Ultracold neutrons and the universe's missing antimatter

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Nearly 60 years ago, two apparently unrelated scientific events took place quite close together: Sakharov's enumeration (in 1967) of the requirements to generate the matter-antimatter asymmetry observed in the cosmos, and the first experimental observations (in 1969) of ultracold neutrons independently by Steyerl (in Munich), and by Lushchikov, Pokotilovskii, Streklov, and Shapiro (in Dubna). The unique and defining property of ultracold neutrons – that they can be stored and studied for extended periods on the order of their ~15 minute decay lifetime – is responsible for their gradual elevation over time, from an experimental curiosity, to a state-of-the art precision measurement tool. This ultimately shaped the landscape of low-energy experimental searches for new sources of CP-violation, as motivated by Sakharov: the neutron's permanent electric dipole moment is an extremely strict test of Standard Model CP-violation, and simultaneously an extremely sensitive witness signal for the as-yet unknown interactions that are needed to produce the matter-filled universe we live in. Recent advances in production and handling of ultracold neutrons, at the lowest achievable energies, promise not only to accelerate the search for an explanation of our universe's composition – but also to deliver new opportunities and applications that have remained out of reach until now.