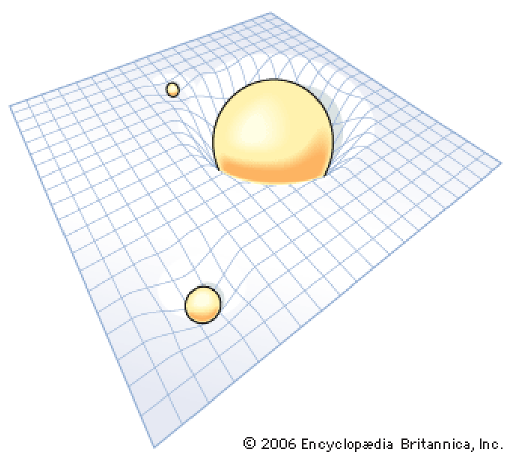
Geometry

Background

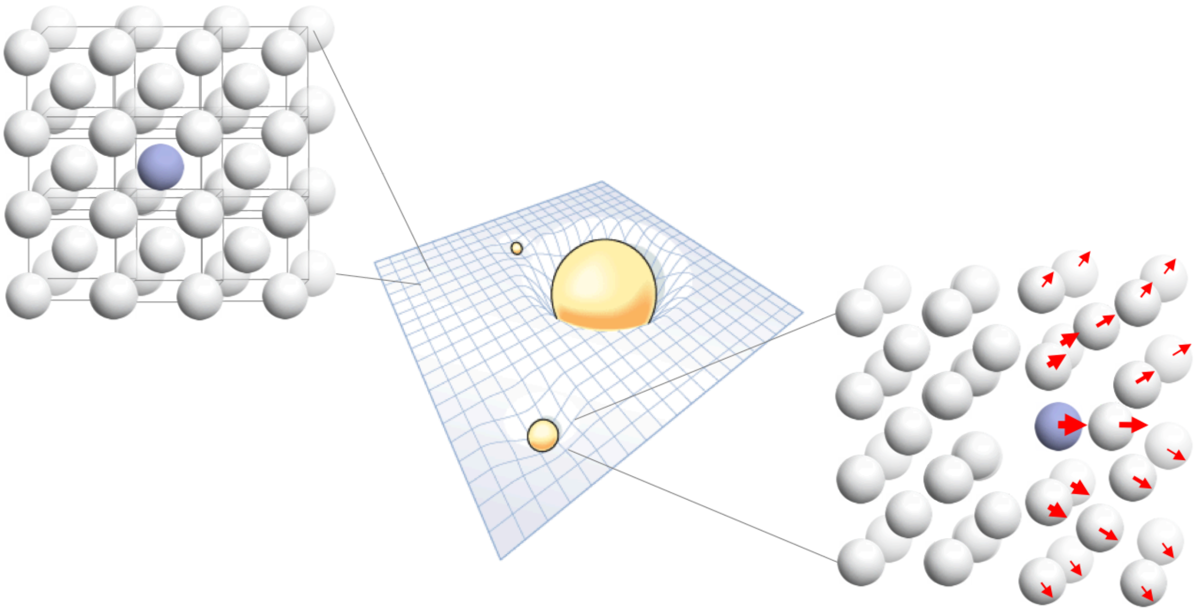
Spacetime is often described as warping, or bending, around a mass. A simple search of *spacetime* images results in graphics that illustrate stars and planets contorting a grid, such as the figure below. The properties of spacetime at the granular level – the substance that fills the space between large bodies that allows this curvature – is never illustrated and rarely addressed. If spacetime can truly warp, there must be a substance that allows warping to occur.



Credit: Encyclopaedia Britannica

Explanation

In **energy wave theory**, the substance of space is filled with granules in a lattice structure. In empty space, relatively little vibration occurs, such as the lattice in the top left of the next figure that has been magnified to the Planck level. Near a mass, the displacement of granules from equilibrium causes a distortion of the lattice and the appearance of warping. The latter is illustrated in the bottom right of the next figure. It is the motion of granules that fuses the time dimension with three dimensions of space, becoming spacetime. The structure of the lattice in three spatial dimensions is linked to the motion (time) of its components.

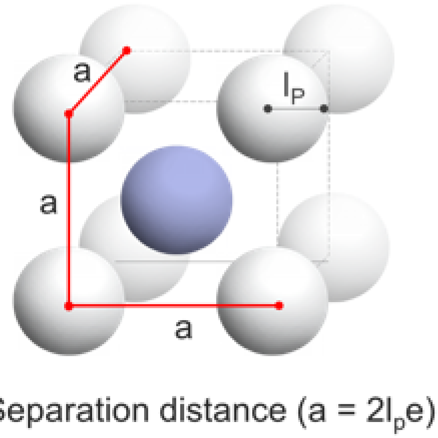


Geometry of a Spacetime Unit Cell

The smallest components of spacetime will never be seen with the human eye as it is orders of magnitudes smaller than an atom. If an atom was the size of the Milky Way galaxy, a granule of Planck length radius would be roughly the size of a grain of sand on Earth. Thus, it will never be directly observed but it can be deduced by mathematics.

In fact, Max Planck proposed natural units back in 1899 that indirectly discovered the lowest-level properties of free space, all born from equations that simplified the mathematics of physics equations. These units are referred to as the Planck units. The fundamental unit of length in this unit system is the Planck length (l_P).

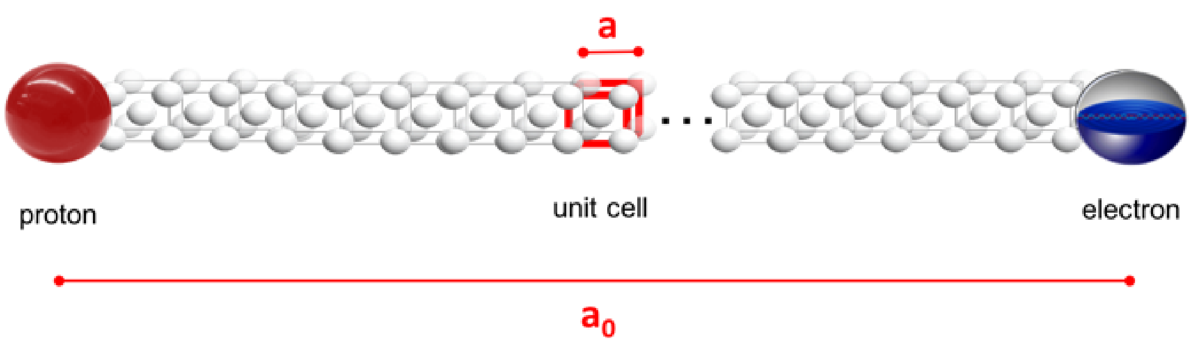
Spacetime is proposed to be a lattice structure, in which its unit cells have sides of length **a**, marked below in the next figure. The lattice contains repeating *cells* with this structure, so it can be simplified to model a single unit cell of this repeating structure. These types of structures are commonly found in molecules. The center point of wave convergence is referred to here as a *wave center* (marked blue in the figure).



Spacetime Unit Cell – Separation Length

The separation length between granules in the unit cell is the diameter of a granule ($2l_P$) multiplied by Euler's number (e), which is the base of the natural logarithm. Why this separation? Because there are exactly Avogadro's number of unit cells in the radius of hydrogen.

$$a = 2l_P e$$



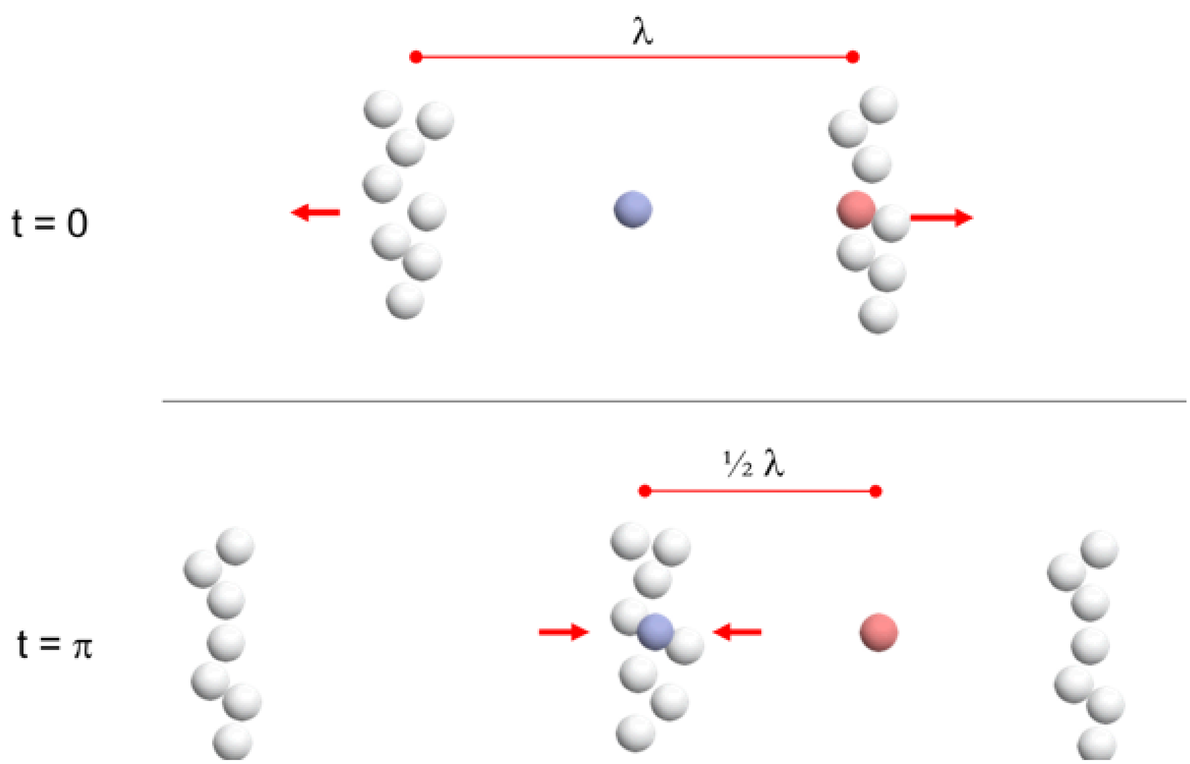
Avogadro's Number of Unit Cells in Hydrogen Radius (a_0)

Geometry of Waves

Euler's number appears again with another Planck unit – the Planck charge. Charge is a property of a particle that is responsible for the motion of other particles, either attracting or repelling them. This property can be explained as the formation of waves and their wave interference patterns.

Sound waves are a good example to illustrate the geometry of longitudinal waves. Imagine air molecules in a lattice structure, not too different than the figure above. As molecules vibrate, they are displaced from equilibrium, collide with other molecules and create the formation of waves which produces sound. When waves combine that are in-phase, the sound is louder (greater amplitude); when waves combine that are out-of-phase, sound can be cancelled. This same process occurs with granules at the Planck level.

As granules are displaced from equilibrium they create the presence of waves shown in the next figure at two times: 1) at time t=0, where granules reach maximum displacement from the blue wave center, and 2) at time t=π, where granules return to the center. They have traveled a distance of a half-wavelength (1/2 λ), but the total distance between the groups of granules is a full wavelength (λ). These become the wavefronts according to Huygen's principle. It is shown in 1D form in the next figure for simplicity, but the wavefront propagates spherically in three-dimensions (shown later).

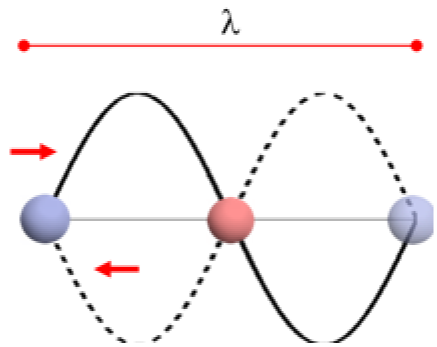


1D View – Motion of Granules Creating Waves

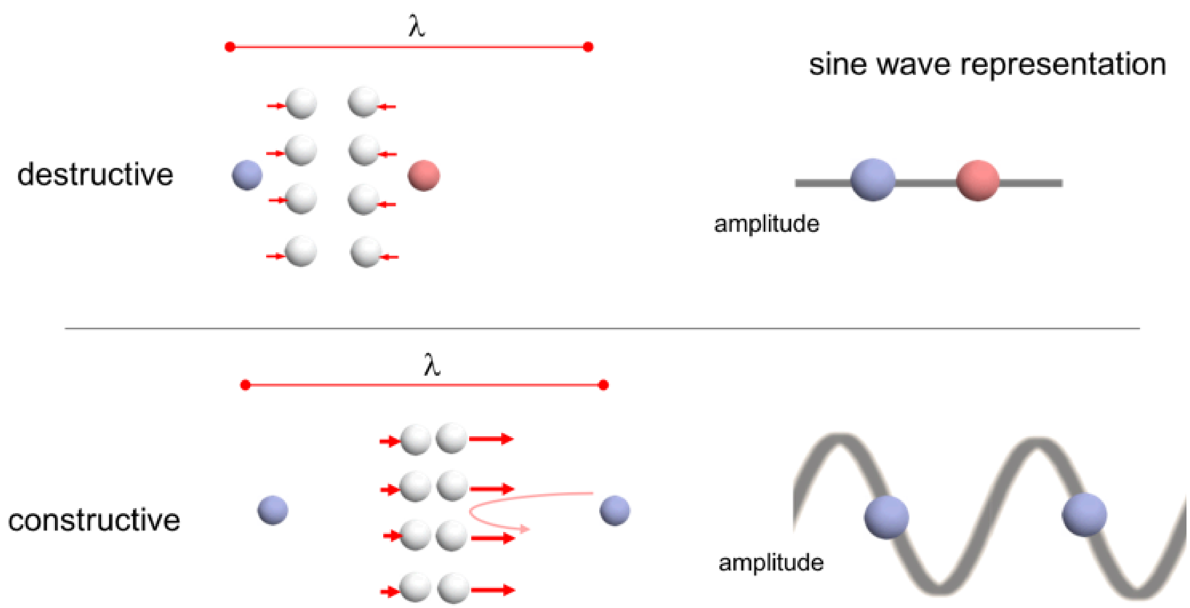
Planck charge is a measure of displacement. The total displacement of a collection of granules from equilibrium, forming a wavefront, is Planck charge times Euler's number squared. The wavelength is twice this value, expressed in the equation below. This matches the wavelength value used in EWT constants (after applying a g-factor to correct for the motion of Earth).

$$\lambda = 2q_P e^2$$

The previous figure illustrates two granules, color coded as the center point for waves (wave centers). When two waves traveling in opposite directions collide, they may forming standing waves. In a given wavelength, there are two nodes where there is little-to-no displacement. One is colored blue and the other is colored red to distinguish these special positions on the wave.



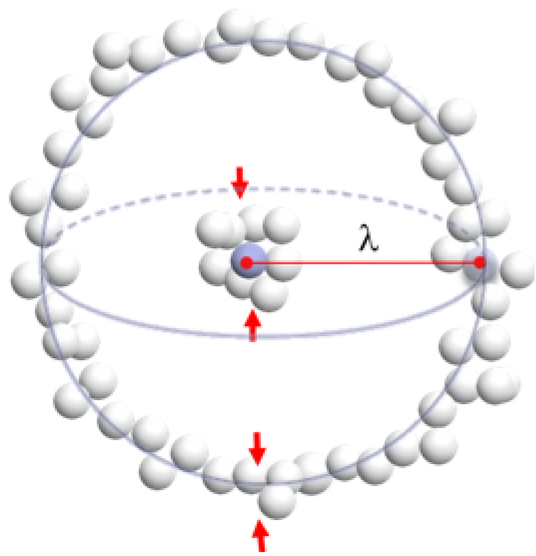
Particles on opposite nodes experience destructive wave interference; particles placed on the same node experience constructive wave interference. The figure below illustrates the two types of wave interference as granules collide and their sine wave representation. This is the cause of particles and antiparticles and the reason for their attractive and repulsive forces (explained in greater detail on the electric force page).



Geometry of Particles

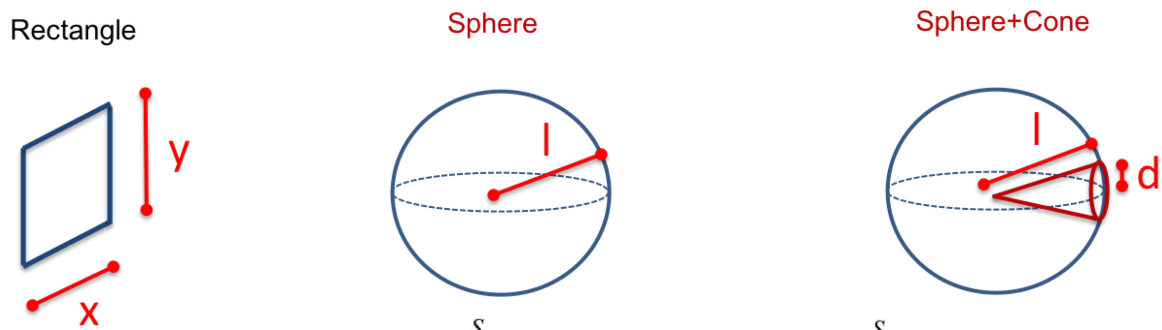
The previous section illustrates the displacement of granules in one-dimension because it is easier to describe and visualize the formation of waves. In reality, the displacement of granules propagates spherically from the center in three dimensions.

A cross section (2D) view of a **spherical wave** forming from the center is illustrated in the next figure. Granules flow in both directions – to and from the wave center marked in blue. This causes standing waves to form to the perimeter of the particle, which is one wavelength (λ) from the center for a particle with one wave center. This geometry is used to explain the creation of particles and the calculation of the fundamental particle – the neutrino. The addition of wave centers to the core of a particle creates the appearance of a new particle, as amplitude and wavelength become larger, resulting in standing wave energy increasing to the fifth power for each wave center.



Geometry of Forces

The propagation of granules in waves, and how it changes form and geometry, is responsible for the types of forces that cause the motion of particles. From the electric force, to the magnetic force, to gravity, to the strong force that binds the nucleus of atoms together, all can be described as granule motion and three shapes: **rectangle**, **sphere** and **cone**. The two geometric ratios used for forces are the ratio of the surface area of a rectangle to sphere (α_1) and the surface area of a rectangle to sphere+cone (α_2).



$$\alpha_1 = \frac{S_r}{S_s} = \frac{xy}{4\pi l^2}$$

$$\alpha_2 = \frac{S_r}{S_s + S_c} = \frac{xy}{4\pi l^2 + (\pi d l + \pi d^2)}$$

These geometric ratios are used to unify forces, as waves change formation (geometry). The first ratio (α_1) is used in the strong force. The second ratio (α_2) is used for particles with spin, resulting in the electric, magnetic and gravitational forces. The latter ratio leads to the derivation of the fine structure constant, the electron's gravitational coupling constant and the electron's magnetic moment. Detailed derivations are in the *Geometry of Spacetime* paper.

Previous: Constants **Next: Mechanics**