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### **Neutron skins and neutron stars in the multi-messenger era<sup>1</sup>**

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The historical first detection of a binary neutron star merger by the LIGO-Virgo collaboration is providing fundamental new insights into the astrophysical site for the r-process and on the nature of dense matter. Limits on the tidal polarizability inferred from the gravitational wave signal translate into constraints on the neutron-star radius. Based on these constraints, models that predict a stiff symmetry energy, and thus large stellar radii, can be ruled out. Given the sensitivity of the neutron-skin thickness of  $^{208}\text{Pb}$  to the symmetry energy, we infer an upper limit on the neutron skin significantly lower than the one reported by the PREX collaboration. However, if the upcoming PREX-II experiment confirms that the neutron-skin thickness of  $^{208}\text{Pb}$  is large, this may be evidence in favor of a softening of the symmetry energy at high densities, likely indicative of a phase transition in the interior of neutron stars.

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