AMONG THE STARS

ACTIVITY G-2

GRADE LEVEL: 4-9

What's This Activity About?

Stars reveal their secrets grudgingly. With our eyes alone, we can observe that stars vary in apparent brightness, and that they have slightly different colors. But spectroscopy and the laws of physics allow scientists to determine or estimate much more about stars. From characteristic patterns of gas absorption lines in the star's light, we can tell its surface temperature and its general type (dwarf, giant, supergiant). By measuring the slight changes in the position of nearby stars relative to much more distant ones as our planet orbits the Sun, we determine the distances of those nearby neighbors. Like the first rungs of a ladder, those distances and temperatures allow astronomers to determine the properties of more distant stars. From the orbital motions of multiple star systems, we can determine stellar masses and develop theories about stellar evolution.

This activity will help students to learn how stars can be classified in many different ways. Participants enjoy role-playing as their favorite stars, and the activity's real strength comes from letting the students come up with different ways to classify themselves.

What Will Students Do?

Each student examines a *star card*, which includes information about a particular star's spectral type, distance, temperature, size, and constellation. Students first form groups based on the constellations and then order themselves according to characteristics. For example, the class could line up by temperature, with the coolest stars at one end and the hottest stars at another. The students can decide which characteristics to use to create their organization.

Tips and Suggestions

- You can create additional cards using the data provided, or have students create them.
- It is important to relate how science is used to determine the many characteristics shown on each card. Tie this activity to those in the *Tools of the Astronomer* section.
- Encourage students to find their star in the night sky by using the Star Finder from the *Star Finding and Constellations* section.

What Will Students Learn?

Concepts
Stellar properties

Inquiry Skills
Classifying
Comparing
Ordering
Organizing

Big Ideas
Diversity and Unity

Among the Stars of Winter

Star Cards and Lesson Plan by Vivian Hoette

LEVEL Third through tenth grade students.

INSTRUCTIONAL ARRANGEMENT There should be open space (a hallway or an open area in the classroom, etc.) for students to form groups or lines.

RATIONALE Personalizing star information allows students to understand physical characteristics of stars in a familiar way, associating individual stars with members of the student group and sorting stars while sorting the people who have the information about those stars on cards.

LENGTH Twenty minutes or more depending on teacher's objectives and students' interests. Star cards may be used on several occasions or with different grade levels depending on lesson objectives.

OBJECTIVES

- Students will learn that stars vary in: color, brightness, true size and luminosity, distance from Earth, temperature, etc. Stars are identified by their place within a constellation pattern.
- Students will learn that the peak color in a star's light is related to the star's surface temperature.
- Students will learn that most of the stars we see in the night sky are bigger and brighter than the sun.
- Using star data as a source of comparison and classification, students will practice classification, ordering, and application of numerical skills involving positive and negative numbers, the number line, decimals to the hundredth place, and number names up to hundreds of thousands.
- Students will become familiar with star and constellation names and historic constellation figures.

MATERIALS and PREPARATION

1. Cut apart the star cards of the forty or so named stars belonging to constellations of the Winter Circle (Orion, Lepus, Canis Major, Canis Minor, Gemini, Auriga, and Taurus).
2. Mount the cards on red, orange, yellow, white, blue-white, or blue construction paper to match the peak color of each star's spectrum. Laminate the cards.
3. Use a marker to write the name of the star and its constellation in large letters on the back of the card. Use uppercase for the first letter and lower case for the remaining letters of the star's name. Use all uppercase for the name of the constellation.

PROCEDURE

Engage Student Interest

- Ask students to observe the night sky on a clear evening or view constellation slides in class. Invite the students to sketch, share and discuss their observations.
- Randomly drop stars of different colors and sizes onto dark construction paper. Ask students to glue down the stars, create drawings around them, and tell or write stories about the drawings.

Allow Students to Explore and Classify Stars

1. Let students select a particular star card or pass cards out randomly. (Some teachers use the cards as basis for cooperative group arrangements.)
2. Ask students to study the information on the cards. Give them time to look over the cards and compare the information on their card with information on the cards of their classmates.
3. Ask the group if anyone has an idea about how these stars could be organized. (As we look at the stars in the night sky, they seem 'stuck' in their constellations. In this activity students are able to arrange and rearrange stars according to their apparent and physical properties.)
4. As different ideas are suggested, encourage the person who presented the idea to organize the people in the class (each being a different star) to form groups or lines illustrating the plan suggested. Encourage student leadership.

Explain Astronomy Concepts

Discuss the astronomy concepts and content of the various data fields presented on the cards as students suggest ways to organize the stars.

Star Names: The names of stars are very old. Meanings that do not make sense when looking at the constellation drawings may give clues to the origination of names from earlier cultures who have imagined different pictures in the stars and told different stories. Often star names refer to significant rising and setting times, seasonal and meteorological events, as well as to imaginary figures.

Identification: On constellation drawings, brighter stars are identified by Greek letters assigned by Johann Bayer in 1601. These stars are identified by the Greek letter and the constellation name in the Latin genitive case; this identification is given in its abbreviated and entire form.

Distance: Distance in space is measured in light-years. One **light-year** is the distance light travels in a year, about 9.5 trillion kilometers or about 6 trillion miles.

Peak Color: Starlight is studied by spectroscopy (using diffraction to break light into its component colors). Depending on how hot a star is, the light emitted from the star shines brightest in certain wavelengths. Stars whose spectra peak in the red are cooler than stars whose spectra peak in the blue.

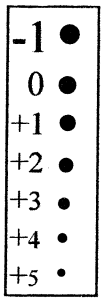
Temperature in Kelvins: This is the surface temperature of the star. When one organizes the stars by surface temperature, one also sees the relationship of peak color to temperature.

Astronomers use the Kelvin scale. Scale changes in Kelvin (K) are equivalent to those in Celsius; the difference is the placement of zero. Absolute zero in Kelvin is 0 K; absolute zero in Celsius is -273.150 degrees. Freezing in Kelvin is 273.150 K; freezing in Celsius is 0 degrees. Boiling in Kelvin is 373.150 K; boiling in Celsius is 100 degrees. One reads the temperature in the Kelvin scale as so many Kelvins rather than using the word degrees as with the Celsius or Fahrenheit scales.

Star's Class (called Luminosity Class by astronomers): The stage of the star's 'life' cycle. Most stars spend most of their existence in the main sequence phase. Later, stars enlarge dramatically to become giant or supergiant stars. Finally, most stars shrink to become white, red, or black dwarfs. Some stars explode as supernovae while their cores collapse into extremely dense neutron stars or black holes.

Diameter: Width of the star, as compared to the sun.

Luminosity: Total light energy emitted by the star, as compared to the sun.



Magnitude Scales: A measure of the brightness of a star. The magnitude scale is logarithmic (2.5 times the brightness between consecutive numbers). Our eyes see light logarithmically. Magnitudes describe brightness inversely so that smaller numbers indicate brighter stars; zero and negative numbers indicate still greater brightness.

Apparent Magnitude: How bright the star appears or seems to be as we observe it from Earth. The system was first set up ages ago with a scale of one to six. One was for the brightest stars and six was for the faintest stars that people could see. Since that time, we have been able to measure the brightness of stars more accurately. The apparent magnitude scale now extends to zero and negative numbers for the very brightest stars.

Absolute Magnitude: True or intrinsic brightness of a star; this scale measures the stars as if they were all the same distance away (about 32.6 light years).

Spectral Type: Spectral classifications are O, B, A, F, G, K, and M. O stars are the hottest and M stars are the coolest. Luminosity class is indicated by Roman numerals. I is supergiant: II is bright giant; III is giant; IV is subgiant; and V is main sequence. Spectral and luminosity classes are further subdivided with numbers and letters.

Constellation Drawings: The drawings of Auriga, Canis Major, Canis Minor, Gemini, and Orion are adapted from Johann Bode, 1801. The drawing of Taurus is adapted from John Bevis (based on Bayer), 1750. The drawing of Lepus is adapted from Pardies.

Enhance Student Interest

- Plan a field trip for your students to the Adler Planetarium or a planetarium near your school.
- Arrange to bring a portable planetarium to your school.
- Plan a star party inviting an amateur astronomer to bring a telescope to your school in the evening.
- Use diffraction gratings or prisms to analyze various sources of light.
- Visit the library to find books on astronomy and constellations. Research constellation stories.

Evaluate Students' Understanding.

- Give individuals or small groups of students a subset of the star cards and ask them to organize and group the stars by various criteria. Ask students to explain their classification systems.
- Ask individuals or groups to brainstorm all the ways stars are different from each other and the ways stars are alike. Do this as both a pre and post evaluation of students' ideas about stars.
- Use the **KWL** (Know?, Want to know? Learned?) method. What do you already know about stars? What do you want to know about stars? as questions to pose to students before the activity. After the activity ask students to write or discuss what they have learned about stars.

ABOUT THE DATABASE

The physical star data used for this set of cards was drawn from StarList 2000 by Richard Dibon-Smith who also provided updated data regarding Alnitak, Betelgeuse, Mebsuta, and Saiph. The temperature values were determined by the author using a variety of methods. Star data varies widely depending on the reference work one is using. Conflicting data results as astronomers learn more about stars, refer to different data sets or use different methods of analyzing data. The author accepts full responsibility for errors not accounted for by the range of values found in the available astronomical reference works.

BIBLIOGRAPHY

Bevis, John. Uranographia Brittanica. London: John Neale, 1750. Fifty-one plates, drawings based on Johann Bayer's plates. Chicago: History of Astronomy Collection, The Adler Planetarium.

Bode, Johann Elert. Uranographia sive Astrorum Descriptio. Berlin, 1801. Twenty plates. Chicago: History of Astronomy Collection, The Adler Planetarium.

Allen, Richard Hinckley. Star Names: Their Lore and Meaning. New York: Dover Publications, Inc., 1963. ISBN 0-486-21079-0

Cox, John and Richard Monkhouse. Philip's Color Star Atlas: Epoch 2000. Waukesha, WI: Kalmbach Publishing Co., 1991. ISBN 0-540-01252-1

Crawford (Hoette), Vivian. "Among the Stars." Cambridge, MA: Project SPICA, 1989.

Davis, Jr., George A. "Pronunciations, Derivations and Meanings of a Selected List of Star Names." Reprint from Popular Astronomy, January, 1944. Cambridge, MA: Sky Publishing Corporation, 1963.

Dibon-Smith, Richard. E-mail and fax correspondence regarding updated star data. January -- March, 1995.

Dibon-Smith, Richard. StarList 2000: A Quick Reference Star Catalog for Astronomers. New York: John Wiley & Sons, Inc., 1992. ISBN 0-471-55895-8

Hirshfeld, Alan, Roger W. Sinnott, and Francois Ochsenbein. Sky Catalogue 2000.0: Volume 1, Stars to Magnitude 8.0, 2nd Edition. Cambridge, MA: Sky Publishing Corporation, 1991. ISBN 0-521-42736-3

Hoette, Vivian. Personal collection of slides and photo CD images of night sky constellations redrawn using computer graphics by Craig Stillwell of the Production Department of The Adler Planetarium, Chicago, 1995.

Ottewell, Guy. The Astronomical Companion. Greenville, SC: Astronomical Workshop, Furman University, 1993. ISBN 0-93456-01-0

Pasachoff, Jay M. and Donald Menzel. Peterson Field Guides: Stars and Planets. Boston, MA: Houghton Mifflin Co., 1992. ISBN 0-395-53759-2

Rey, H.A. The Stars. Boston, MA: Houghton Mifflin Co., 1980. ISBN 0-395-08121-1

"Report Prepared by Committee of the American Astronomical Society on Preferred Spellings and Pronunciations." Adler Planetarium Booklet No. 20. Reprinted by Chicago Park District from Popular Astronomy, August, 1942.

Pardies. Serenissimo Principi Joanni Friderico Duci Brunswicensi. Works on Paper-118c. Undated. Plate 3 from an unbound book. Chicago: History of Astronomy Collection, The Adler Planetarium.

Staal, Julius D. W. The New Patterns in the Sky: Myths and Legends of the Stars. Blacksburg, Virginia: McDonald and Woodward Publishing Co., 1988. ISBN 0-93992304-1

Tuttle, Don. "Pronunciation Guide for Astronomical Objects." Great Lakes Planetarium Association.

Tyson, Neil de Grasse. Universe Down to Earth. New York: Columbia University Press, 1994. ISBN 0-231-07560-X

Among the Stars of Winter Database

Star Name	Pronunciation Key	Abbreviated Identification	Greek Letter Name + Constellation Genitive	Distance in Light-years	Peak Color in Spectrum
Capella	kah-PELL-ah	α Aur	Alpha Aurigae	44	yellow
Menkalinan	men-CALL-ih-nan	β Aur	Beta Aurigae	80	blue-white
Almaaz	al-MAAZ	ε Aur	Epsilon Aurigae	6,500	white
Hoedus II	HEE-dus 2	η Aur	Eta Aurigae	310	blue
Hassaleh	hah-SAW-leh	ι Aur	Iota Aurigae	330	orange
Theta Auriga	THAY-tah Auriga	θ Aur	Theta Aurigae	150	blue-white
Hoedus I	HEE-dus 1	ζ Aur	Zeta Aurigae	530	orange
Sirius	SEAR-eh-us	α CMa	Alpha Canis Majoris	9	blue-white
Mirzam	MERE-zam	β CMa	Beta Canis Majoris	740	blue
Wezen	WE-zen	δ CMa	Delta Canis Majoris	3,100	white
Adhara	a-DAY-rah	ε CMa	Epsilon Canis Majoris	490	blue
Muliphen	moo-li-FAYN	γ CMa	Gamma Canis Majoris	1,000	blue
Aludra	ah-LUD-rah	η CMa	Eta Canis Majoris	2,500	blue
Furud	FOU-rude	ζ CMa	Zeta Canis Majoris	290	blue
Procyon	PRO-seh-on	α CMi	Alpha Canis Minoris	11	white
Gomeisa	go-MY-za	β CMi	Beta Canis Minoris	140	blue
Castor	CASS-ter	α Gem	Alpha Geminorum	47	blue-white
Pollux	PAUL-lucks	β Gem	Beta Geminorum	35	orange
Wasat	WAY-sat	δ Gem	Delta Geminorum	53	white
Mebsuta	meb-SUE-tah	ε Gem	Epsilon Geminorum	190	yellow
Alhena	al-HEN-ah	γ Gem	Gamma Geminorum	88	blue-white
Propus	PRO-puss	η Gem	Eta Geminorum	190	red
Tejat Posterior	TAY-got posterior	μ Gem	Mu Geminorum	160	red
Alzirr	al-ZEER	ξ Gem	Xi Geminorum	59	white
Mekbuda	mek-BOO-dah	ζ Gem	Zeta Geminorum	1,500	yellow
Arneb	ARE-neb	α Lep	Alpha Leporis	930	white
Nihal	HIGH-al	β Lep	Beta Leporis	320	yellow
Betelgeuse	BET-el-jooz	α Ori	Alpha Orionis	325	red
Rigel	RYE-jel	β Ori	Beta Orionis	910	blue
Mintaka	min-TAH-kah	δ Ori	Delta Orionis	2,300	blue
Alnilam	al-NIGH-lam	ε Ori	Epsilon Orionis	1,200	blue
Bellatrix	beh-LAY-trix	γ Ori	Gamma Orionis	360	blue
Algiebba	al-GABE-bah	η Ori	Eta Orionis	770	blue
Nair al Saif	NAIR al-SIGH-f	ι Ori	Iota Orionis	1,900	blue
Saiph	SAFE	κ Ori	Kappa Orionis	215	blue
Meissa	my-SAH	λ Ori	Lambda Orionis	470	blue
Alnitak	al-NIGH-tak	ζ Ori	Zeta Orionis	1,600	blue
Aldebaran	al-DEB-ah-ran	α Tau	Alpha Tauri	65	orange
El Nath	EL-nath	β Tau	Beta Tauri	150	blue
Ain	EYE-n	ε Tau	Epsilon Tauri	150	yellow
Al Hecka	al-HECK-a	ζ Tau	Zeta Tauri	520	blue
Alcyone	al-SIGH-oh-nee	η Tau	Eta Tauri	260	blue
Sun		Distance from Earth is 8.3 light-minutes			yellow

Among the Stars of Winter Database

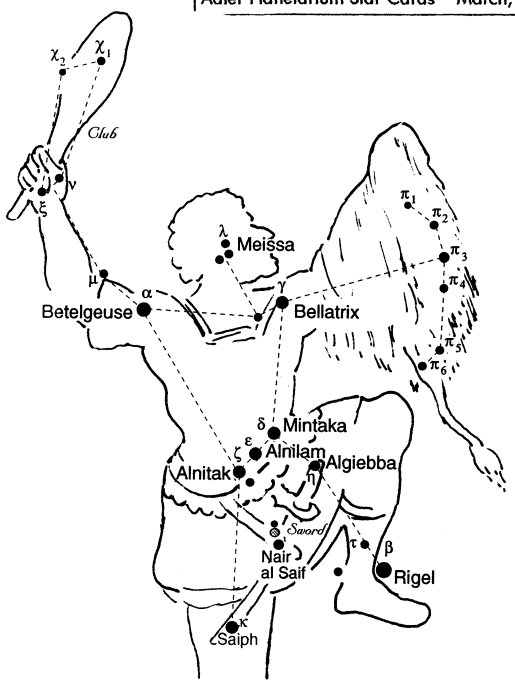
Star Name	Greek Letter	Star's Luminosity Class	Temperature in Kelvins (K)	Diameter in Suns	Luminosity in Suns	Apparent Magnitude	Absolute Magnitude	Spectral Type
Capella	α	giant	5,100	11	72	0.08	0.09	G8 III
Menkalinan	β	subgiant	9,000	2	45	1.90 variable	0.6	A2 IV
Almaaz	ε	supergiant	7,200	365	200,000	2.99 variable	-8.5	F0 Ia
Hoedus II	η	main sequence	21,000	3	377	3.17	-1.7	B3 V
Hassaleh	ι	bright giant	4,200	73	655	2.69	-2.3	K3 II
Theta Auriga	θ	peculiar	10,000	2	146	2.62 variable	-0.7	A0 pec
Hoedus I	ζ	bright giant	4,300	53	655	3.75 variable	-2.3	K4 II
Sirius	α	main sequence	9,700	2	21	-1.46	1.42	A1 V
Mirzam	β	bright giant	26,000	4	6,500	1.98 variable	-4.8	B1 II
Wezen	δ	supergiant	6,000	365	125,000	1.86	-8.0	F8 Ia
Adhara	ε	bright giant	20,000	5	4,500	1.50	-4.4	B2 II
Muliphen	γ	bright giant	14,000	5	1,803	4.11	-3.4	B8 II
Aludra	η	supergiant	14,500	37	50,000	2.44	-7.0	B5 Ia
Furud	ζ	main sequence	18,000	2	377	3.02	-1.7	B2.5 V
Procyon	α	subgiant	6,700	2	7	0.38	2.64	F5 IV
Gomeisa	β	main sequence	13,000	2	95	2.90 variable	-0.2	B8 Ve
Castor	α	main sequence	9,300	2	28	1.58	1.14	A1 V
Pollux	β	giant	4,900	9	32	1.14	0.98	K0 IIIb
Wasat	δ	subgiant	7,000	2	8	3.53	2.46	F2 IV
Mebsuta	ε	supergiant	5,000	33	175	2.98	-0.9	G8 Ib
Alhena	γ	subgiant	9,800	3	79	1.93	0	A0 IV
Propus	η	giant	3,100	34	125	3.28 variable	-0.5	M3 III
Tejat Posterior	μ	giant	2,900	35	125	2.88 variable	-0.5	M3 IIIa
Alzirr	ξ	giant	6,600	2	11	3.36	2.1	F5 III
Mekbuda	ζ	supergiant	5,700	86	5,000	3.79 variable	-4.5	G0 Ib
Arneb	α	supergiant	7,400	32	6,000	2.58	-4.7	F0 Ib
Nihal	β	bright giant	5,600	30	545	2.84	-2.1	G5 II
Betelgeuse	α	supergiant	3,400	265	5,000	0.50 variable	-4.5	M1 Iab
Rigel	β	supergiant	13,000	58	55,000	0.12	-7.1	B8 Iac
Mintaka	δ	giant	24,000	13	50,000	2.23 variable	-7.0	B0 III
Alnilam	ε	supergiant	23,000	16	25,000	1.70 variable	-6.2	B0 Iae
Bellatrix	γ	giant	23,000	3	2,168	1.64	-3.6	B2 III
Algiebba	η	main sequence	19,000	8	1,977	3.36 variable	-3.5	B1 V
Nair al Saif	ι	giant	28,000	6	20,000	2.77	-6.0	O9 III
Saiph	κ	supergiant	22,000	4	525	2.06	-2.1	B0.5 Ia
Meissa	λ	not indentified	35,000	3	552	3.66	-2.2	O8 e
Alnitak	ζ	supergiant	28,000	80	34,000	2.05	-6.6	O9.5 Ib
Aldebaran	α	giant	4,000	34	137	0.85 variable	-0.6	K5 III
El Nath	β	giant	14,000	2	344	1.65	-1.6	B7 III
Ain	ε	giant	5,000	13	65	3.53	0.2	G9.5III
Al Hecka	ζ	giant	18,000	4	1247	3.00	-3.0	B4 III
Alcyone	η	giant	15,000	3	344	2.87	-1.6	B7 III
Sun		main sequence	5,800	1	1	-26.72	4.74	G2 V

Among the Stars of Winter Database

Star Name	Significance of Star Name
Capella	little she-goat, goat star, rainy goat star
Menkalinan	shoulder of the rein holder
Almaaz	he-goat; western goat star; signal for close of navigation; also called Al Anz
Hoedus II	one of kid goats, rising before Sun marks stormy season
Hassaleh	marks back of charioteer's knee
Theta Auriga	marks wrist of charioteer
Hoedus I	one of kid goats; rising before Sun marks stormy season; also called Sadatoni
Sirius	sparkling; dog star; scorching one; rising before Sun on hottest days of summer
Mirzam	roarer or announcer (of Sirius)
Wezen	weight; also called Wesen
Adhara	maiden, attendant of Suhail who married Orion
Muliphen	marks the top of the dog's head
Aludra	maiden, attendant of Suhail who married Orion
Furud	male apes, also called Phurud
Procyon	before the dog (rising before Sirius), water dog (near Milky Way)
Gomeisa	watery eyed (near Milky Way), also called Mirzam
Castor	horseman, mortal twin
Pollux	boxer, immortal twin
Wasat	middle of the sky (near the ecliptic)
Mebsuta	outstretched paw of the lion
Alhena	brand mark
Propus	the projecting foot; also called Tejat Prior
Tejat Posterior	heel
Alzirr	button
Mekbuda	folded paw of the lion
Arneb	the hare
Nihal	camels quenching their thirst
Betelgeuse	arm of central one; armpit of white belted sheep
Rigel	left leg of giant, Orion's left foot
Mintaka	belt
Alnilam	string of pearls
Bellatrix	Amazon female warrior
Algiebba	handle of the sword
Nair al Saif	bright one of the sword
Saiph	sword of powerful one
Meissa	glittering star
Alnitak	girdle
Aldebaran	follower (of the Pleiades)
El Nath	the one butting with horns
Ain	eye
Al Hecka	white one
Alcyone	brightest one of the Pleiades (Seven Sisters)

Adler Planetarium Star Cards March, 1995

Star: Rigel *RYE-jel*
left leg of giant, Orion's left foot



Identification: β Ori *Beta Orionis*

Distance from Earth: 910 light-years

Peak Color: blue

Temperature in Kelvins: 13,000 K

Star's Class: supergiant

Diameter: 58 solar diameters

Luminosity: 55,000 times Sun's brightness

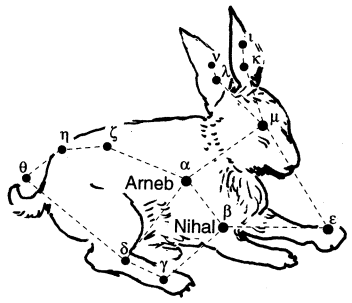
Apparent Magnitude: +0.12

Absolute Magnitude: -7.1

Spectral Type: B8 Iac Constellation: **ORION** *oh-RYE-un* **HUNTER**

Adler Planetarium Star Cards March, 1995

Star: Arneb *ARE-neb*
the hare



Identification: α Lep *Alpha Leporis*

Distance from Earth: 930 light-years

Peak Color: white

Temperature in Kelvins: 7,400 K

Star's Class: supergiant

Diameter: 32 solar diameters

Luminosity: 6,000 times Sun's brightness

Apparent Magnitude: +2.58

Absolute Magnitude: -4.7

Spectral Type: F0 Ib Constellation: **LEPUS** *LEE-puss* **HARE**

Adler Planetarium Star Cards March, 1995

Star: Procyon *PRO-seh-on*
before the dog (rising before Sirius), water dog (near Milky Way)

Identification: α CMi *Alpha Canis Minoris*

Distance from Earth: 11 light-years

Peak Color: white

Temperature in Kelvins: 6,700 K

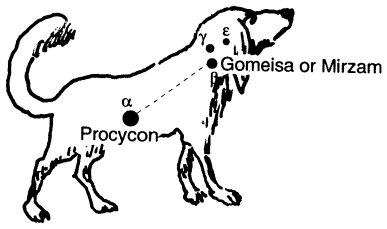
Star's Class: subgiant

Diameter: 2 solar diameters

Luminosity: 7 times Sun's brightness

Apparent Magnitude: +0.38

Absolute Magnitude: +2.64



Spectral Type: F5 IV Constellation: CANIS MINOR *KAY-niss MY-ner* LITTLE DOG

Adler Planetarium Star Cards March, 1995

Star: Betelgeuse *BET-el-jooz*
arm of central one; armpit of white belted sheep

Identification: α Ori *Alpha Orionis*

Distance from Earth: 325 light-years

Peak Color: red

Temperature in Kelvins: 3,400 K

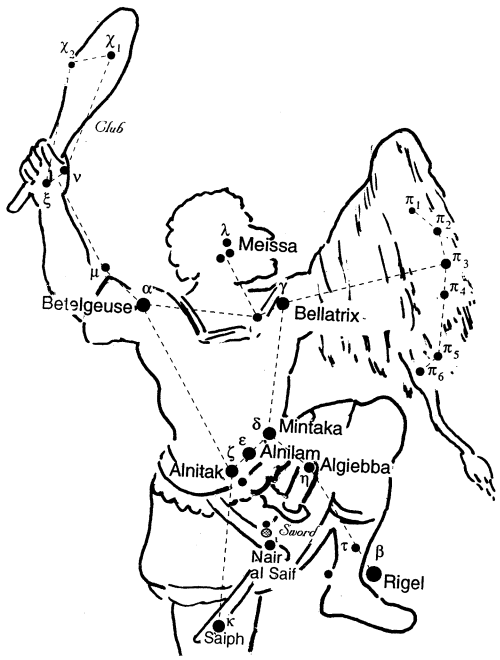
Star's Class: supergiant

Diameter: 265 solar diameters

Luminosity: 5,000 times Sun's brightness

Apparent Magnitude: +0.50 variable

Absolute Magnitude: -4.5



Spectral Type: M1 Iab Constellation: ORION *oh-RYE-un* HUNTER

Adler Planetarium Star Cards March, 1995

Star: Alnitak *al-NIGH-tak*
girdle

Identification: ζ Ori *Zeta Orionis*

Distance from Earth: 1,600 light-years

Peak Color: blue

Temperature in Kelvins: 28,000 K

Star's Class: supergiant

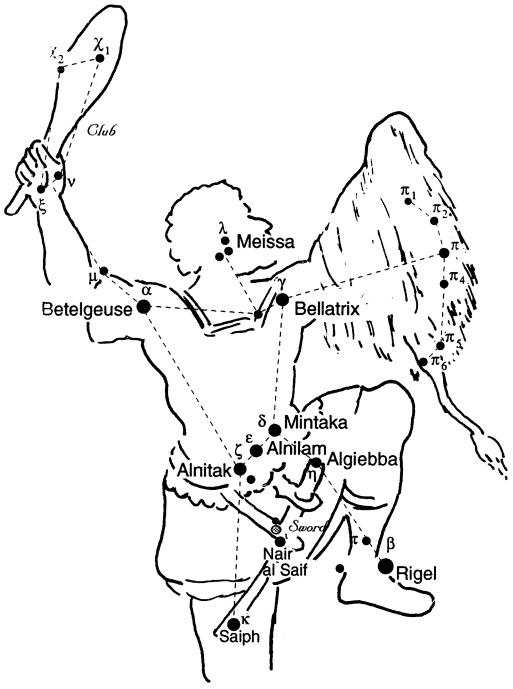
Diameter: 80 solar diameters

Luminosity: 34,000 times Sun's brightness

Apparent Magnitude: +2.05

Absolute Magnitude: -6.6

Spectral Type: O9.5 Ib **Constellation:** ORION *oh-RYE-un* HUNTER



Adler Planetarium Star Cards March, 1995

Star: Pollux *PAUL-lucks*
boxer, immortal twin

Identification: β Gem *Beta Geminorum*

Distance from Earth: 35 light-years

Peak Color: orange

Temperature in Kelvins: 4,900 K

Star's Class: giant

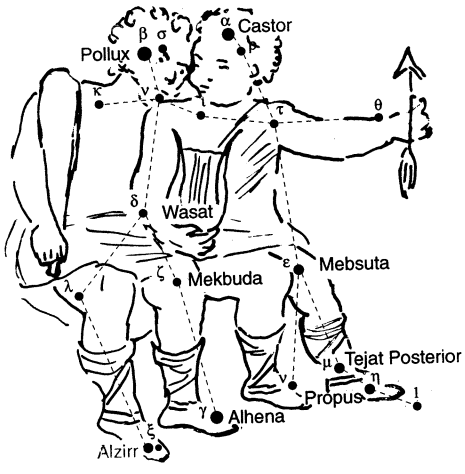
Diameter: 9 solar diameters

Luminosity: 32 times Sun's brightness

Apparent Magnitude: +1.14

Absolute Magnitude: +0.98

Spectral Type: K0 IIIb **Constellation:** GEMINI *GEM-in-eye* TWINS



Adler Planetarium Star Cards March, 1995

Star:

Identification:

Distance from Earth: light-years

Peak Color:

Temperature in Kelvins: K

Star's Class:

Diameter: solar diameters

Luminosity: times Sun's brightness

Apparent Magnitude:

Absolute Magnitude:

Spectral Type: Constellation:

Notes