	<i>Cass</i>
CASTOR... KAS-ter	<i>Gemi</i>
DENE... DEN-eb	<i>Cygn</i>
DENEB KAITOS... DEN-eb KAY-tos	<i>Ceti</i>
DENEbola... de-NEB-o-la	<i>Leo</i>
FOMALHAUT... FOE-mal-awt	<i>PscA</i>
HAMAL... HAM-al	<i>Arie</i>
HYADES... HIE-uh-deez	<i>Taur</i>
KOCHAB... KOE-kab	<i>U Min</i>
MARKAB... MAR-kab	<i>Pegs</i>
MEROPE... MARE-o-bee	<i>Taur</i>
MIRA... MY-ra	<i>Ceti</i>
PLEIADES... PLEE-uh-deez	<i>Taur</i>
POLARIS... poe-LAY-ris	<i>U Min</i>
POLLUX... POL-uks	<i>Gemi</i>
PROCYON... PRO-si-on	<i>C Min</i>
PROSEPE... pre-SEE-bee	<i>Canc</i>
REGULUS... REG-yoo-lus	<i>Leo</i>
RIGEL... RYE-jel	<i>Orio</i>
SAIPH... SAH-if	<i>Orio</i>
SCHEDAR... SHED-er	<i>Cass</i>
SHAULA... SHOE-la	<i>Scor</i>
SIRIUS... SEER-ee-us	<i>C Maj</i>
SPICA... SPY-ka	<i>Virg</i>
VEGA... VEE-ga	<i>Lyrn</i>

CONSTELLATIONS

ANDROMEDA... an-DROM-eh-duh	
AQUARIUS... ah-KWAIR-ih-us	
AQUILA... AK-wi-la	
ARIES... A-rih-eez	
AURIGA... aw-RYE-ga	
BOOTES... Buh-OH-teez	
CAMELOPARDUS... ka-MBL-o-pard-us	
CANES VENATICI... KAY-neez ve-NAT-i-ti-ye	
CANIS MAJOR... KAY-nit MAY-jer	
CAPRICORNUS... kap-ri-KOR-nus	
CASSIOPEIA... Kass-ee-oh-PEE-ah	
CENTAURUS... sen-TAW-rus	
CEPHEUS... SEE-foos or FEE-us	
COMA BERENICES... KO-ma ber-e-NIE-seez	
CORONA BOREALIS... ko-ROW-ae bow-ee-A-lis	
CYGNUS... SIG-nus	
DRACO... DRAY-koe	
GEMINI... JEM-i-mi-ye	
HERCULES... HUR-kyoo-leez	
LACERTA... lah-SER-tah	
LEO... LEE-oh	
LEPUS... LEE-pus	
LIBRA... LIE-bra	
MONOCEROS... now-NOSS-er-us	
OPHIUCHUS... off-i-YOU-kus	
ORION... oh-RYE-unn	
PEGASUS... PEG-uh-sus	
PERSEUS... PER-soos or see-us	
PISCES... PIE-seez or PIS-seez	
SAGITTA... sah-JIT-tah	
SAGITTARIUS... saj-i-TAY-ri-us	
SCORPIUS... SKOR-pi-us	
TAURUS... TAW-rus	
TRIANGULUM... TRY-ANG-gyoo-lum	
URSA MAJOR... ER-sa MAY-jer	
URSA MINOR... ER-sa MIE-ner	
VELA... VEE-la	
VIRGO... VER-go	
VULPECULA... vul-PECK-you-la	