



By Dr. Eugene F. Mallove

## The Andromeda Galaxy

When the star constellation, Andromeda, appears, there is a blur of light within it faintly visible to the naked eye observer. This is the Andromeda galaxy, a collection of about 300 billion stars which live together and form a giant whirlpool structure.

The Andromeda galaxy, or Messier object 31(M31), is the nearest major galaxy to our own Milky Way galaxy within which the Sun lives.

Even though it is larger in size and twice as massive as the Milky Way galaxy, Andromeda's spiral structure is a mirror of our own galaxy's shape. Though the plane of Andromeda's spiral is but 15 degrees tilted to our line of sight, we still see its spiral arms, formed of billions of stars, wrapping around the bright core region.

It is fortunate that our telescopes can resolve the shapes of other galaxies, since it is impossible for us visually to grasp our own position in the galactic "boondocks" of the Milky Way, way out on a spiral arm.

The Andromeda galaxy and our own are tied gravitationally to a "local group" of about 20 galaxies. Andromeda is "only" about two million light years distant, and it is drifting slowly toward our galaxy at 68 kilometers per second.

No worry about our two galaxies ever "colliding" — the distances between stars are so great that the galaxies would pass through one another without any stars touching!

It was only 1923 when American astronomer Edwin Hubble proved that the Andromeda galaxy was indeed a vast collection of stars by identifying a known type of variable brightness star — a Cepheid variable — in Andromeda's arms. Prior to that time there was still the question whether Andromeda might be a "local" glowing gaseous object within our own galaxy.

Even though the Andromeda galaxy is very far away, its largest dimension still spans from 2 to 3 degrees of the sky — a large object 4 to 6 times the apparent diameter of the Moon. Its physical size is about 120,000 light years across.

Stars orbit the bright galactic nucleus of billions of stars in periods of hundreds of millions of years, while the galaxy's shape gradually evolves in a sequence not yet fully understood.

Galaxies are often called "island universes," even though the universe as a whole is comprised of hundreds of billions of galaxies (each with hundreds of billions of stars). Indeed, the great Andromeda galaxy is but one "oasis" of light in the huge void between galaxies.

It is sobering to contemplate the hierarchy first of stars, then of galaxies, groups of galaxies, and even groups of galactic groups! In gazing at the Andromeda galaxy with the unaided eye or through a small telescope, we take the first cosmic leap up this awe-inspiring order.