# Scientific American

## THE HEAVENS IN MARCH. BY HENRY NORRIS RUSSELL, PH.D.



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HE planet Jupiter is now just past opposition, and is visible all night long-the chief ornament of the sky. While the amateur astronomer, with a small telescope, may find delight in watching its markings, changing hour by hour before his eyes as the planet rotates, and the varying aspects of its four large

satellites, the most powerful instruments of some of the world's greatest observatories will be busy photographing its faint outer satellites, which can be observed only in this way.

The faintest and most distant of these-discovered last year at Greenwich-has been found again, on photographs taken at the same place on January 16th very near the place predicted by the calculations of Cowell and Crommelin, of which we spoke some months ago.

These new satellites of Jupiter, so much like the asteroids, and so distant from their primary, naturally make us ask: Have they really always belonged to

Jupiter's system, or are they stray asteroids, which, having at some past time passed near the planet, have been "captured" by its attraction, and left revolving around it?

To see how this problem can be attacked, let us imagine first that we are dealing with a projectile shot upward from the surface of Jupiter at a fixed velocity. If this is small -say that of a cannon ball-it will rise only a few miles, and then fall back upon the planet. As the initial velocity is increased, the height to which it will rise, before Jupiter's attraction puts an end to its ascent, will increase.

If nothing but the planet's attraction came into play, this height would be the same, from whatever part of the planet's surface the shot was fired (neglecting certain small effects due to the elliptical form of the planet). That is, the projectile can never get beyond a certain distance from the planet's center. Wherever it starts, and wherever it goes, it must always be inside a sphere whose center is the planet. The size of this sphere depends on the initial velocity alone.

If now we take into account the fact that the sun, as well as Jupiter, attracts the projectile, we find. after calculation. that the region to which

it is confined is no longer spherical, but egg-shaped, with its long end pointing toward the sun. As before, the height above the planet's surface to which it may rise is limited; but in the direction of the sun it is greater than in the opposite direction.

At 9 o'clock: Feb. 6.

At 8 o'clock: Feb. 21.

At 81% o'clock: Feb. 14.

If the initial velocity of the projectile is increased, this egg-shaped region grows bigger in all directions,

the body, however the sun's attraction may change the shape of its orbit, can never leave the planet altogether, but must always remain, and, reckoning backward, always has been, a satellite.

But if it includes both the sun and planet, it is then possible that the small body's orbit about Jupiter may be so changed that at some future time it will pass through the neck of the hour glass, and recede very far from the planet; and of course the reverse process may have occurred in the past.

When the actual computations are made, it is found that the sixth and seventh satellites of Jupiter, as well as all those of the other planets, are of the first sort. They always have been near their primaries, and always will be. But the eighth satellite is an example-and the only known one-of the other case. It may be a captured asteroid, and may at some future time rejoin its former fellows; but at present it is impossible to say whether it has ever actually done so, or ever will.

### THE HEAVENS.

The winter constellations are now well past the meridian. Taurus is almost due west, Orion about southwest, and Canis Major west of south. On the other side of the Milky Way, and higher up, are Canis Minor and Gemini. The latter constellation-which

orthern Horizon

At 9 o'clock: Mar. 8.

At 8 o'clock: Mar. 23.

At 81% o'clock: Mar. 16.

Eggs are often preserv-

them with air-excluding substances or germicides. Eggs packed dry are apt to become musty and acquire an unpleasant flavor. It is better to immerse them in lime water, water glass, or salicylic acid, or to varnish them. A very good liquid for immersion is made by dissolving salicylic acid to saturation in a mixture of 1 part glycerin, 5 parts strong alcohol, and 15 parts water. The eggs should not be more than 10 days old when immersed. They should be carefully cleaned and all spotted or addled eggs should be excluded.

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is one of the finest constellations in the heavens; but we never see its brighest stars at all, nor the rest of it well.

#### THE PLANETS.

Mercury is morning star, best visible about the 9th, when he is at his greatest apparent distance from the sun; but he is far south, and rises only about 5:20 A. M., so he is not favorably placed.

Venus is morning star, still nearer the sun than Mercury, and can hardly be seen at all, except just before sunrise at the beginning of the month.

Mars is morning star in Sagittarius, rising about 3 A. M. He is still too far away to look very bright, being four times as remote from us as he will be in September.

Jupiter is in Leo, just past opposition, and observable till near daybreak. His satellites can be seen with a field glass, and even a small telescope will show much detail on his disk. The full list of the transits and eclipses of the satellites is too long to give here, but it may be mentioned that, about midnight on the 5th, both the first and third satellites, and their shadows, will be projected upon the planet's disk.

Saturn is evening star in Pisces, setting about 8 P. M. on the 1st, but becomes lost in the twilight

before March is over.

Uranus is morning star in Sagittarius. On the mornings of the 26th and 27th he will be very near Mars-to the left on the first date, and above on the second, as seen in the morning sky-and so he can be easily identified.

Neptune is in Gemini, observable all the evening. THE MOON.

Full moon occurs at 10 P. M. on the 6th, last quarter at 11 P. M. on the 14th. new moon at 3 P. M. on the 21st, and first quarter at noon on the 28th.

The moon is nearest us on the 21st, and farthest off on the 7th. She is in conjunction with Neptune on the 1st, Jupiter on the 6th, Mars and Uranus on the 16th, Mercury on the 19th, Venus on the 20th, Saturn on the 22d, and Neptune again on the 29th.

At 1 A. M. on the 21st the sun crosses the equator, passing through the point in the heavens known as the vernal equinox, and, in almanac "spring comlanguage, mences."

Princeton University.

To Keep Eggs.

ed by packing them in chopped straw, salt ashes, slaked lime, or other dry material, by immersing them in lime water, solution of water glass (sodium silicate) or of salicylic acid, or by coating

but especially toward the sun.

As we still increase the velocity, we reach a point at which the projectile, if aimed in the right direction, will pass beyond the "neutral point" where the influence of the attraction of Jupiter balances that of the sun, and escape from the planet's influence, for a time at least. For velocities greater than this, the egg-shaped region must be replaced by one resembling an hour-glass with two unequal bulbs, the small one surrounding Jupiter, and the big one the sun.

Now, in order to calculate the size and shape of this limiting region, we need not assume (as we did above for the sake of clearness) that our moving body started from the surface of Jupiter. We may start it anywhere in the planet's vicinity; and if we know its distances from Jupiter and from the sun, and the direction and speed of its motion, we can determine the shape of the limiting region.

If this is egg shaped, and surrounds Jupiter alone,

and they cannot be mistaken when once seen. Castor is a fine double, easily seen with a small telescope. The faint star near by is moving with the other two, which revolve about one another in a period of some 350 years.

Southern Horizon

At 91/2 o'clock: March 1.

NICHT SKY: FEBRUARY AND MARCH

is figured in our initial letter-bears some faint re-

semblance to its prototype, and what is more remark-

able, to its conventional sign, which consists of two

parallel lines joined at top and bottom. The bright

stars Castor and Pollux are in the heads of the fig-

ures whose name they bear. No other two bright stars

visible in our latitude are nearly as close together,

Auriga is northwest of the zenith, with Perseus below. Cassiopeia and Cepheus are below the pole on the left, and Ursa Minor and Draco on the right. Ursa Major is high up in the northeast, splendidly displayed. The curve of its tail (the Dipper handle) followed downward points out Arcturus, which has just risen south of east, and still lower in Spica, in the constellation Virgo. Above this is Leo, with Jupiter far outshining any of his stars. Cancer, almost overhead, is worth looking at only for the star cluster Praesepe (interesting in an opera glass). Hydra in the southeast has but one solitary bright star, Alphard; but its long line descending from near Procyon to the horizon is fairly conspicuous. Argo, low in the south,

The average automobile user is the prospective purchaser of some better machine than the one he may be using at the present time. Invariably the owner of an automobile who purchases a new car pays more money for it than for his first purchase. In the automobile business, quality is almost invariably commensurate with price. The car which is built under a full year guaranty costs more as a rule than the car which is built under one covering a period of sixty to ninety days. For example, a car which is guaranteed for a full year must be built of such materials and with such care and must incorporate such mechanical principles as will enable its makers to guarantee the car free of cost for repairs due to defective material or workmanship for that time.