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Perspectives and challenges of multi-messenger astronomy including gravitational-waves

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On Aug. 17, 2017, the merger of a binary neutron-star system observed through gravitational waves and multi-wavelength emissions, from gamma rays, X-rays, ultraviolet-optical-near-infrared, and radio, marked the history of multi-messenger astronomy, showing its enormous potential in probing the physics of the most energetic events in the Universe. Multi-messenger observations are a unique tool to unveil the rich physics of neutron star mergers in association with gamma-ray bursts and kilonovae, to probe relativistic astrophysics, nuclear physics, nucleosynthesis, and cosmology. Starting with the current status of gravitational-wave observations, the talk will give an overview of challenges and perspectives of gravitational-astronomy expected with the next generation of gravitational-wave detectors, such as the Einstein Telescope, in the context of multi-messenger astrophysics.

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