

# Atomic traps

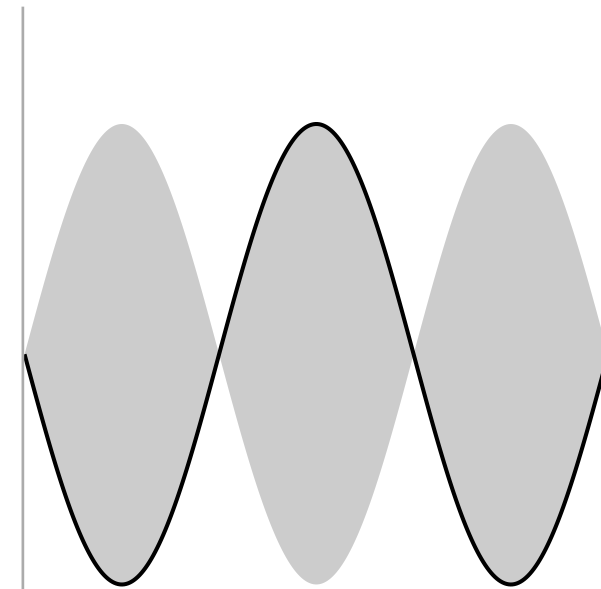
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# Guitar waves

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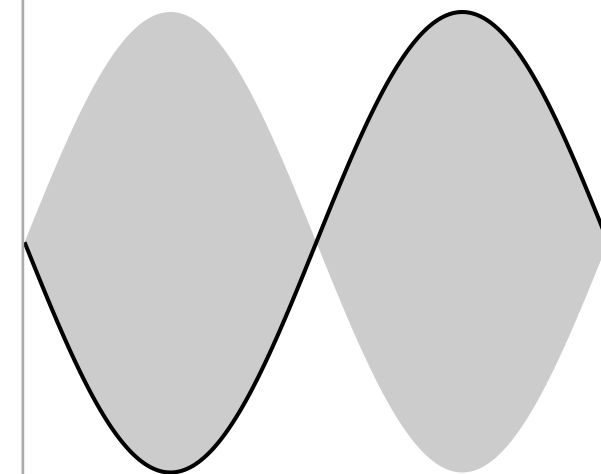
- Really any uniform trap of a line-like wave

2<sup>nd</sup> harmonic



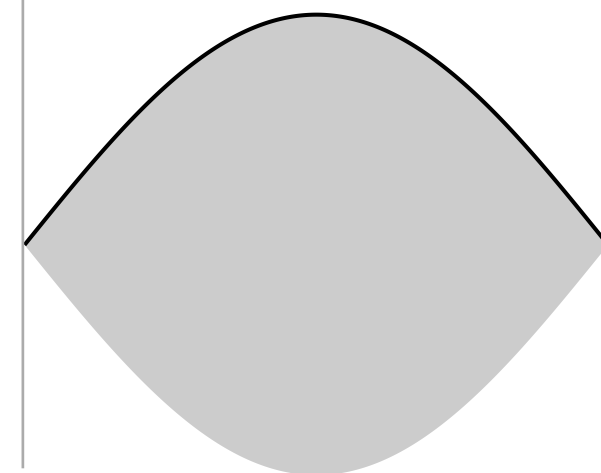
Next-next  
lowest energy

1<sup>st</sup> harmonic



Next lowest  
energy

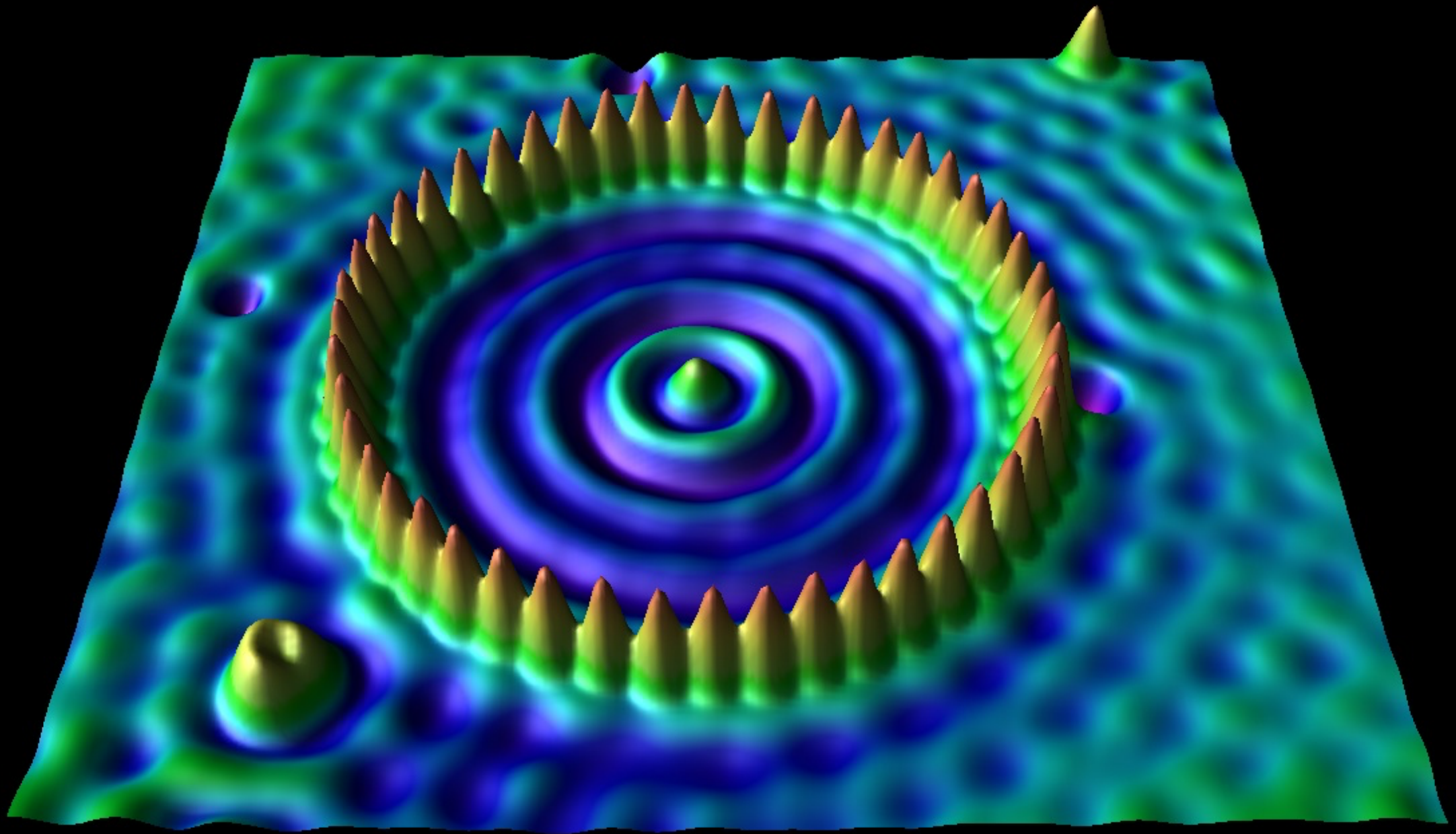
Fundamental



Lowest  
energy

# Quantum corral

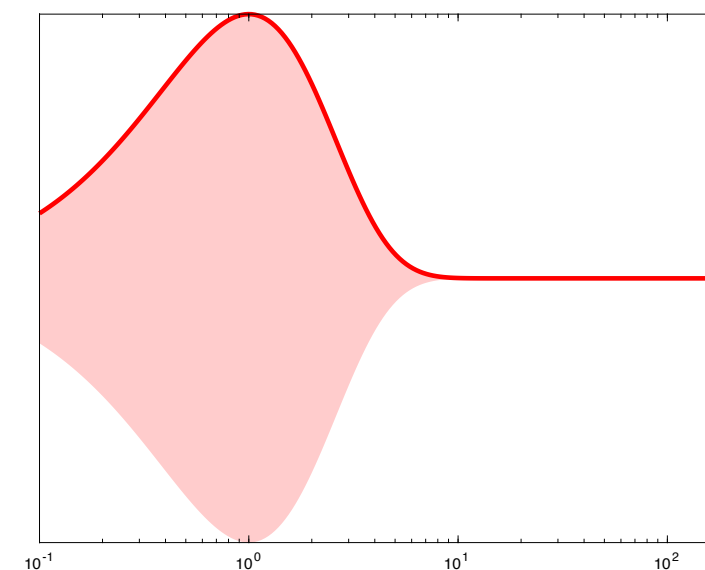
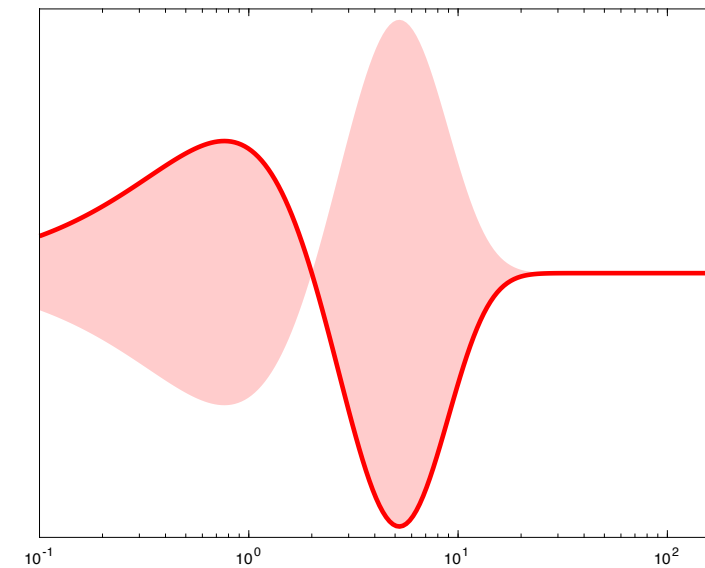
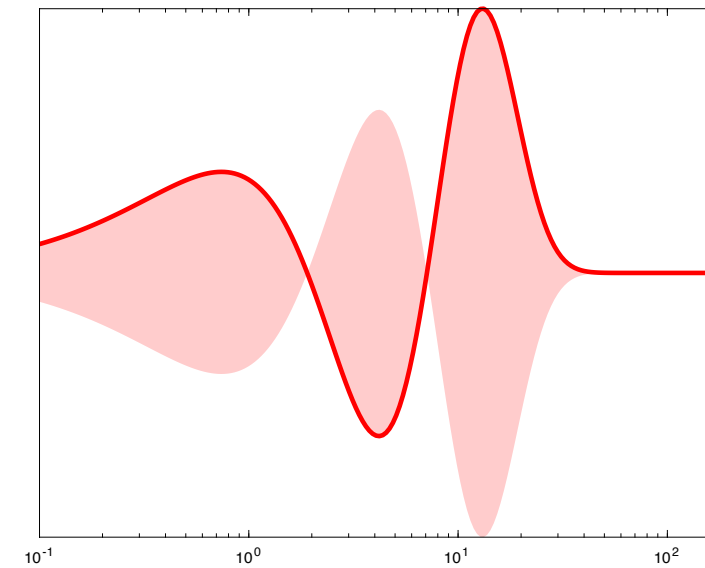
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# Atomic traps

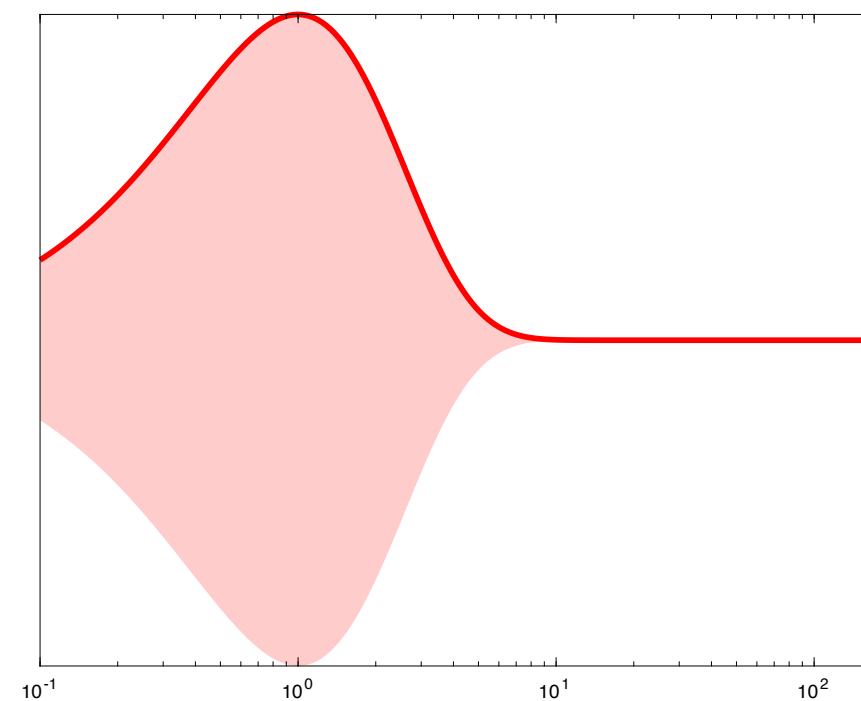
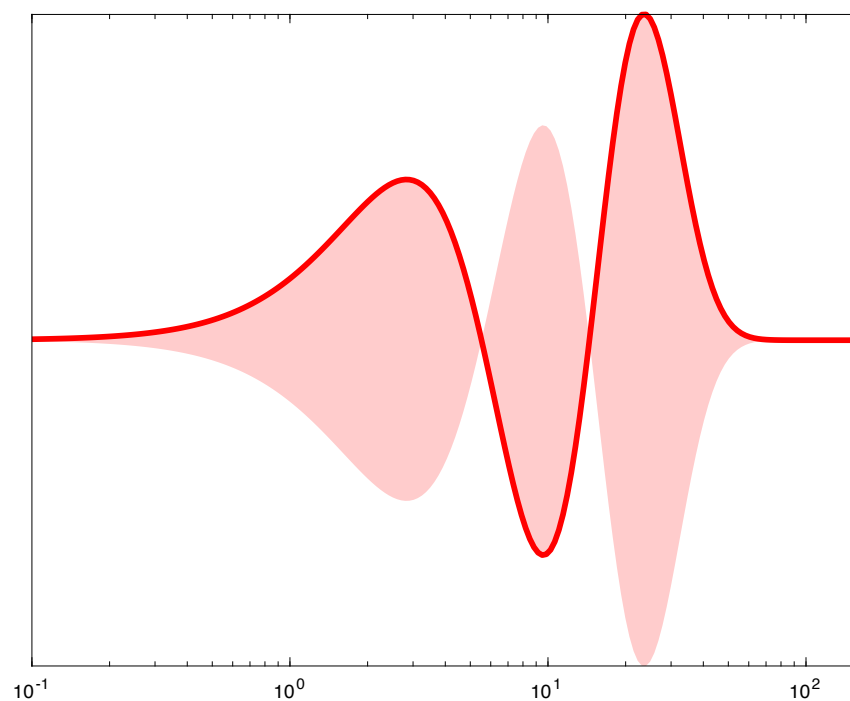
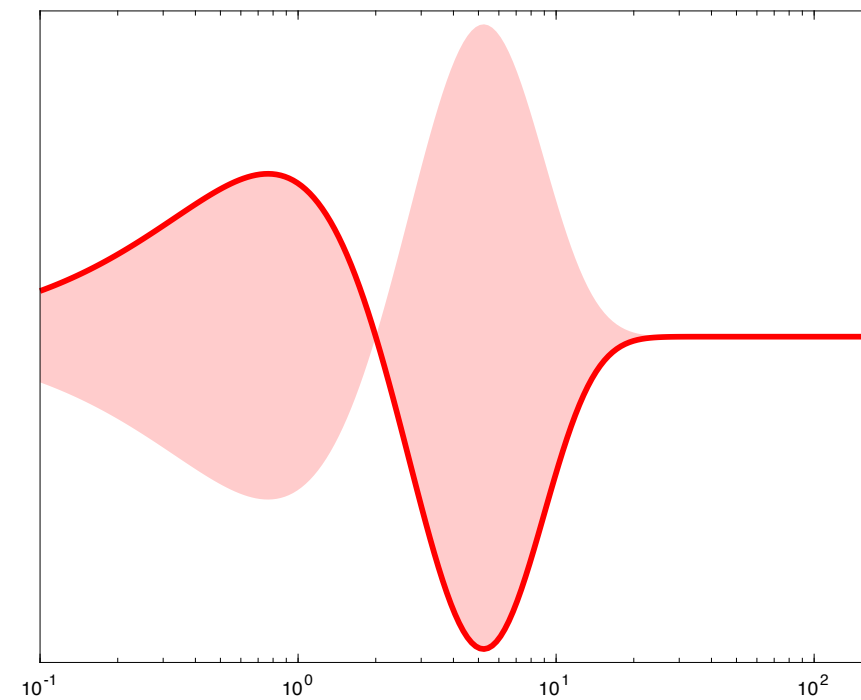
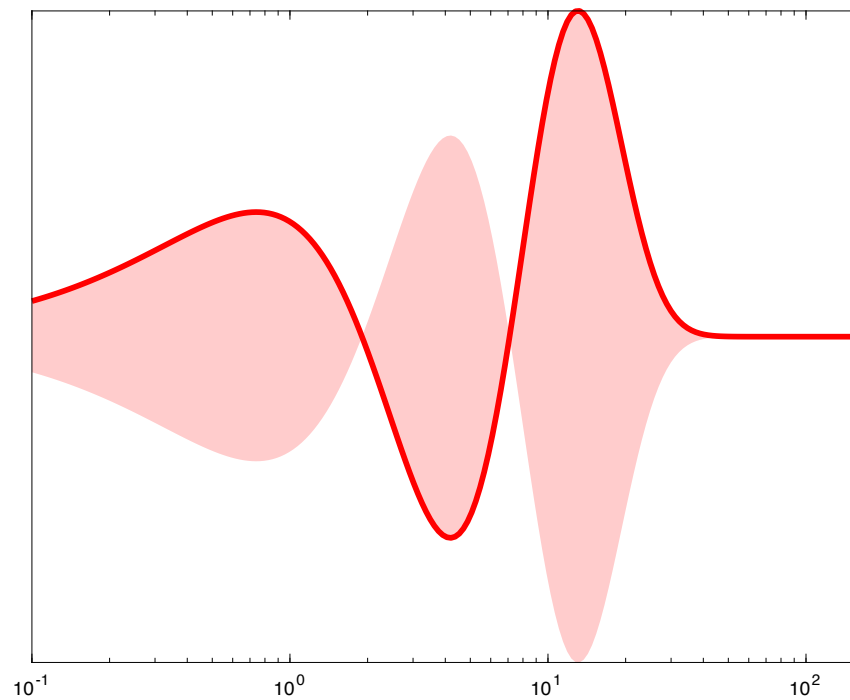
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- Electron moves like a wave
- Is trapped by the nucleus
- Funny trap 'shape': strong near nucleus weaker farther away
- Really 3D, only showing radial shape here



# 4 waves

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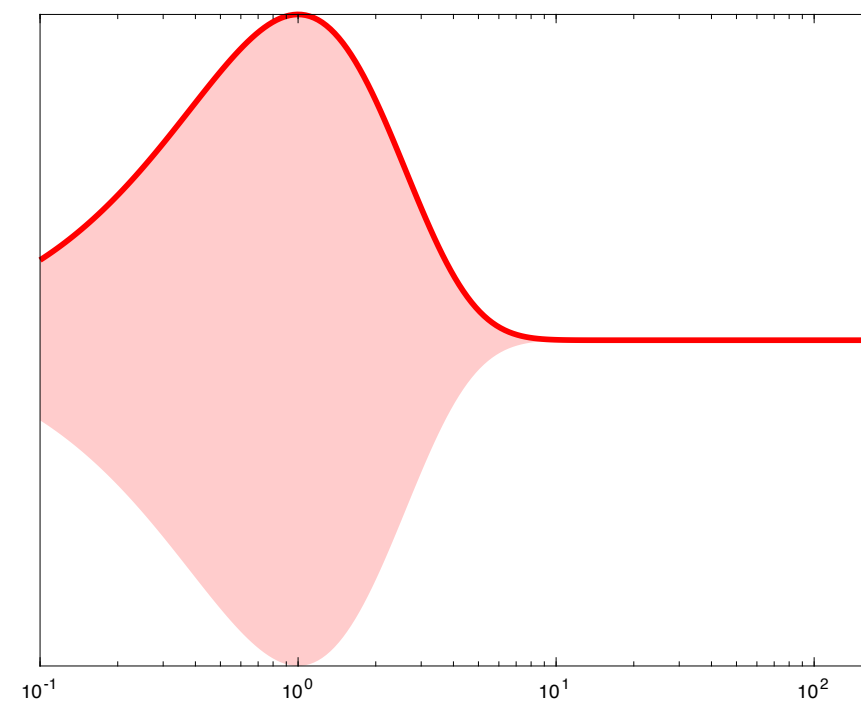
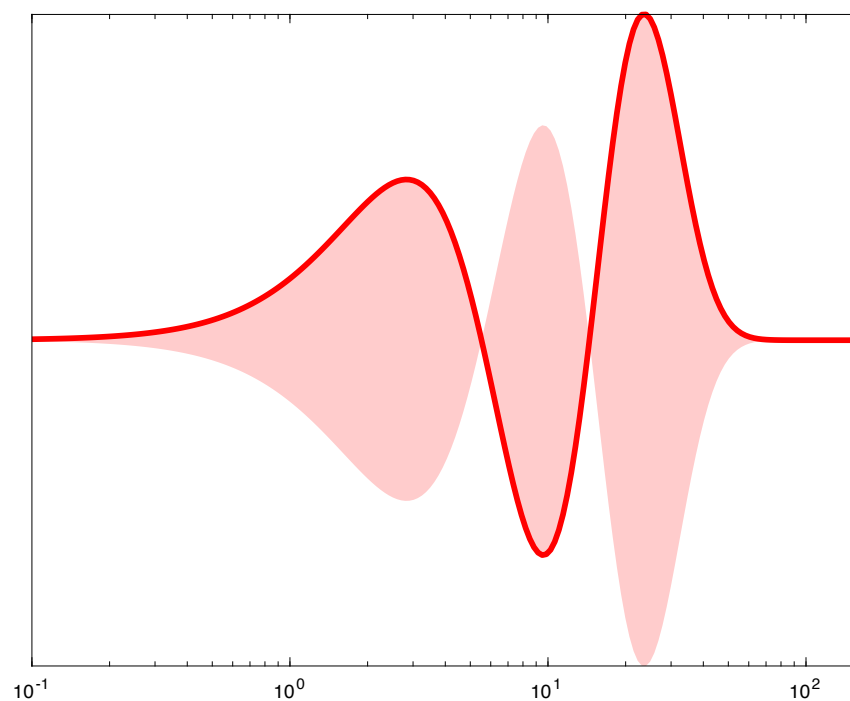
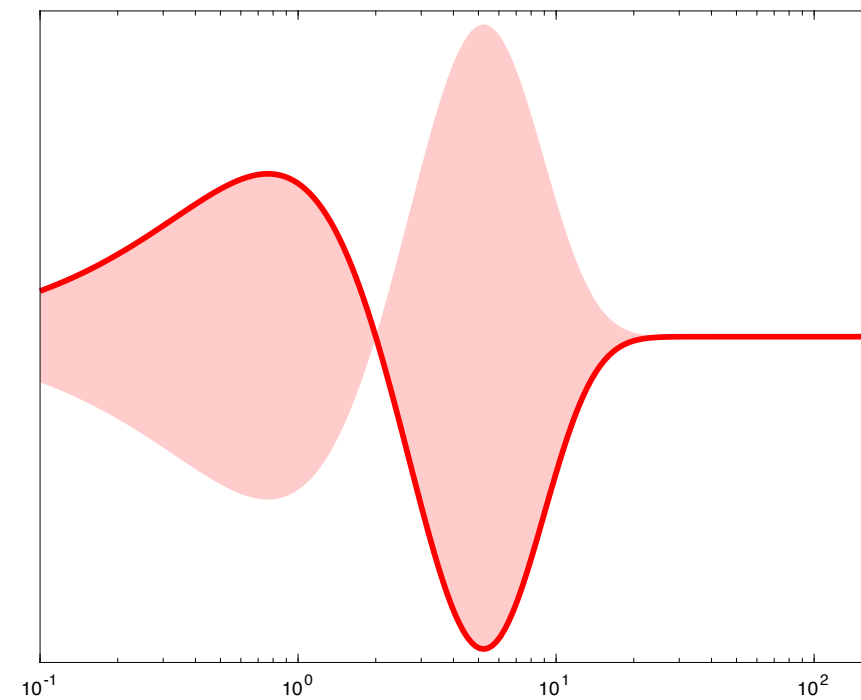
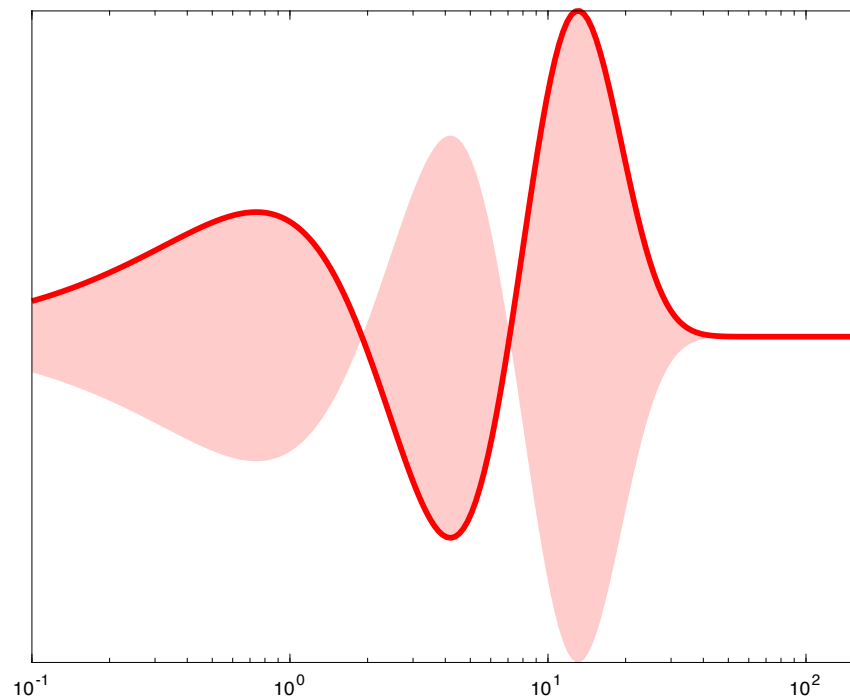
# Energy of an electron wave depends on:

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- How sharp the wave curvature is
- How far from the nucleus (how far right)

# 4 waves

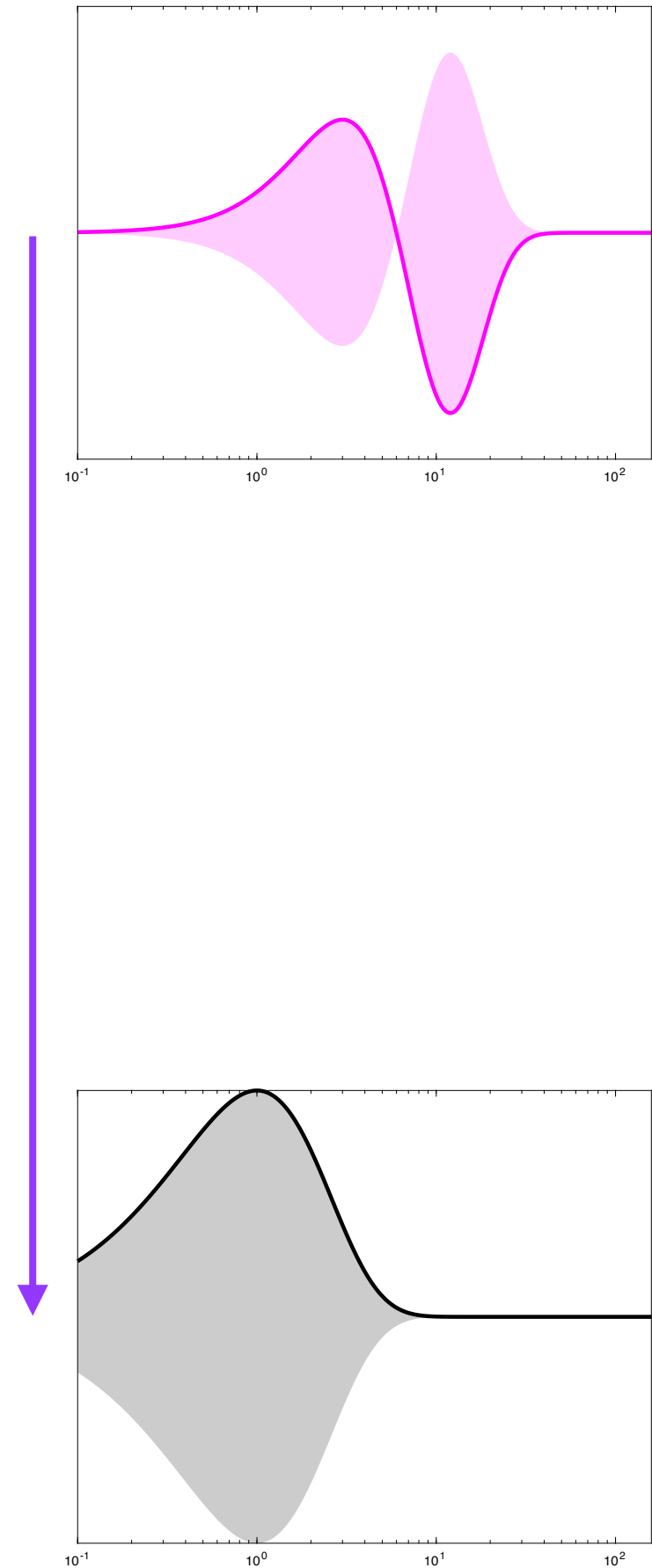
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# Making light

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- We don't see the electron waves, or what energy they have
- When an electron jumps down from one wave to another, it creates a photon with the energy ***difference***.





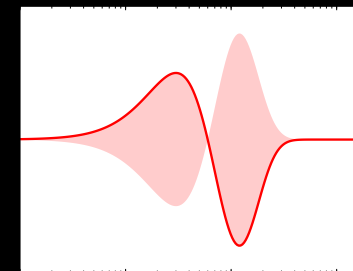
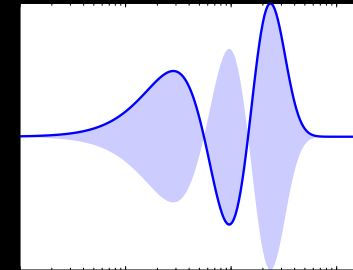
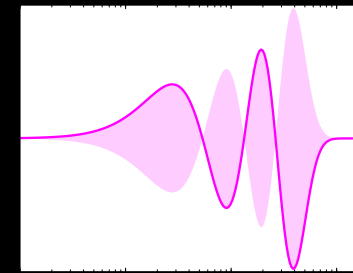
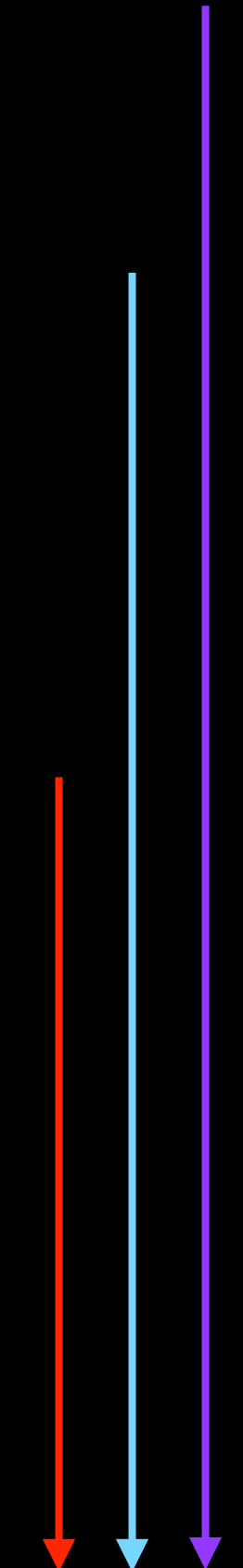
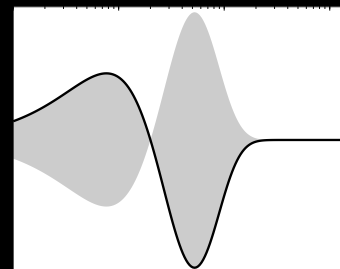
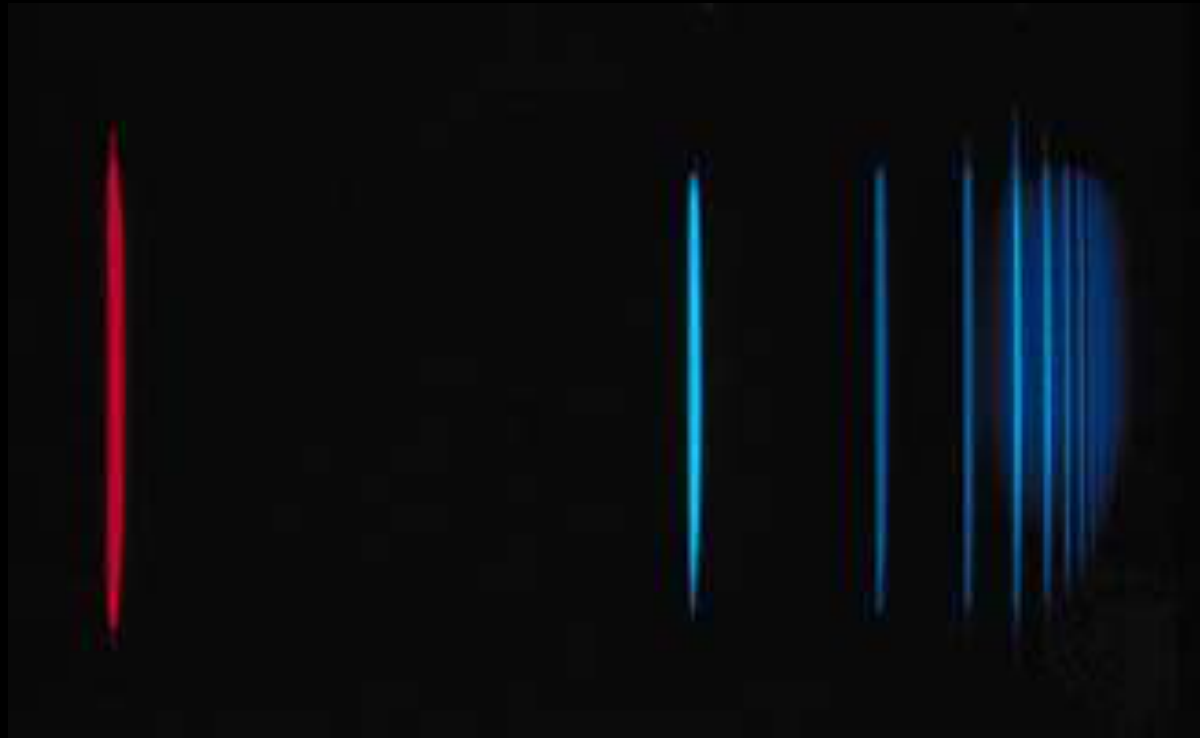
# Jumping down the stairs

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- Can't see energy levels
- We can 'listen' to how far the electrons jump
- Figure out stair spacing

# Jumping down the stairs

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# It get's complicated...

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- Hydrogen has 1 electron around 1 proton
- Iron has 26 electrons, and every electron feels every other electron
- 325 terms in the math...

# Every atom has a fingerprint

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- The lines emitted by an element are unique
- Helium discovered in on the sun ***before*** being found on earth