

APR17-2016-001090

Abstract for an Invited Paper
for the APR17 Meeting of
the American Physical Society

Supernova 1987A: The Supernova of a Lifetime¹

ROBERT KIRSHNER, Gordon and Betty Moore Foundation and Harvard-Smithsonian CFA

Supernova 1987A, the brightest supernova since Kepler's in 1604, was detected 30 years ago at a distance of 160 000 light years in the Large Magellanic Cloud, a satellite galaxy of the Milky Way. Visible with the naked eye and detected with the full range of technology constructed since Kepler's time, SN 1987A has continued to be a rich source of empirical information to help understand supernova explosions and their evolution into supernova remnants. While the light output has faded by a factor of 10 000 000 over those 30 years, instrumentation, like the Hubble Space Telescope, the Chandra X-ray Observatory, and the Atacama Large Millimeter Array has continued to improve so that this supernova continues to be visible in X-rays, ultraviolet light, visible light, infrared light and in radio emission. In this review, I will sketch what has been learned from these observations about the pre-supernova star and its final stages of evolution, the explosion physics, the energy sources for emission, and the shock physics as the expanding debris encounters the circumstellar ring that was created about 20 000 years before the explosion. Today, SN 1987A is making the transition to a supernova remnant— the energetics are no longer dominated by the radioactive elements produced in the explosion, but by the interaction of the expanding debris with the surrounding gas. While we are confident that the supernova explosion had its origin in gravitational collapse, careful searches for a compact object at the center of the remnant place upper limits of a few solar luminosities on that relic.

¹Support for HST GO programs 13401 and 13405 was provided by NASA through grants from the Space Telescope Science Institute, which is operated by the Association of Universities for Research in Astronomy, Inc., under NASA contract NAS5-26555.