

ASTRONOMY

Distant "Universe" Found Much Bigger Than Supposed

Examination of Photograph Made With Special Schmidt-Type Telescope Reveals Shape of Andromeda

PROOF that the distant Andromeda galaxy is about as big as our own galaxy, or Milky Way system, has been obtained by Dr. Robley C. Williams and Dr. W. Albert Hiltner of the University of Michigan.

The constellation of Andromeda, the chained lady, is overhead on autumn nights, and the galaxy may be seen, if the sky is dark, with the naked eye. It is so far away that light, travelling 11,000,000 miles per minute, takes about 720,000 years to reach us. About 15 years ago Dr. Edwin P. Hubble, of the Mt. Wilson Observatory, showed that it is a disk-shaped mass of stars, like that comprising the Milky Way, of which the sun is part. This is one of the nearest of these outer galaxies, but millions of others can be seen, with the greatest telescopes. Only a few are close enough for the individual stars to be revealed.

It appeared that the Andromeda galaxy and the others were far smaller than ours, which is estimated to be around 100,000 light years in diameter. Several years ago Dr. Joel Stebbins and Dr. A. E. Whitford made measurements with the electric eye attached to the 100-inch reflecting telescope at Mt. Wilson, the world's largest. These showed that the object extended much farther than one could see, or photograph, with the same telescope.

Using a new photograph of the galaxy,

taken by Dr. Hubble with a special Schmidt-type telescope at the new Mt. Palomar Observatory, Drs. Williams and Hiltner have determined its shape. This has been done with an instrument invented by Dr. Williams, called the isophotometer. It automatically examines a photograph, and draws a line corresponding to a region of a certain brightness. It, also, uses an electric eye, which is sensitive to far slighter effects on the plate than the eye could detect.

From the lines drawn by this instrument, they find that, in its greatest length, the galaxy is at least 13 times as long as the apparent diameter of the moon. At the accepted distance for the Andromeda object, this corresponds to a linear diameter of 80,000 light years. Since there is some evidence that the object extends still farther, it seems that its size is about the same as our Milky Way. They also find evidence, far out from the center, of two previously unknown places where the stars are closer together.

One important feature of the work is that the measurements were made despite a considerable amount of fogging of the negative from the general light of the sky, which is present even at the best locations. In fact, in the outer parts of the galaxy, the brightness is actually less than the sky. However, the instrument detects the difference between the sky light, which is uniform, and the

sky light plus galactic light, even though the latter is very minute.

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Cartoon Characters Lend New Romance to the Stars

See Front Cover

IN JULY the sun will be in the constellation of Mickey and Minnie Mouse! High in the northern evening sky appears Pluto the pup! On autumn evenings you can see the heavenly figure of Donald Duck!

Such statements as these will be perfectly reasonable if it should happen that new star groups, which are making their bow this month in the demonstration at the Fels Planetarium of the Franklin Institute in Philadelphia, should become generally adopted. For, with Walt's own permission and assistance, a whole galaxy of Disney characters appears on the artificial sky vault of the planetarium.

However, Wagner Schlesinger, director of the Fels Planetarium, and his asso-

CONSTELLATIONS A LA DISNEY

The constellations of Bootes, the bear driver, and Corona Borealis, the northern crown, as they appear in star maps, are shown at the left. In the middle is the ancient figure, which dates back some 3,000 years. The right-hand picture shows how Walt Disney has fitted Madame Upanova, from the ostrich ballet in Fantasia, around these stars, for the April demonstration in the Fels Planetarium. The cover picture shows how Mickey and Minnie Mouse have been fitted around the stars of Gemini, the twins. Castor is in Mickey's face and Pollux in Minnie's nose. These pictures were photographed from the planetarium dome by Gladys Muller.



ciates, have no hope that these groups will become generally used. Rather their purpose is to cause discussion and eventually to bring renewed interest in the constellations and the old myths.

"Literal-minded moderns," said Mr. Schlesinger, "sometimes fail to appreciate the significance of the naming of the constellations, and many fail to find the few good outlines of the figures in the sky. We should realize that the named areas were not originally intended to be portraits, but merely memorials to the persons, creatures, or objects for which the areas were named. The pictures were fitted to the stars much later.

"In these days when few learn and still fewer remember the classical myths, we might suggest the method of origin of the constellation names by modern analogies. For fanciful pictures in the stars, the figures of fanciful creatures might seem most appropriate, so in the Fels Planetarium during April the creations of Walt Disney, acknowledged master of whimsy, are featured.

"Madame Upanova, of the ostrich ballet, in 'Fantasia,' as well as the familiar characters in other Disney creations, are projected among the stars and found to fit as well as the ancient groups. The Sea serpent, Hydra, becomes a Fantasian Brontosaurus, looking down on a puzzled Goofy. Mickey and Minnie Mouse take the place of the Twins, Castor and Pollux. Pluto replaces Ursa Major, the Big Bear, of which the Big Dipper is a conspicuous part. Classical Cygnus, the Swan, plus a few neighboring stars, is transformed into Donald Duck, in as angry a pose as he ever displays. Even future Disney productions are not ignored; the Reluctant Dragon, as weird a creation as one could wish, replaces Ophiuchus and Serpens."

The apparatus by which the pictures

are shown in the planetarium sky was first developed at the Fels Planetarium, and later used at others. Special projectors, made by planetarium technicians, are fastened to the framework of the Zeiss projector. Each has its own control at the switchboard where the lecturer stands. One by one, the imaginary figures

are shown around the stars, gradually appearing, and then fading. Or, if desired, the entire sky may be filled with all figures at once. The old figures are not slighted, but they are shown also, in comparison with Mickey Mouse and his colleagues.

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RADIO—AERONAUTICS

Light on Television Tube Shows Direction of Plane

On Tube Like Those Now Used in Receivers, Pilot Can See His Compass Direction and That of Beam Station

BY SPOTS of light on the face of a tube like that used for receiving television pictures, an aviator can now see at a glance the compass direction toward which he is flying and also the direction of a radio station that he is using as a beacon.

This is possible with a new device just recognized by the U. S. Patent Office with patent 2,233,275, to Irving Wolff, of Merchantville, N. J. He assigned his rights to the Radio Corporation of America.

Present aircraft compasses show the point of the compass toward which the plane is heading. With radio direction finder the pilot can also determine the direction, with respect to the plane, of a radio station. Then some calculation is needed to tell the compass direction of the station from the plane.

In the new invention, a compass, either earth inductor or gyroscopic, and a radio direction finder are both connected to a television tube, on the face

of which are graduated marks. Inside, a beam of cathode rays, falling on the face, causes spots of light to appear, and they show both the plane's direction and that of the transmitting station.

Mr. Wolff points out that this is especially useful because, when travelling at three or four miles per minute, the pilot should get this information quickly and directly without having to look at several instruments.

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There are ten species of *armadillos*, but only one really rolls up in its shell for defense.

NEW WILDLIFE STAMPS

The 1941 series of wildlife stamps are ready for distribution. Sponsored as in past years by the Wildlife Institute, proceeds of the sale are to be used in work leading to the restoration of America's native plant and animal species. The sample strip shown here includes: muskox, box turtle, fawn and baldpate ducks.

