



*The exploding galaxy M 82, which is 10 million light years from the earth.*

## EXPLODING GALAXY

The most violent type of explosion known to man — an exploding galaxy — has now been photographed for the first time by the 200-inch telescope at Palomar Observatory. The photograph, taken by Dr. Allan R. Sandage, of the Mt. Wilson and Palomar Observatories staff, is that of the galaxy M 82, which is comparatively nearby (only 60 billion billion miles, or 10 million light years, away). Tremendous jets of matter, stretching out 60 billion million miles (10,000 light years), are shown streaming from the galaxy's nucleus above and below the flattened galactic disk, which is about 20,000 light years across.

Spectral work on the galaxy was done at Lick Observatory by Dr. C. R. Lynds of the Kitt Peak National Observatory. From spectroscopic examination of the jets, it was determined that the material is rushing out at velocities ranging up to 20,000,000 miles an hour at the most distant points. From these velocities, it was calculated that the explosion started 1,500,000 years ago. It is still going on.

Earlier photographs of M 82 indicated only that something chaotic was going on. In obtaining the new photograph, all the light from the galaxy except that emitted by excited hydrogen was filtered out. Astronomers believe that this is the material that would be most affected by the

explosion and that a photograph only of the hydrogen would best reveal the configuration of the explosion.

While the photograph does show only the turbulent hydrogen, it is assumed that other material also is affected by the blast. Drs. Sandage and Lynds calculated that all the matter being exploded outward is equal to that of 5,000,000 suns.

Explosions of this magnitude may well be the prime source of cosmic rays, the astronomers say. Cosmic rays are chiefly composed of the nuclei of atoms that have been energized to tremendous speeds by events such as explosions in stars and galaxies. Until recently, exploding stars were thought to be the principal source of these high energy cosmic rays.

The importance of M 82 is that this galaxy is also a source of radio radiation, as discovered by Dr. Lynds, while a staff member at the National Radio Astronomy Observatory. It is believed that M 82 provides an essential clue to the mechanism for the generation of radio noise in most cosmic radio sources. High energy electrons may be created in the explosions and these interact with the magnetic fields to produce radio noise. The magnetic field in M 82 can possibly be traced in photographs, appearing as loops in the hydrogen alpha photograph on the cover of this issue.