Strong Quantum Darwinism

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Quantum Darwinism [1] and spectrum broadcasting [2] are two different frameworks providing insight into how the objective world might emerge from the underlying quantum world. However, recent works show these two frameworks are unequal and can lead to conflicting conclusions on the (non-)objectivity of a state [2–4]. By upgrading quantum Darwinism to "strong quantum Darwinism", we prove that strong quantum Darwinism, when combined with strong independence of the subenvironments, is equivalent to spectrum broadcasting [5]. Along the way, we also find that strong quantum Darwinism alone is equivalent to bipartite spectrum broadcast structure and argue that objectivity of the state does not necessarily require strong independence of the subenvironments. We now have two complimentary approaches to perceiving objectivity: the entropic and information-theoretic picture described in strong quantum Darwinism and the state structure and geometric picture painted by spectrum broadcasting.

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