We summarize unusual bound or localized states in quantum mechanics. Our guide through these intriguing phenomena is the classical physics of the upside-down pendulum, taking advantage of the analogy between the corresponding Newton’s equation of motion and the time independent Schrödinger equation. We discuss the zero-energy ground state in a three-dimensional, spatially oscillating, potential. Moreover, we focus on the effect of the attractive quantum anti-centrifugal potential that only occurs in a two-dimensional situation.

Key words: Quantum Mechanics; Bound States; Parametric Oscillator; Periodic Potential.