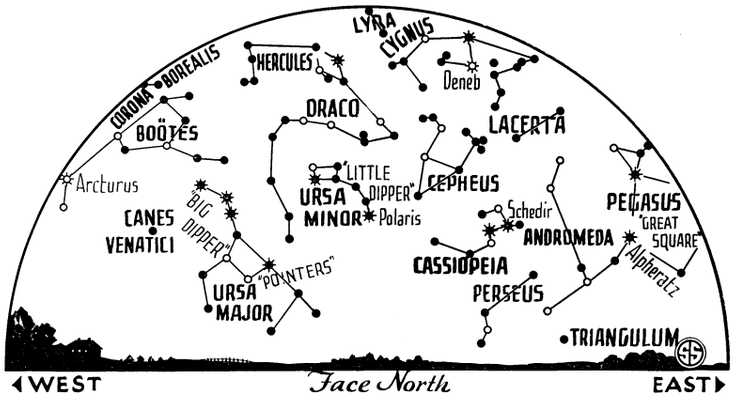


HEAVENLY "LANDMARK"

*The Great Dipper in the northern skies is a convenient starting point for discovering other familiar stars. The pointers carry your eye to the pole star; the curve of the handle to Arcturus.*

watch, are of practically no scientific value in making possible observations which can not be made at other times. Consequently no expeditions of astronomers are going to Africa, as they would if the eclipse were total. Even the small remaining ring of sun is enough to blot out the faint light of the corona, its outermost layer.

### An Elliptical Orbit

Every 29½ days, approximately, the moon travels once in its orbit around the earth. This orbit is not circular, but elliptical, and so the distance between the two bodies varies. This month the moon is most distant from the earth, at "apogee," on August 8 at 4 p. m., eastern standard time. Then it will be 252,510 miles from the earth. At 3 p. m. on the twenty-third, the moon will be closest, or at "perigee," and then only 226,650 miles will separate us. One effect of this is on the tides in our oceans. Tides are caused by the attractions of the moon and of the sun. As the intensity of this tide-producing force varies with the cube of the distance of the source, this difference of approximately 26 million miles produces a considerable effect. So the tides are greater at perigee than at apogee.

Now the moon plays a large part in causing the tides, but many ages ago, according to a widely held theory, the tides caused the moon. This was suggested late in the nineteenth century by Sir George Darwin, whose place in physical science is nearly as great as that of his father, Charles, in biology. This tidal theory is quite mathematical in its details. It assumes that the earth was originally a globe of liquid, with no moon, and which turned once in five hours instead of twenty-four. The tides set up on this liquid earth by the attraction of the sun gradually became larger and larger, finally becoming so high that a piece broke off. This piece eventually formed the moon.

As the tides travel around the earth, pulled now by the attraction both of the moon and the sun, there is a certain amount of friction, especially where they pass over shallow areas like the Bering Sea or through narrow straits. Slight as it is, it causes a braking action which is gradually making the earth turn more slowly. On the other hand, the tides formed on the earth, also attract the moon in such a way as to make it speed up slightly. The faster a sling-shot is whirled about, the farther the stone tries to get from the center of the motion. So the speeding up of the moon makes it move a little farther from the earth. But when a celestial body that is revolving around another is farther away, it moves more slowly in its larger orbit, and so the net effect of the speeding up of the moon is to make it move more slowly around the earth. According to the theory of Darwin, this process still continues, even though it is exceedingly slow, and the time will come when the day and the month will both be about fifty-five of our days, the earth always keeping the same face towards the moon just as the moon does now towards the earth.

During August the moon, then in a crescent phase, passes by Jupiter on the fifteenth, with the planet about thirteen moon diameters to the south. On the twenty-fourth it passes Saturn more closely at about half that distance. The planet Mercury may, perhaps, be seen low in the western sky just after sunset at the very beginning of the month, for it was at its greatest distance east of the sun on the last day of July. Venus and Mars are close together, and may be seen in the eastern sky just before sunrise. The moon, again a crescent, passes them on the seventh, and the three objects will be an interesting spectacle that morning. Venus is the more brilliant, and Mars is red in color, so there should be little difficulty in distinguishing them.

*Science News Letter, August 4, 1934*

### Phases of the Moon

| | | E. S. T. |
|---|---|---|
| **Last Quarter** | **August 2** | **1:26.9 a. m.** |
| **New Moon** | **August 10** | **3:45.6 a. m.** |
| **First Quarter** | **August 17** | **11:32.9 p. m.** |
| **Full Moon** | **August 24** | **2:36.7 p. m.** |
| **Last Quarter** | **August 31** | **2:39.9 p. m.** |

PHYSICS

## Magnetic Objective For Electron Microscope

A MICROSCOPE which uses electrons instead of light rays to "see" tiny objects has been developed by Dr. E. Ruska and reported in the German scientific publication *Zeitschrift für Physik*. By magnification in two stages the German scientist has obtained a device capable of enlarging the apparent size of things some 10,000 times. The maximum magnification usually possible with ordinary optical instruments is 3,500 times.

Whether electrons or light rays are used in a microscope they must be brought to a focus. For electrons a magnetic field is used for this purpose since the electron's charge makes it react in a magnetic field.

The electron microscope, developed by Dr. Ruska, has theoretically a resolving power a thousand times greater than that of a microscope using light,

because the wavelength corresponding to the electron is a thousand times shorter than that of ordinary light. But to realize this power, strongly converging or short focus objectives are required. Glass lenses cannot be used. Electric or magnetic fields take their place, and bend or converge the electron streams just as lenses bend or focus light rays.

One could use a series of low power objectives one after the other in a series of stages. But this would make the microscope unduly long and cumbersome. The development of a high power magnetic objective that will give a magnification of 10,000 diameters in two stages is therefore a considerable step in advance.

*Science News Letter, August 4, 1934*

PHYSICS

# Rotor Spins With Force Million Times That of Gravity

A "ROTOR" spinning 160,000 times a minute (over 2,600 revolutions a second) has been constructed by the Swedish Nobel prize winner, Prof. The Svedberg for investigating the behavior of proteins, the material of which living matter is composed.

Protein placed in Prof. Svedberg's apparatus at the University of Upsala, Sweden, when whirled at such speeds has acting upon it centrifugal force a million times the force of gravity.

The enormous force acting outward on the material is sufficient to separate the small protein molecules from the water in which they are dissolved. By watching the rate of motion of the protein molecules their size and weight can be calculated.

In operation the protein is placed in tiny chambers having quartz windows through which the happenings can be photographed. Both ordinary and ultraviolet light are used for illumination.

Prof. Svedberg and his coworkers, G. Boestad and I.-B. Eriksson-Quensel, report their results and difficulties of the work in the British scientific journal *Nature*.

Hemoglobin, for example, when rotated in a centrifugal field equal to 900,000 times gravity moves outward in such a way that it is known that the particles of which it is composed must be the same size. There were 2,400 whirls a second.

So great is the force generated by the rapid rotation that several of the little "rotors" flew apart and "exploded."

*Science News Letter, August 4, 1934*

PHYSICS

# Better Standards Proposed For X- and Gamma Ray Strengths

SUGGESTIONS for standardizing measurements of X-ray and gamma ray intensities which should aid medical science in the treatment of cancer by radiation were advanced by Dr. Gioacchino Failla before the Fourth International Congress on Radiology.

Dr. Failla is chief physicist at Memorial Hospital in New York City and one of five American delegates to the Congress.

At present the proper doses of X-rays can be determined with considerable accuracy but deciding the right dose of gamma rays from radium is less certain. In practice, rule-of-thumb tests known from experience often serve as a gauge by which the conflicting and scattered observations of many investigators are judged.

The present unit for measuring X-ray and gamma ray intensities, Dr. Failla declared, is the roentgen or R unit. Two ray beams are now compared by the amount of ionization, or atmospheric electricity, which they will produce in a small air chamber at fixed distances from the source.

For X-rays, where the length of the waves is not so short, the method works with some success. For gamma rays, having much shorter wavelength, the ionization method of determining intensity does not work so well. This is due in part, Dr. Failla said, to the fact that what really needs to be known about a gamma ray beam is its effect on body tissues.

What science now tries to do is to take ionization produced in air and apply the results to tissue which is 800 times more dense. For X-rays this discrepancy seems to make little difference but it does matter for the more penetrating gamma rays.

Dr. Failla suggests that the intensity of gamma rays be determined by the ionization they produce in liquid air rather than in gaseous air. Liquid air and human tissue do not differ greatly in density. It is to be hoped that conditions could thus be achieved approximating more closely those found in actual treatment.

*Science News Letter, August 4, 1934*

ASTRONOMY

## Horizontal Telescope Will Aid Astronomer's Comfort

WHEN Gustavus Wynne Cook, banker, manufacturer and amateur astronomer of Philadelphia, Pa., wishes to observe the stars next winter from his private observatory at Wynnewood, near Philadelphia, he will not have to do it from a cold observatory, where the temperature inside and out must be the same.

From a steam heated room he will use a telescope projecting horizontally in through one wall, and by means of remote electrical controls he will operate a 25-inch diameter mirror outside which will reflect the star light into the 15-inch lens of the telescope. A series of dials, electrically connected to the mirror, will enable him to tell where it points, and to set it accurately to any astronomical body within reach. An accurately adjusted electric motor, operating in a manner similar to the electric clocks that one attaches to the lighting circuit, will keep the mirror moving steadily. Thus it will compensate for the earth's turning, and will remain pointed to the star.

This is called a siderostat telescope, and it is believed to be the first of its kind in the United States. It is now reaching completion in the telescope works of J. W. Fecker, in Pittsburgh, and it will be installed within the next few weeks. Already Mr. Cook has several other instruments, including two