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Astronomy

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SCIENCE BULLETIN

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decidedly abstract and are seldom mastered in even the most elementary sense by the average high school student. If the instructor proceeds in the right manner, they can be made concrete and very interesting to him.

Note:—Speed and velocity have been used interchangeably in the above article. There is a theoretical difference. The term velocity associates direction with the idea of speed.

All the problems on falling bodies given above can easily be duplicated by using 980 centimeters per second per second as the acceleration of gravity.

L. Begeman.

ASTRONOMY

General Science.

In the field of general science, astronomy offers projects for practical as well as very useful knowledge. One of the greatest values is its appeal to the intellect. Astronomy attempts to unravel the secrets of nature, not only on our planet, but also in the vastness of space around us that is within reach of man's powerful instruments. It acquaints man with what is going on around him as well as with what is happening in regions far removed from everyday experiences and personal contacts. Astronomy tries to make man feel "comfortable" and at "home" in his universe.

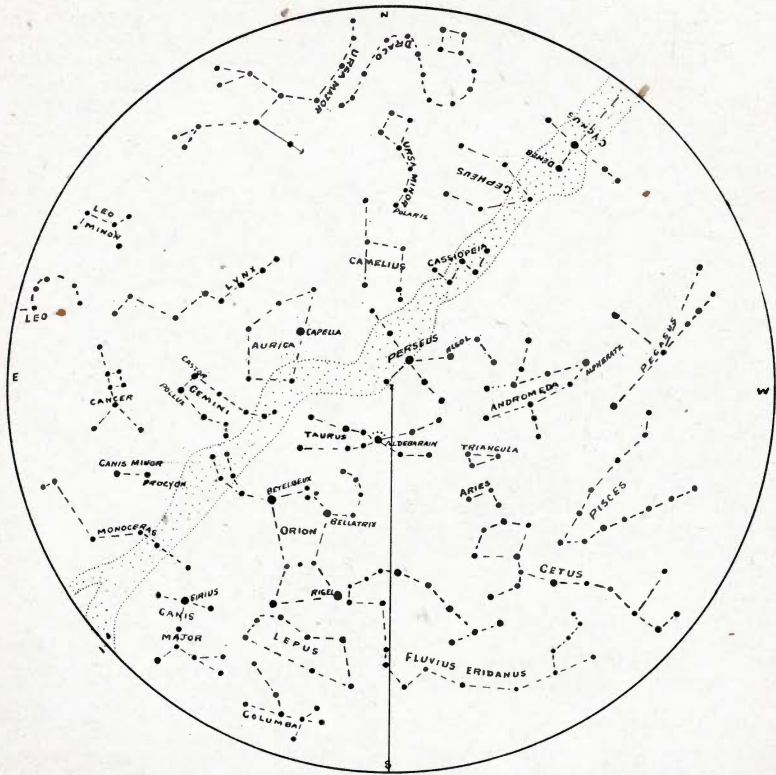
Without a knowledge of astronomy man would be without an accurate time piece. Land surveys would be impossible as there would be no means of finding true north and south. Map-making would be primitive and inaccurate, as even the shape of the earth would be debatable, and navigation would be relegated to the realm of uncertainty. One of the most recent fields to be invaded by astronomy, is that of meteorology. Weather and climate on the earth are largely dependent upon the heat which comes from the sun. A careful study of

the sun reveals the fact that the amount of heat which comes from the sun varies from day to day, and from one year to another. It is quite possible that, if the law of variation of heat from the sun can be determined for given periods, long range weather forecasts will come within the realm of actuality. It would be impossible to measure the value of such forecasting to agriculture. It is thus evident that the modern world is greatly indebted to astronomy for its contribution to civilization.

It is with this thought in mind that the writer ventures a series of studies for general science work in the future Science Bulletins.

The first article will concern itself with a study of the stars. There are five different kinds of bodies in our solar system: the sun, planets, satellites, asteroids, comets and meteors.

What are stars and how can they be distinguished from planets? Stars are large incandescent bodies shining by means of their own light. While they have motion, their great distance from the earth makes them appear as fixed to the unaided eye. Our sun is a star but very small in comparison with many of the stars in our universe. Some of the larger stars which have been measured recently are Betelgeuse in Orion which is 230,000,000 miles in diameter; Antares of Scorpio, which is 350,000,000 miles, and Mira of Cetus, which has a diameter of 400,000,000 to 450,000,000 miles or 400 times the diameter of our sun. The size of a star is not determined by its brightness alone, but also by its distance from the earth. Astronomers have, for convenience, divided the stars into various magnitudes. The faintest star that can be seen with the naked eye is a sixth magnitude star. A first magnitude star is purely theoretical. It is the average of the first twenty brightest stars. Stars of intermediate brightness are called second, third, fourth and fifth magnitude stars. Some of the first magnitude stars are brighter than the average first magnitude stars and are known as zero magnitude stars or even negative magnitude stars. Astronomers have determined the ratio of one brightness to an-



SKY FOR DECEMBER AND JANUARY

Fig. I.

other. This ratio is 2.512. This means that a star of the first magnitude is 2.512 times brighter than a star of the second magnitude, a star of the second magnitude is 2.512 times brighter than a star of the third magnitude, and so on. For stars with a brightness between magnitudes, a fractional ratio has also been devised. A star which is 2.512 times brighter than a first magnitude star is known as a zero magnitude star. A star which is 2.512×2.512 brighter than a first magnitude star is called a negative magnitude star. Sirius of Canis Major is a -1.6 magnitude.

The number of stars in the higher magnitudes are limited but those in the smaller magnitudes are great. There are 20 stars of the first magnitude, 65 of second mag-

nitude, 200 of third magnitude, 412 of fourth magnitude, 1250 of fifth magnitude, 41,000 of sixth magnitude, and so on.

The distance of stars is measured in terms of light years. A light year is the distance which light will travel in one year. In round numbers the distance is about six trillion miles. There are about 30 stars within 100 trillion miles from the earth, while a large majority visible to the naked eye are more than 500 trillion of miles away.

Planets may readily be distinguished from stars in two ways. Planets shine by means of a steady light while stars twinkle. Planets actually shift their position among the stars, as they are not fixed. Planets between the earth and the sun never get far away from the

rising and setting sun and so are called morning and evening stars. Mercury and Venus are the two planets so named. Venus is now a Morning Star and will continue to be until February 6th, when it again becomes an Evening Star until November 22nd, when it again shifts to a Morning Star. Mars may now be seen in the morning before daylight comes on. Jupiter is now a brilliant object in the eastern sky early in the evening. After June 20th, Jupiter will be found in the western sky early in the morning. The planet Saturn appears in the morning until July 1st, when it becomes an evening object to the end of the year.

Outside of the practical concern of life, there is nothing that possesses a more fascinating interest for people than the observation and study of the ancient star figures of the heavens, called constellations. These star groups of the sky are constantly challenging us to fathom their changing mysteries. In studying the heavens it was very natural to arrange the stars which to the casual observer on first glance, seemed sprinkled at random over the sky, into geometric figures, triangles, squares, and lines. It was natural and easy for the imagination to people the sky with elaborate forms of giants, land and sea animals of all kinds, and flying fowl. Forty-eight such figures were named by the ancients, for the most part, for objects or heroes of mythology. The ordinary observer cannot see much resemblance to the objects for which they were named by the ancients, but this should not in the least detract from a true interest in them. This phase of study and observation is practical for general science projects, but should be followed in logical sequence. The writer suggests that a seasonal study be made taking up the fall, winter, and spring, constellations. This is the time of year when some of our most beautiful constellations are visible. The place of rising, position on the meridian, place of setting, and the principal star of stars of each constellation studied should be noted.

The following are the constellations for study for December and January: Andromeda, the Chained

Maiden; Aries, the Ram; Auriga, the Charioteer; Cetus, the Whale; Cassiopeia, the Queen's Chair; Cepheus, the King; Canis Major, the Greater Dog; Canis Minor, the Lesser Dog; Draco, the Dragon; Fluvius Eridamus, the River Po; Gemini, the Twins; Lepus, the Hare hunted by Orion; Orion, the Giant Hunter; Pisces, the Fishes; Pegasus, the Flying Horse; Perseus, the Champion; Taurus, the Bull; Ursa Major, the Greater Bear; and Ursa Minor, the Lesser Bear.

To locate these constellations study the accompanying chart of the heavens for December and January. First select a constellation for study, preferably Ursa Major. Face to the north, holding the chart above your head in such a way that the portion of the figure marked with the letter "N" is toward the north. Study the outline of the constellation form the chart, then see if you can find its outline in the sky. In like manner, select constellations from the above list, find them on the chart, then hold the chart in the proper direction and find the constellation in the sky. The chart will show in print the principal stars or stars of the constellation. Note its location in the figure and study often enough so that each can be recognized without aid of chart. In this way one can come to know and recognize each constellation readily.

E. J. Cable.

HOUSEHOLD INSECTS

Biology

It was said above (see November Bulletin) that practically every animal is attacked by one or more kinds of insects. Man constitutes no exception to this statement, and it is my purpose in this article to deal with a few of the insects commonly found in or around our homes.

Perhaps the most familiar of all household insects is the housefly. Not all flies found in our dwellings are true houseflies. For example, the large blue or green-bottle flies frequently enter houses where they may be heard buzzing loudly behind the window curtains and at certain seasons of the year the little red-eyed pomace or fruit-fly