SN 1987A: A unique laboratory for shock physics

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Supernova 1987A is the brightest and nearest supernova observed since Kepler's SN1604, and is the only one close enough to resolve and directly observe the temporal growth of the ejecta. Over the past 25 years, intensive observations across the electromagnetic spectrum with observatories on the ground (Australia Telescope Compact Array, Gemini-S, Magellan, VLT) and in space (IUE, KAO, CGRO, Hubble, Chandra, Spitzer, Herschel) have given us an unprecedented view of the evolution of the debris of the supernova and of its shock interaction with circumstellar matter. The outer supernova debris, now expanding with velocities ~8000 km/s, encountered the relatively dense circumstellar ring formed by presupernova mass loss starting in 1994. The resulting shock interaction has been manifested by: rapidly brightening UV-optical "hotspots", an expanding X-ray ring, an expanding ring of knotty non-thermal radio emission, and a ring of thermal IR emission from silicate dust. The recent evolution of these emissions reveal new details about the shock interaction, circumstellar material, and the star that exploded. Certain critical problems about SN 1987A, such as the still undiscovered compact object formed in the explosion and the structure of the central debris, require the capabilities of JWST.

This invited talk will be presented at the European Week of Astronomy and Space Science, Rome, Italy, July 1-6, 2012