ASTRONOMY

Pinwheels in the Heavens

Pinwheels of stars and shining nebulae glow in the night skies, so enormous they take hundreds of millions of years to complete a single turn.

By MARTHA G. MORROW

➤ THERE ARE fireworks in the heavens. Pinwheels of stars and shining nebulae glow in the night skies. Long arms of stars, bright dust and gas spiral outward from their fiery centers.

These permanent pinwheels of the heavens take hundreds of millions of years to make a single turn. Yet they are so enormous that individual stars racing around the center travel hundreds of miles each second.

Some of these heavenly fireworks are so distant that you can see them only with the world's best telescopes. A few can be picked up with a home-made model. One or two you can see with the unaided eye if your eyesight is good.

There is one starry pinwheel, however, that everyone can see, at least in part. Just go far from city lights on a clear, moonless night during late summer, and you will see the Milky Way glowing faintly across the heavens. This band of soft, misty light encircling the sky comes from millions of stars too faint to be seen without a telescope. They outline the pinwheel galaxy to which our earth and sun belong.

We are riding on a cosmic carousel. The Milky Way is our celestial merry-go-round. This gives us the disadvantage, however, of being on the inside, looking out. It is difficult to visualize how our galaxy looks and just where we are in relation to the myriad of other stars.

Pocket-Watch Shape

All spiral galaxies are shaped like a pocket watch. Spinning has flattened them out. The Milky Way galaxy to which we belong has this same shape. It is about ten times as broad as it is thick.

The center of our galactic system is located in the direction of the constellation of Sagittarius, the archer, visible low in the south these September evenings. It would take light, traveling some 186,000 miles a second, 25,000 to 30,000 years to reach its center. This estimate was made by Dr. Harlow Shapley, director of Harvard College Observatory, some 20 years ago and his figures are still accepted.

It takes about 200,000,000 years for our spiral galaxy to make one complete revolution. Yet we, the sun and other stars in our neighborhood, are racing around the center of our universe at a speed of some 150 miles a second.

We actually are located in an outer spiral arm of our pinwheel galaxy. People in the United States cannot see this luminous arm, nor even stars marking the direction in which it lies. The constellation of Carina, the ship's keel, is visible only in the southern hemisphere. Dr. Bart J. Bok, associate director of Harvard College Observatory, has recently demonstrated that the Eta Carina Nebula is really a luminous knot in one of the spiray arms of our Milky Way.

The Milky Way is enormous, even for a galaxy. Light would take 100,000 years to cross it. Yet it is only 10,000 light-years thick at the central bulge.

But stars belonging to our system are found much farther out from the center than this. A thin haze or corona of stars encircles the main discoid system. This atmosphere of stars, tens of thousands of light-years thick, envelops our galaxy.

Fully a hundred billion stars belong to our celestial pinwheel. Some 6,000 of these are near enough and bright enough to be seen with the unaided eye. Our galaxy

GREAT NEBULA OF ANDROMEDA—This spiral nebula is believed to be much like our own Milky Way galaxy, both in size and shape. By studying our neighbor, astronomers are learning much about the universe to which our solar system belongs.

also contains vast clouds of gas and dust. Some of these are quite luminous and shine in our night sky; others are dark and cut off some of the light of stars beyond them.

We fail to see many nearby stars because of these dark clouds. Others are just faintly seen when in reality they are quite bright objects. Much of this dark material lies between us and the hub around which our galaxy rotates, cutting off our view of the millions of bright stars clustered together there.

An enormous cloud of obscuring dust and gas, shaped like a slightly-bent cigar, divides the Milky Way at places into two branches. You can easily see these two branches on a clear, dark night in the late summer. Look toward that part of the Milky Way which extends from the constellation of Cygnus, the swan, in which you will find bright Deneb high in the evening sky, down between Altair in Aquila, the eagle, and the serpent's tail, and on down to the southern horizon.

Stars of high surface temperature and great brilliance on the other side of this cloud particularly interest Dr. J. J. Nassau of the Warner and Swasey Observatory, Cleveland, and Dr. W. W. Morgan of the University of Chicago's Yerkes Observatory. These stars, which do not look particularly bright in our sky, are all at least 1,500 times as bright as our sun and many of them are over 10,000 times as bright.

Few Peep-Holes Available

At night when you pass over a city in an airplane, or look at it from the roof of one of the tallest buildings or from a nearby mountain, it is easy to grasp the lay-out of the city by studying the lights that shine in the dark. But if you remain in the street, or look out of a first-floor window, you have a hard time picturing the metropolis. Astronomers are in the difficult position of trying to picture the Milky Way galaxy when they have only a few peep-holes from which to view its lay-out.

There is a nearby pinwheel system of stars, however, which looks very much like our own. Astronomers are using the Great Nebula of Andromeda as a model for studying our own galaxy. This is a most direct attack on the structural problems of our system.

To the unaided eye, the Great Nebula looks like a small luminous cloud or misty star. It is of the fifth magnitude, thus is rather difficult to spot. Its spiral shape appears in a telescope. In photographs with the world's best telescopes, dark lines of obscuring matter as well as bright stars are visible.

It was Dr. Walter A. Baade of Mt. Wilson and Palomar Observatories of the California Institute of Technology and the Carnegie Institution of Washington who first showed the central nucleus of the Andromeda Nebula to be a myriad of individual stars. Before that astronomers had photographed the hot blue stars in the galaxy's spiral arms, but not until World War II were the brilliant red stars in its shining center revealed. Dr. Baade and the 100-inch telescope at Mt. Wilson "captured" them individually for the first time on photographic plates.

With the 200-inch Hale telescope atop Mt. Palomar, Dr. Baade has been exploring this neighboring nebula still further and has been examining other galaxies in detail. He has picked out the individual stars of which they are composed and confirms the work of Dr. F. H. Seares of Mt. Wilson Observatory a generation ago on the location of different types of stars. Hot blue stars are found most frequently in the spiral arms; giant cool red stars tend to concentrate in the nucleus.

Thus Milky Way astronomers have been

furnished another clue as to where we are located in our own galaxy. The presence of numerous hot blue stars, for instance, signals the direction to one spiral arm.

Just suppose astronomers could carry their telescopes to a planet in the Andromeda Nebula. What would our Milky Way galaxy look like from there? Calculations show it would look much like the Great Neubula does to us. Photographs would probably reveal individual giant stars in our galaxy, including most of our variable stars.

Magellanic Cloud Galaxies

Two companion galaxies could also be spotted nearby. They are the Magellanic Clouds. These Clouds are both irregular galaxies which from the earth look like faint luminous clouds broken off from the Milky Way. Unfortunately, they are too far south to be seen from the United States.

The two Magellanic Clouds and the Milky Way galaxy form a triple system. Our galaxy is nearly 30 times as bright as the Small Cloud and six times as bright as the Large Cloud. Yet these clouds are not dwarf galaxies, Dr. Shapley has shown, but are probably brighter and more massive than most galaxies. They whirl around with us in our travels through space.

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BIOCHEMISTRY

Nerve Gas Antidote

➤ AN ANTIDOTE to Parathion and some other nerve-gas types of insecticides, and maybe to the nerve gases themselves, has been discovered.

It is called Buscopan. In treatment of laboratory animals poisoned by Parathion, it is much more effective than atropine. Atropine has so far been considered the best drug for treating both nerve-gas and Parathion-insecticide poisoning.

Buscopan is a German drug. Chemically, it is 1-N-butylscopolammonium bromide. It comes from scopolamine, the "twilight sleep" drug once popular as a childbirth pain-reliever.

The effectiveness of this drug as an antidote to poisoning by insecticides, Parathion, dimethyl Parathion and Systox, was reported by Dr. William B. Deichmann of Albany Medical College to the International College of Surgeons, Chicago. (See p. 168.)

Buscopan, in Dr. Deichmann's opinion, is "terrifically better" than atropine. It acts at the ganglia, which are collections of nerve cells occurring along the chains of sympathetic and parasympathetic nerves. Atropine acts at the nerve endings rather than at the ganglia of these nerve chains. This different spot at which the new drug takes effect may be what makes it, in Dr. Deichmann's experience, so much better than atropine.

Dr. Deichmann emphasized that so far he has only tried the new drug in experimental animals and only as an antidote for the three insecticides, Parathion, dimethyl Parathion and Systox. While these are related to the nerve gases, they are not the same and their effect is somewhat different. Symptoms of Parathion poisoning develop more slowly and are not as responsive to atropine as those of the nerve gases.

Dr. Deichmann also finds that both atropine and Buscopan are more effective when given with oxygen and glucose than when given alone.

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SURGERY

Partial Lung Removal

➤FOR SOME TB patients having a surgeon cut out the diseased portion of the lung may be better than any other method of treatment, it appears from a "preliminary report" of such an operation on 87 patients.

The operation is called segmental resection of the lung. The promising results in 87 cases were reported by Capt. Clifford F. Storey and Lieut. Bruce F. Rothmann of the U. S. Naval Hospital, St. Albans, Long Island, N. Y., at the meeting of the International College of Surgeons in Chicago.

So far, 59 patients have been discharged from the hospital. Of these, 38 are gainfully employed, and 16 are well and apparently able to work but have been advised not to do so for the present. Another 25, all well with negative sputum, are still in the hospital because of a strict policy of insisting on six months' bed rest after the operation. This method of treatment is for "carefully selected" patients in whom the tuberculosis is confined to a single segment of the lung or in whom the primary focus occupies a segment and no more than one additional adjacent segment is involved.

The method is not a "cure-all" suitable for all types of patients with TB of the lung.

Studies of lung function shows that there is less impairment of function after removal of a segment of lung than when other surgical methods are used for similar cases.

"There is no significant change in function following segmental removal of the diseased portion of the lung," the Navy doctors reported.

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Eggs should be stored large-end-up to keep the yolks well-centered.