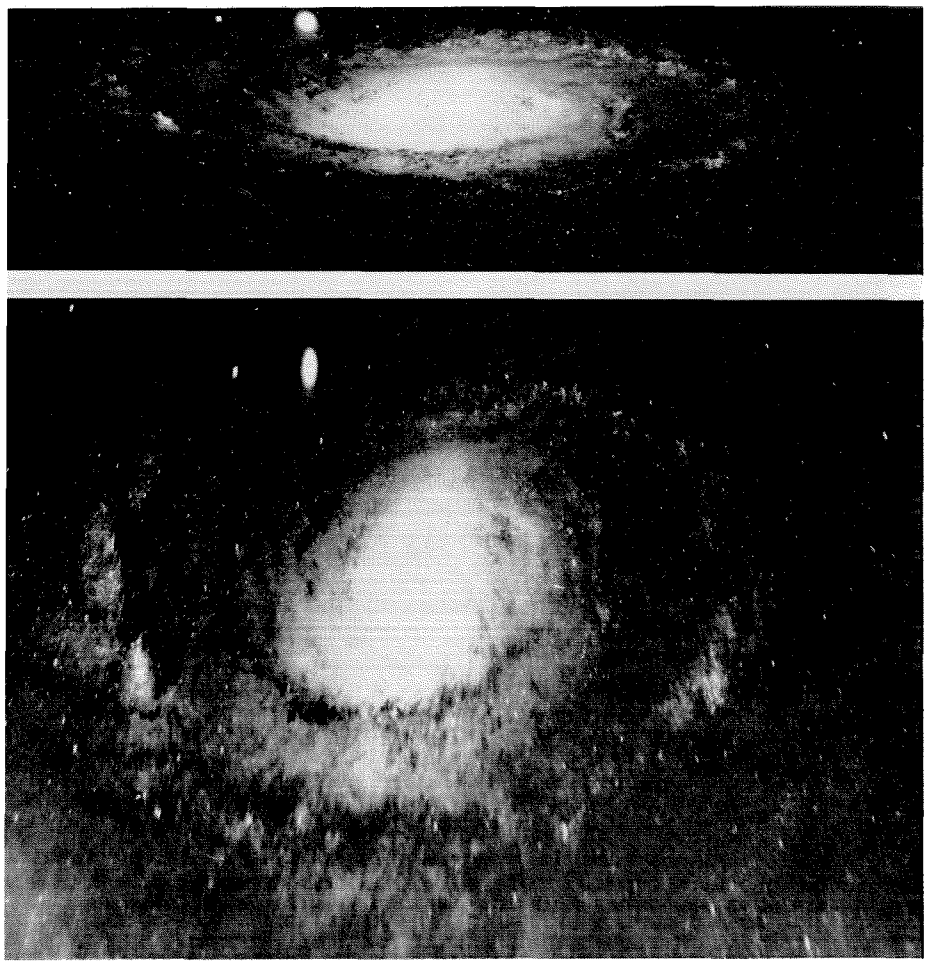

Andromeda Galaxy as seen from Palomar Observatory — and as it would look if it could be seen from above.

A NEW LOOK AT ANDROMEDA

The nearest big neighbor of our Milky Way Galaxy is the Andromeda Galaxy of 100 billion stars, thought to be very similar in shape and size to the Milky Way. The over-all appearance of the galaxy has been difficult to perceive and study, however, because it is seen from the earth almost edge-on. Now, using a unique combination of mathematical calculations and photography, Caltech astronomers have produced a picture of Andromeda from such an angle that we seem to be looking down on it. This new look has shown that the vast galaxy of stars, gas, and dust is much less similar to our galaxy than astronomers had supposed.

The work was done by Halton C. Arp, staff member of the Mount Wilson and Palomar Observatories; and William C. Miller, Observatory photographer. Dr. Arp made a lattice tracing of Andromeda's stars and mathematically lifted the lattice upright. Mr. Miller then photographed a picture of Andromeda at an angle, making it appear that he was looking down at the galaxy. The photograph and the mathematical lattice checked.

Studies of the photograph reveal that the galaxy's two major spiral arms are symmetrically coiled and spaced some 13,000 light years apart. In our Milky Way Galaxy, the arms are much closer together and probably are either multiple or branched, which suggests that the Milky Way has a higher percentage of gas than Andromeda, and therefore a higher percentage of young stars.

Attempts have been made in the past to project Andromeda upright so that its structure could be studied more satisfactorily. The late Dr. Walter Baade, of the Mount Wilson and Palomar Observatories, measured the positions of 688 emission nebulosities in the galaxy's arms; these are clouds of gas made fluorescent by hot, bright stars in their immediate neighborhood. Dr. Baade found that the emission clouds outlined segments of the spiral arm structure like "beads on a string."

Dr. Arp, a student of Dr. Baade's, found that the over-all spiral arm pattern of these fluorescent hydrogen clouds is difficult to interpret without also studying the effect of a small satellite galaxy of Andromeda's, known as M-32. It is a rich sphere of stars about 1,600 light years in diameter (Andromeda is 100,000 light years in diameter). M-32 is near one edge of the big galaxy and recent observations made with radio telescopes by the Department of Terrestrial Magnetism of the Carnegie Institution of Washington have disclosed that M-32 has pulled the gas and stars, normally congregated together in the arms, away from each other on that side.

This observation opens the intriguing question of whether the effect is gravitational, magnetic, or both.