

## ASTRONOMY

# Impressive Stellar Display

Jupiter, Mars and Saturn will shine in the evening sky and the spacecraft Mariner will make the first close-up observation of Venus in December, James Stokley reports.

▶ ALTHOUGH ONLY ONE of them appears on our December star map, three planets are visible in the evening this month. Brightest of all—and the one that is shown—is Jupiter, which sets in the west about midnight on the first and about two hours earlier on the 31st. It is in the constellation of Aquarius, the waterbearer, and its astronomical magnitude is minus 1.9.

The maps show the appearance of the skies about 10 p.m. (your own kind of standard time) at the beginning of the month, 9 p.m. on the 15th and 8 p.m. on the 31st. At these times Mars will just be rising, but not high enough to be visible. It is located in Leo, the lion. By midnight this will be well above the eastern horizon. Mars' magnitude will be minus 0.1, or about a fifth as bright as Jupiter. It will be brighter than any nearby star, and its red color will make it easy to identify.

## Saturn in Capricornus

The third December evening planet is Saturn, in Capricornus, the sea goat. It sets about an hour before the times for which the maps are drawn. At about 8 p.m., on the first, the constellation of Capricornus is low in the west, just below Aquarius, in which Jupiter stands.

Jupiter, Saturn and Mars are all planets—members of the solar system, like earth, and revolve around the sun, which illuminates them.

The stars, however, are distant suns, each shining by its own light. The brightest shown is Sirius, also called the dog star. It is in Canis Major, the great dog, low in the southeast, and its magnitude is minus 1.6. Thus it is nearly as bright as Jupiter, because the brighter an object, the lower its magnitude, negative magnitudes denoting the very brightest objects. However, being a star, Sirius appears as a point of light and irregularities of the atmosphere cause it to scintillate, or "twinkle." The planet Jupiter presents a small disc, visible in a telescope, which does not twinkle.

Above Canis Major you can see the magnificent constellation of Orion, the warrior, generally considered the finest in the sky. Three stars in a nearly vertical row form his belt. The group also includes two first-magnitude stars: Betelgeuse to the left, and Rigel to the right. Taurus, the bull, is above Orion, with ruddy Aldebaran, another star of the first magnitude.

Off to the left are Gemini, the twins, with Castor and Pollux, the latter being the lower. Below them is Canis Minor, the lesser dog, with Procyon, while above them stands Auriga, the charioteer, with Capella. Both of these stars also are first magnitude. This region of the sky, now visible in the south-

east, contains more stars of this brightness than any other area of the same size.

This month of December, 1962, will probably become an important one in astronomical history. For unless there are unforeseen difficulties, historians will remember it as the time of the first close-up observation of another planet by a spacecraft launched from earth. Ever since it was launched from Cape Canaveral on Aug. 27, the spacecraft Mariner has been speeding toward Venus, the planet which comes nearer to us than any other.

As Venus shone brilliantly in the western evening last summer and in the early autumn, it was moving in toward us. On Nov. 12, as it passed between earth and sun, it was closest to us—only 25,000,000 miles away. At that time, of course, it was invisible. But now it has reappeared, and shines brighter than any other star or planet in the east before sunrise. Though pulling away from us, it is still close: 28,800,000 miles on Dec. 1, and 36,000,000 on the 15th. Next Aug. 30th it will again be invisible, far out beyond the sun, and 161,000,000 miles away from earth.

Mariner's flight was planned so that the 447-pound spacecraft would not hit Venus. In the early stages of planetary exploration we can probably learn more from a "fly-by"

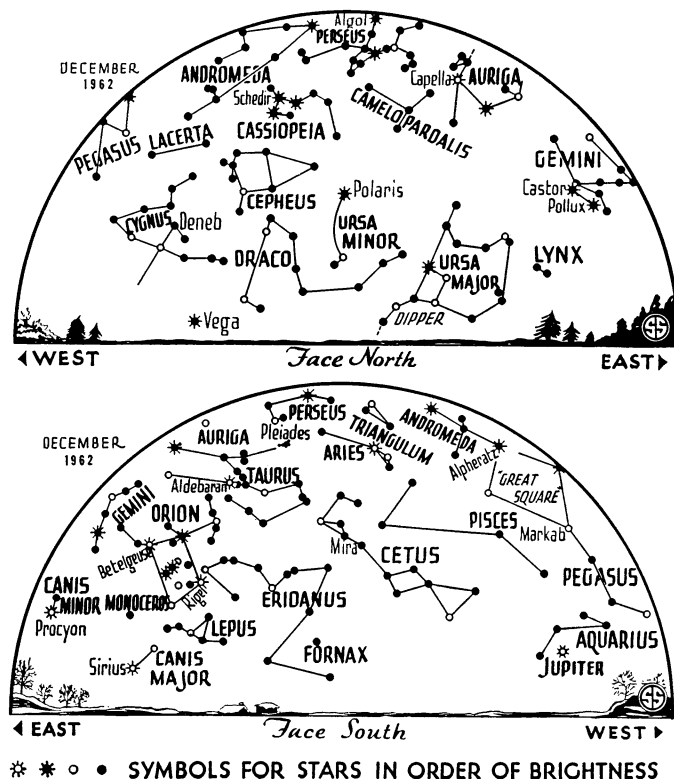
mission that we could from one that actually landed there. Scientists of the National Aeronautics and Space Administration (NASA) who planned it designed the flight path so that scientific instruments on board could measure the temperature of the planet and its atmosphere. They expect them to reveal much about the physical and chemical make-up of Venus and its gaseous mantle. This atmosphere, which is continually cloudy, perpetually shrouds the bright planet.

Mariner's flight path was altered on Sept. 4 on command from the earth—the first time that such a complicated maneuver had ever been performed successfully by a spacecraft in flight. This put it into a long curved path which, after 109 days and 180,000,000 miles of travel, will bring it within 21,000 miles of Venus on Dec. 14.

## Mariner Will Telemeter Data

During the cruise and the encounter with Venus, according to a NASA statement, the Mariner will be telemetering data back to earth. As the sensors of its six experiments receive information, they feed it to a data conditioning system (DCS), located in the base of the craft. The DCS prepares the information for transmission to earth in the form of a digital code.

All the data collected cannot be transmitted at the same time, so an electronic clock has been built into the DCS. This controls the equipment so that the receiver "listens" to one experiment at a time for about one second. After 20.16 seconds the



DCS switches off the scientific telemetry and then sends spacecraft engineering data for 16.8 seconds. This cycle continues during the flight through interplanetary space.

But beginning at ten hours before it passes Venus, the spacecraft will devote its telemetry system to full-time transmission of scientific data from the six experiments.

Thus is astronomy approaching the most important advance of its history. Up to now it has been purely an observational science. From great distances astronomers have picked up light, radio waves and other radiations from celestial bodies. They have analyzed these messages and learned much about the stars, planets and galaxies. Now they are reaching out to observe at close range. Soon astronauts will reach the moon and later the planets—perhaps walk around on some. The era of astronomical exploration will then be here.

**Celestial Time Table for December**

DEC.	EST	
1	10:00 p.m.	Moon passes Saturn
3	10:00 p.m.	Moon passes Jupiter
4	11:48 a.m.	Moon in first quarter
7	3:31 a.m.	Algol (variable star in Perseus) at minimum brightness
8	noon	Moon nearest, distance 226,800 miles
10	12:20 a.m.	Algol at minimum
11	4:28 a.m.	Full moon
12	9:09 p.m.	Algol at minimum
15	5:58 a.m.	Algol at minimum
16	2:00 a.m.	Moon passes Mars
18	5:43 p.m.	Moon in last quarter
20	6:00 a.m.	Moon farthest, distance 251,500 miles
22	3:15 a.m.	Winter commences in Northern Hemisphere
23	2:00 a.m.	Moon passes Venus
26	5:59 p.m.	New moon
29	9:00 a.m.	Moon passes Saturn
30	2:04 a.m.	Algol at minimum
31	10:00 a.m.	Moon passes Jupiter

Subtract one hour for CST, two hours for MST, and three hours for PST.

• Science News Letter, 82:338 November 24, 1962

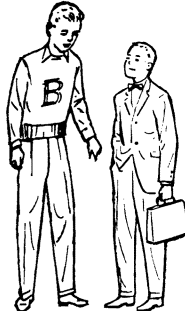
**SOCIOLOGY**

**Intellectual Activity on Social Systems Needed**


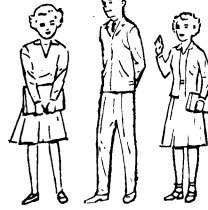
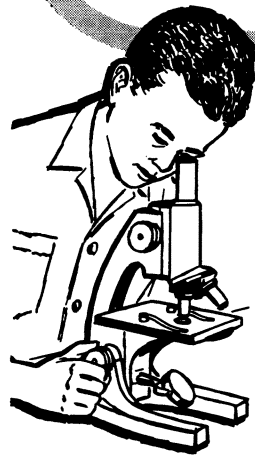
► THE GREATEST threats of American disaster are rising in social systems and not the physical and biological developments into which we are putting our major intellectual energy, Dr. Kenneth E. Boulding, professor of economics, University of Michigan, declared to the American Philosophical Society meeting in Philadelphia.

Mankind's intellectual resources are scarce and their proper allocation among different lines of endeavor, Dr. Boulding said, is a serious problem which we have no good machinery to solve. The surplus of intellectual activity that is available over and above what is necessary to maintain the existing stock of knowledge needs to be used in the most effective way, he maintained. His contention is that not enough of it is going into finding out the best utilization in the fields of water resources, transportation, agricultural policy, urban policy, social security and national defense.

• Science News Letter, 82:339 November 24, 1962



Unless  
all your  
students  
are the same  
height...

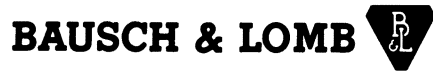
*you need both these  
Bausch & Lomb Standard  
Teaching Microscopes*

The vertical-eyepiece ST Microscope has outsold every other student microscope ever made. And for good, basic reasons: full standard size and operation; fine achromatic objectives; student-proof design; budget-conscious price. But, let's face it, some of your students are too short to use it in a sitting position.



That's where the new Bausch & Lomb Inclined-Eyepiece series comes in. It lets your shorter students see better, learn better, free from the distraction of discomfort. And it has all the best-seller features of the vertical-eyepiece series *plus* a built-in condenser for brighter images.

Every classroom needs both. And now's the time to do something about it, in time for Fall delivery. Just mail the coupon.



**BAUSCH & LOMB INCORPORATED**  
83835 Bausch Street,  
Rochester 2, N. Y.

Please demonstrate ST Microscopes at my convenience.  
 Please send me literature.

Name, Title .....

School Name .....

Address .....