New perspectives onto the Universe in the era of multi-messenger astronomy (MMA) (No 2632)

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Tuesday Plenary

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In the past five years, the LIGO and Virgo gravitational wave (GW) detectors have announced the discovery of at least fifty compact object mergers including the first two binary neutron star mergers GW170817 and GW190425. The discovery of both gravitational wave and electromagnetic (EM) radiation from the first binary neutron star merger, GW170817, has opened up a new era of multi-messenger GW+EM astronomy. The EM follow-up campaign for this single event was unprecedented in terms of its scale, coordination and the resulting observational data-sets. Although only a single event, the follow-up and joint GW+EM characterization have offered us a new perspective on the Universe enabling critical insights into diverse fields from gravity,high-energy astrophysics, nuclear physics, to cosmology. In this talk, I will give an overview of the GW discovery and EM follow-up of this event, and then discuss how to place compact object mergers in their full astrophysical context using joint GW+EM measurements. I will conclude by discussing the lessons that we are learning from this one event and ongoing new science run. Finally, I will provide my perspective on the remarkable opportunities and challenges that have emerged in this new observationally-driven and fast-paced field as we move from the discovery era to one of precision astrophysics in the next decade.