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Neutrinos: Particles with Maddeningly Few Properties[1]

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It might be thought that a particle with no charge, half-integer spin, and very little mass could not really be that complicated. Yet it took nearly 70 years to discover that they had any mass at all, and in the process the objects with well-defined mass were found not to have well-defined flavor and vice versa. Exactly what the mass is still remains unknown. The mixing of the quarks, particles that cannot even be observed in isolation, is small but precisely known. But for neutrinos, an angle, θ_{13}, is still missing. Ordinarily it would be trivial to decide whether a particle and an antiparticle were the same or not, and yet a trick of the weak interaction has cloaked this basic property for neutrinos, demanding experiments of heroic scale and difficulty to unmask. What will it take to get the answers?

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