

Franklin's Scientific Society Still Active

General Science

Following are reports of the American Philosophical Society by James Stokley.

America's oldest scientific society, founded in 1727 by Benjamin Franklin at an informal gathering of his friends, held its annual meeting from April 19 to 21 in the same home that it occupied in pre-revolutionary days, when Franklin was president. This is the American Philosophical Society, whose meeting place is in historic Independence Square, in the same group of buildings as Independence Hall, where the Declaration of Independence was signed, and where the Liberty Bell is preserved. The meeting room itself is filled with paintings and other relics of former officers and members, back to Franklin's time.

As modern astronomers told of the latest discoveries in the exploration of the universe, there stood at one side the telescopes used by David Rittenhouse, pioneer American astronomer. With one of these he observed the transit of Venus that occurred in 1769 from a platform especially erected for the purpose almost under the windows of the meeting room. Seven years later this same platform was used when the Declaration of Independence was first read in public.

The Center of the Galaxy

Travel with the speed of light at 186,000 miles a second, in the general direction of the constellation of the Scorpion, for about 52,000 years. Then you will be at the center of the Milky Way, or Galaxy, the stellar system of which the sun and all the stars that we ordinarily see, are part.

So announced Dr. Harlow Shapley, the director of the Harvard College Observatory.

The Scorpion now appears in the southeastern sky late in the evening, and is characterized by the bright star Antares. The light from Antares takes about 125 years to reach us, traveling some six million miles each year. So small is this compared to the distance of the solar system from the heart of the Galaxy that Antares is practically our next-door neighbor, in one of the outlying stellar suburbs.

Dr. Shapley has arrived at this startling conclusion by a study that the Harvard Observatory has been making of some interesting regions in the scorpion and the neighboring groups of Ophiuchus, the serpent car-

rier, and Sagittarius, the archer. These regions turn out to be the galactic center, though their identification as such is a by-product of other searches.

It is from the distribution of the globular clusters, vast spherical swarms of stars, that has come the best determination of the direction of the center of the Milky Way, says Dr. Shapley. But this is not the only basis for his belief. Counts made of faint stars by D. Frederick H. Seares, of the Mt. Wilson Observatory, confirm the determination. So do the distribution of new stars, the number and faintness of stars that vary their light regularly, and the motions of the stars in the region of the sun.

Another important fact has been revealed by the velocities of these stars. They show that, just as the earth revolves around the sun, the sun itself is revolving around the center of the Galaxy, with a speed that cannot yet be accurately determined. It is, however, between two and three hundred miles a second.

Whether there is a central "sun" at the center of the Milky Way, and around which the stars revolve is another question that cannot now be answered. Scattered throughout space, outside of the Galaxy and far beyond it, are numerous spiral nebulae. These are watch-shaped objects usually with a spiral structure. By recent work of Dr. Edwin P. Hubble, at Mt. Wilson, some of these have been proven to be swarms of stars, like that of the Milky Way itself. Many of them have a nucleus of bright material at the center, and it may be that our own Galactic system has such a nucleus at the center in the direction of Scorpio, Ophiuchus and Sagittarius. However, there are in these constellations, clouds of dark matter, that makes its presence evident only by its silhouette against the bright starry background. This would obscure the central nucleus, if there is one.

Dr. Shapley announced that the study which revealed these facts is still in progress, and that it will finally give more accurate figures. Already 300 new variable stars have been found, as well as several new star clusters.

Star Distance Revelations

Observations of star distances made at the McCormick Observatory of the University of Virginia,

and the Allegheny Observatory, Pittsburgh, are furnishing the yardstick by which the size of the universe is being measured. So, Prof. Samuel A. Mitchell, director of the Virginia observatory, told the members of the American Philosophical Society.

Prof. Mitchell is the champion astronomical distance measurer. Personally he has determined the parallaxes, from which are derived the distances, of over 300 stars. At his observatory a total of 800 stars has been measured.

These parallaxes are determined in the same way that a surveyor finds the distance of a far-off mountain peak. From each of two stations, separated by a known distance, he observes the peak and the other station. Then, knowing the base and two angles of a triangle, the distance can be computed. In measuring the star distances the astronomer takes the diameter of the earth's orbit, 186 million miles, as the base line. Careful measurement of photographs of the stars made six months apart, when the earth is on opposite sides of the orbit, gives the parallax.

Though there are other methods of getting star distances indirectly, they all depend ultimately upon these "trigonometric" parallaxes, the speaker stated. Some of these indirect methods make use of the spectrum of the star's light when it is passed through the prisms of the spectroscopy, or of the light changes of a peculiar type of variable star, or a study of the motions of a star across the sky.

Chiefly basing his results on the study of variable stars, Dr. Edwin P. Hubble, of the Mt. Wilson Observatory, recently found that the spiral nebulae, long-standing astronomical mysteries, were independent systems of stars, outside the "local" one of which our sun and the Milky Way are parts. The nearest spiral nebula, he estimates, is so distant that its light takes a million years to reach us.

However, these determinations also depend upon the parallax determinations, for if the nearer of these "Cepheid" variables are not at the distance that astronomers suppose, the error is even greater for the far-away ones in the nebulae. Prof. Mitchell revealed (*Turn to next page*)

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that in cooperation with the Mt. Wilson Observatory, the McCormick Observatory has made the first of a series of plates to determine the distance of about 150 of these Cepheid variables.

"It will now be necessary," he said, "to wait for another eight or ten years before taking the second series, until the lapse of sufficient time interval to permit the determination of the proper motions with sufficient precision. The mind of the astronomer that contemplates with serenity the time of a million years does not fret in being forced to wait a paltry decade to complete his observations."

Human Bulldogs

When a person with a broad face, projecting jaw, and sunken-in bridge of the nose is described as "bull-dog-dish" the comparison is more than one based on mere superficial resemblances. In fact, both the human being and the bulldog have to blame their glands, probably the thyroid and pituitary, for their condition. Both are abnormal, the victims of what the physician calls "achondroplasia." So announced Dr. Charles R. Stockard, professor of anatomy at the Cornell University Medical College.

Dr. Stockard showed pictures of several types of human dwarfs. One was the cretin, due to a failure of the thyroid gland to function properly, and immediately improved and eventually cured by administering thyroid extract. Another type is entirely normal in proportions, but merely built on a smaller scale than ordinary persons. Finally, there is the achondroplastic dwarf, the human "bulldog" with the head and torso practically normal size but with the legs and arms unusually short.

The bulldog, especially the English bull, shows remarkably similar characteristics, examination of the glands after death show the same abnormalities, and the behavior of the man and dog is similar, for, he said, "the bull is the most stupid of all dogs." Dr. Stockard has also ascertained the cause of the facial characteristics. Inside the skull, at the base of the brain cavity, is a bone that, in normal individuals, does not become hard until about 22 years of age. Before that time it consists of cartilage and grows with the individual. In the achondroplastic dwarfs and dogs, this bone is hard at birth. It does not grow any larger and so there is nothing to push out the upper part of the face as the person grows. Other types of dogs, such as the dachshund, are the result

of similar abnormalities which have been cultivated by breeders, and Dr. Stockard is hopeful that by their study he can gain information of value in treating the disorders in humans.

Three Century Old Cells

Half a century or more before the society was founded began the life of cells from an Arizona bean tree exhibited to the members by Dr. Daniel T. Macdougall. Dr. Macdougall is director of the Carnegie Institution's Desert Laboratory at Tucson. These are the oldest living cells known, he said. Though the big trees of California, for example, have ages estimated at thousands of years, this age refers to the tree as a whole. The individual cells of which the tree is composed are much younger, for they are continually renewed, but even in these redwoods there are cells whose age, as individual cells, runs into centuries. The bean tree that he has studied has produced the oldest cells so far found, with ages in excess of 250 years. The old cells are found in the pith, and also in the woody part, the same part of the tree that is used for lumber.

As there are even larger trees of the same species than those he has studied, he believes that there may be cells far older. In fact, he said, there is no reason why they should not continue to live indefinitely. So far he has not been able to determine exactly why these cells can live so much longer than those of common trees, but he has found that they contain ten times as much calcium or ash as in the oak or beech, for instance. Also, the space between the cells contains from two to fifteen per cent of carbon dioxide, a gas present in the air in smaller proportions.

Life in a Cell

Dr. Edwin G. Conklin, professor of biology at Princeton, told of his researches which alter the usual conception held of cells of another kind. Working with the eggs cells of a primitive aquatic animal related to the sea-squirt, he has shown that the cell may be made to go through the complete life cycle of the animal and still remain a single cell. Ordinarily, after the egg cell is fertilized, the cell begins to divide into two, then into four, and so on, until in about 12 hours it has turned into a freely swimming tadpole. Then the metamorphosis begins to the adult form of the animal. Dr. Conklin has succeeded in making the nucleus of the cell divide and redivide many times, all within the

wall of a single cell. The nucleus is the "heart" of the cell—its center of activity. These nuclei behave like those of normally developed cells. Those that form in the region from which muscle tissue would ordinarily develop, for instance, are large, like muscular nuclei, those corresponding to the animal's primitive spine are small and transparent. And then, when the time comes for the metamorphosis to take place, these nuclei change like those in the normal animal.

Vitamin in Cod's Eggs

Vitamin D, widely known as a preventive of rickets, may play an additional and equally important part in the normal development of the egg and the young, Dr. Alfred F. Hess of Bellevue Hospital announced.

Cod liver oil is one of the richest sources known of this vitamin used for the protection and cure of rickets, yet it is evident, said Dr. Hess, that this cannot be its function in the cod and other fish, the livers of which contain this factor in varying amounts.

Investigation of the problem showed that eggs of all fish, and hens' and snakes' eggs as well, contain the valuable antirachitic factor. Although present in the hen's egg, it does not occur in the livers of young chicks.

"In other words," explained Dr. Hess, "this 'vitamin' has been utilized and used up in the course of the development of the chick. The same is true in regard to fish. Although fish eggs are rich in the antirachitic factor, the fish fry are devoid of it. A consideration of all these data, together with others, makes it evident that the so-called antirachitic vitamin has one or more functions in addition to the protection and cure of rickets. It may have several functions. Evidently, however, one is closely associated with the normal development of the egg and of the young.

"Whether this fact can be applied to mammals is a question which has not been investigated."

Science News-Letter, April 28, 1928

Milk is richer in vitamin D when cows are fed on green pasture.

Some of the peach trees in Arizona canyons are descendants of trees planted by Spanish priests who brought the seed to America over 300 years ago.