

7.10: Broken Symmetries

Of course one cannot propose a symmetry, discover that it is not realised in nature (“the symmetry is broken”), and expect that we learn something from that about the physics that is going on. But parity is broken, and we still find it a useful symmetry! That has to do with the manner in which it is broken, only weak interactions – the exchange of W^\pm and Z bosons – break them. Any process mediated by strong, electromagnetic or (probably) gravitational forces conserves the symmetry. This is one example of a symmetry that is only mildly broken, i.e., where the conserved quantities are still recognisable, even though they are not exactly conserved.

In modern particle physics the way symmetries are broken teaches us a lot about the underlying physics, and it is one of the goals of grand-unified theories (GUTs) to try and understand this.

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