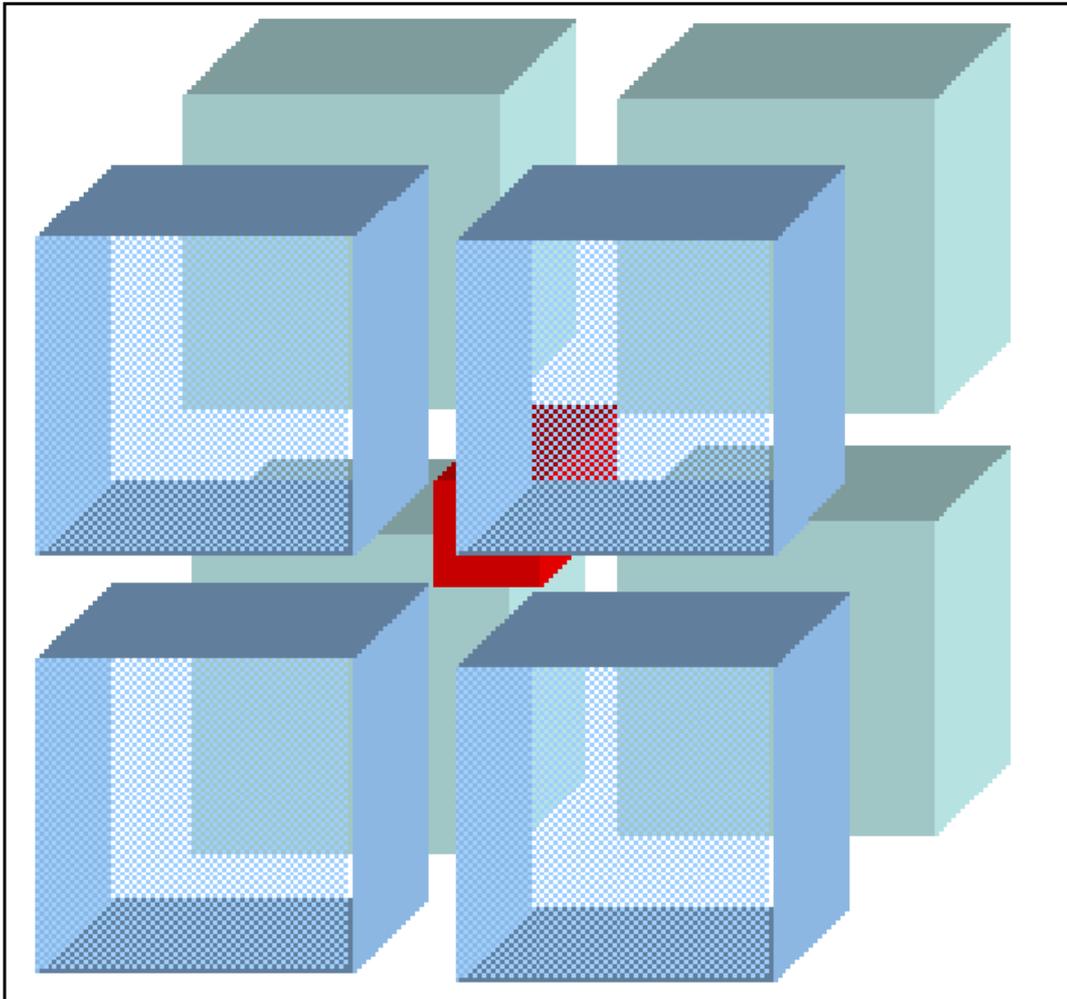


# The Holographic Photon



**By John Frederick Sweeney**

## **Abstract**

In Vedic Physics, the Photon is called the Vritihi (neutrino), which is merely the visible stage of the life cycle of this particle. The Vritihi decays over time, and the final point of decay marks the radial edge of our holographic Universe. This paper explains the combinatorial process which forms the Vritihi and the various states of matter involved in this process versus conventional notions about the electromagnetic spectrum, gravity and strong and weak forces.

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# Introduction

Vedic Physics holds the classics of Hindu literature as a metaphor for the hidden science which lies beneath the external layer. The hidden science has remained obscure until the very recent past.

For example:

Sri Krishna, the symbol of primal energy, guides Arjuna, the symbolic manipulator of human skills, in the Mahabharatha, in an allegorical setting replete with symbolic meaning. Sri Krishna's chariot (athmaan) with six horses (the senses), and Sri Krishna as the charioteer (epitome of humility with knowledge) advises Arjuna (Vrithi), to use the bow (three gunas) and arrow (the target) against his own people (absolute objectivity) to fulfill responsibility (destiny) without the stain of sinning (because a vrithi is a hologram which eventually decays).

This interpretation of the story of Sri Krishna might shock many followers of the Hare Krishna, but comes much closer to the truth of the literature, which has remained obscure for millennia. According to Hindu philosophy, man has been undergoing a process of degradation for millennia, and we devolve more rapidly as time progresses. For this reason, we no longer understand the true meanings of ancient literature, for the meaning has been lost over time as humanity devolves.

We have been living during the age of Kali Yuga, the period when humans are destined to devolve and to degrade to the point of say, a homosexual Roman church or government by assassination and military participation in the WTC fiasco, to cover up the collective theft of \$3 trillion. In the USA things can't get much worse than having a George Bush in the White House, except for the reign of his successor, Barry

Sotero.

The Dao De Jing of Chinese Daoist culture attests to the same process, when read carefully with understanding. If our ancestors during Early Global Civilization lived with a level of high technology and science, unmatched by contemporary methods, then the attempts to obscure and make occult this advanced technology and science mark the very downfall of humanity. We cannot possibly hope to match their level of advancement, yet the thrust of our "civilization" means to destroy, obliterate and pave over that advanced technology with the fruits of our own ignorance. The actions of the Catholic Church in destroying Mayan culture serves as an example.

This series of papers published on Vixra by the author represent a last - ditch effort to present this science to the world in the hope that some enlightened souls in each quadrant of the Earth undertake and understand this most ancient of sciences. When the next global disaster strikes humanity, as happened at the transition of Sanskrit from an oral to a written language, may at least one enlightened human possess this science, with at least one per continent.

# The Neutrino / Wikipedia

The following comes directly from Wikipedia:

A **neutrino** (/nʃuːˈtriːnoʊ/) is an electrically neutral, [weakly interacting elementary subatomic particle](#)<sup>[1]</sup> with [half-integer spin](#). The neutrino (meaning "small neutral one" in Italian) is denoted by the Greek letter ν (*[nu](#)*). All evidence suggests that neutrinos have [mass](#) but that their mass is tiny even by the standards of subatomic particles. Their mass has never been measured accurately.

Neutrinos do not carry [electric charge](#), which means that they are not affected by the [electromagnetic forces](#) that act on charged particles such as electrons and protons. Neutrinos are affected only by the [weak sub-atomic force](#), of much shorter range than electromagnetism, and [gravity](#), which is relatively weak on the subatomic scale. Therefore a typical neutrino passes through normal matter unimpeded.

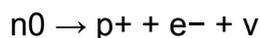
Neutrinos are created as a result of certain types of [radioactive decay](#), or [nuclear reactions](#) such as those that take place in the [Sun](#), in [nuclear reactors](#), or when [cosmic rays](#) hit atoms. There are three types, or "[flavors](#)", of neutrinos: [electron neutrinos](#), [muon neutrinos](#) and [tau neutrinos](#).

Each type is associated with an [anti - particle](#), called an "antineutrino", which also has neutral electric charge and half-integer spin. Whether or not the neutrino and its corresponding antineutrino are [identical particles](#) has not yet been resolved, even though the antineutrino has an opposite [chirality](#) to the neutrino.

Most neutrinos passing through the Earth emanate from the Sun. About 65 billion ( $6.5 \times 10^{10}$ ) [solar neutrinos](#) per second pass through every square centimeter perpendicular to the direction of the Sun in the region of the Earth.<sup>[2]</sup>

## Pauli's proposal[\[edit source\]](#)

The neutrino<sup>[nb 1]</sup> was postulated first by [Wolfgang Pauli](#) in 1930 to explain how [beta decay](#) could conserve [energy](#), [momentum](#), and [angular momentum \(spin\)](#). In contrast to [Niels Bohr](#), who proposed a statistical version of the conservation laws to explain the phenomenon, Pauli hypothesized an undetected particle that he called a "neutron" in keeping with convention employed for naming both the [proton](#) and the [electron](#), which in 1930 were known to be respective products for alpha and beta decay.<sup>[3][4][nb 2]</sup>



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[James Chadwick](#) discovered a much more massive nuclear particle in 1932 and also named it a [neutron](#), leaving two kinds of particles with the same name. [Enrico Fermi](#), who developed the theory of beta decay, coined the term *neutrino* (the [Italian](#) equivalent of "little neutral one") in 1933 as a way to resolve the confusion.<sup>[5][nb 3]</sup>

Fermi's paper, written in 1934, unified Pauli's neutrino with [Paul Dirac's positron](#) and [Werner Heisenberg's](#) neutron-proton model and gave a solid theoretical basis for future experimental work. However, the journal [Nature](#) rejected Fermi's paper, saying that the theory was "too remote from reality". He submitted the paper to an Italian journal, which accepted it, but the general lack of interest in his theory at that early date caused him to switch to experimental physics.<sup>[6][7]</sup>

**Direct detection**[\[edit source\]](#)

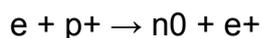


Clyde Cowan conducting the neutrino experiment c. 1956

In 1942 [Wang Ganchang](#) first proposed the use of beta-capture to experimentally detect neutrinos.<sup>[8]</sup> In the July 20, 1956 issue of [Science](#), [Clyde Cowan](#), [Frederick Reines](#), F. B. Harrison, H. W. Kruse, and A. D. McGuire published confirmation that they had detected the neutrino,<sup>[9][10]</sup> a result that was rewarded almost forty years later with the [1995 Nobel Prize](#).<sup>[11]</sup>

In this experiment, now known as the [Cowan–Reines neutrino experiment](#), antineutrinos created in a nuclear reactor by beta decay reacted with protons producing [neutrons](#) and [positrons](#):

$\bar{\nu}$



The positron quickly finds an electron, and they [annihilate](#) each other. The two resulting [gamma rays](#) ( $\gamma$ ) are detectable. The neutron can be detected by its capture on an appropriate nucleus, releasing a gamma ray. The coincidence of both events – positron annihilation and neutron capture – gives a unique signature of an antineutrino interaction.

**Neutrino flavor**[\[edit source\]](#)

In 1962, [Leon M. Lederman](#), [Melvin Schwartz](#) and [Jack Steinberger](#) showed that more than one type of neutrino exists by first detecting interactions of the [muon](#) neutrino (already hypothesised with the name *neutretto*),<sup>[12]</sup> which earned them the [1988 Nobel Prize in Physics](#). When the third type of [lepton](#), the [tau](#), was discovered in 1975 at the [Stanford Linear Accelerator Center](#), it too was expected to have an associated neutrino (the tau neutrino). First evidence for this third neutrino type came from the observation of missing energy and momentum in tau decays analogous to the beta decay leading to the discovery of the neutrino.

The first detection of tau neutrino interactions was announced in summer of 2000 by the [DONUT collaboration](#) at [Fermilab](#); its existence had already been inferred by both theoretical consistency and experimental data from the [Large Electron–Positron Collider](#).<sup>[citation needed]</sup>

### **Solar neutrino problem**[\[edit source\]](#)

Starting in the late 1960s, several experiments found that the number of [electron neutrinos](#) arriving from the Sun was between one third and one half the number predicted by the [Standard Solar Model](#). This discrepancy, which became known as the [solar neutrino problem](#), remained unresolved for some thirty years. It was resolved by discovery of [neutrino oscillation](#) and mass. (The [Standard Model of particle physics](#) had assumed that neutrinos are massless and cannot change flavor. However, if neutrinos had mass, they could change flavor, or *oscillate* between flavors).<sup>[citation needed]</sup>

### **Oscillation**[\[edit source\]](#)

A practical method for investigating neutrino oscillations was first suggested by [Bruno Pontecorvo](#) in 1957 using an analogy with [kaon oscillations](#); over the subsequent 10 years he developed the mathematical formalism and the modern formulation of vacuum oscillations. In 1985 [Stanislav Mikheyev](#) and [Alexei Smirnov](#) (expanding on 1978 work by [Lincoln Wolfenstein](#)) noted that flavor oscillations can be modified when neutrinos propagate through matter.

This so-called [Mikheyev–Smirnov–Wolfenstein effect](#) (MSW effect) is important to understand because many neutrinos emitted by fusion in the Sun pass through the dense matter in the [solar core](#) (where essentially all solar fusion takes place) on their way to detectors on Earth.

Starting in 1998, experiments began to show that solar and atmospheric neutrinos change flavors (see [Super-Kamiokande](#) and [Sudbury Neutrino Observatory](#)). This

resolved the solar neutrino problem: the electron neutrinos produced in the Sun had partly changed into other flavors which the experiments could not detect.

Although individual experiments, such as the set of solar neutrino experiments, are consistent with non-oscillatory mechanisms of neutrino flavor conversion, taken altogether, neutrino experiments imply the existence of neutrino oscillations. Especially relevant in this context are the reactor experiment [KamLAND](#) and the accelerator experiments such as [MINOS](#).

The KamLAND experiment has indeed identified oscillations as the neutrino flavor conversion mechanism involved in the solar electron neutrinos. Similarly MINOS confirms the oscillation of atmospheric neutrinos and gives a better determination of the mass squared splitting.<sup>[13]</sup>

### **Supernova neutrinos**[\[edit source\]](#)

See also: [Supernova Early Warning System](#)

[Raymond Davis Jr.](#) and [Masatoshi Koshi](#) were jointly awarded the 2002 [Nobel Prize in Physics](#); Davis for his pioneer work on [cosmic neutrinos](#) and Koshi for the first real time observation of [supernova neutrinos](#). The detection of [solar neutrinos](#), and of neutrinos of the [SN 1987A supernova](#) in 1987 marked the beginning of [neutrino astronomy](#).<sup>[citation needed]</sup>

### Properties and reactions[\[edit source\]](#)

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The neutrino has half-integer [spin](#) ( $\frac{1}{2}\hbar$ ) and is therefore a [fermion](#). Neutrinos interact primarily through the [weak force](#). The discovery of [neutrino flavor oscillations](#) implies that neutrinos have mass. The existence of a neutrino mass strongly suggests the existence of a tiny neutrino magnetic moment<sup>[14]</sup> of the order of  $10^{-19} \mu_B$ , allowing the possibility that neutrinos may interact electromagnetically as well.

An experiment done by [C. S. Wu](#) at [Columbia University](#) showed that neutrinos always have left-handed [chirality](#).<sup>[15]</sup> It is very hard to uniquely identify neutrino interactions among the natural background of radioactivity. For this reason, in early experiments a special reaction channel was chosen to facilitate the identification: the interaction of an antineutrino with one of the hydrogen nuclei in the water molecules.

A hydrogen nucleus is a single proton, so simultaneous nuclear interactions, which would occur within a heavier nucleus, don't need to be considered for the detection experiment. Within a cubic metre of water placed right outside a nuclear reactor, only relatively few such interactions can be recorded, but the setup is now used for measuring the reactor's plutonium production rate.

## **Mikheyev–Smirnov–Wolfenstein effect**[\[edit source\]](#)

*Main article:* [Mikheyev–Smirnov–Wolfenstein effect](#)

Neutrinos traveling through matter, in general, undergo a process analogous to [light traveling through a transparent material](#). This process is not directly observable because it doesn't produce [ionizing radiation](#), but gives rise to the [MSW effect](#). Only a small fraction of the neutrino's energy is transferred to the material.

## **Nuclear reactions**[\[edit source\]](#)

Neutrinos can interact with a nucleus, changing it to another nucleus. This process is used in radiochemical [neutrino detectors](#). In this case, the energy levels and spin states within the target nucleus have to be taken into account to estimate the probability for an interaction. In general the interaction probability increases with the number of neutrons and protons within a nucleus.

## **Alteration of nuclear decay rate**[\[edit source\]](#)

A Russian study suggests that the decay rate of radioactive isotopes is not constant as is commonly believed,<sup>[16]</sup> and a recent study<sup>[17]</sup> also finds this, and says it appears to be affected by the rate of neutrinos emitted by the Sun.

## **Induced fission**[\[edit source\]](#)

Very much like [neutrons](#) do in [nuclear reactors](#), neutrinos can induce [fission reactions](#) within heavy [nuclei](#).<sup>[18]</sup> So far, this reaction has not been measured in a laboratory, but is predicted to happen within stars and supernovae.

The process affects the [abundance of isotopes](#) seen in the [universe](#).<sup>[19]</sup> Neutrino fission of [deuterium](#) nuclei has been observed in the [Sudbury Neutrino Observatory](#), which uses a [heavy water](#) detector.

Types[[edit source](#)]

Neutrinos in the Standard Model of elementary particles		
Fermion	Symbol	Mass <sup>[nb 4]</sup>
<b>Generation 1</b>		
Electron neutrino	$\nu_e$	< 2.2 eV
Electron antineutrino	$\bar{\nu}_e$	< 2.2 eV
<b>Generation 2</b>		
Muon neutrino	$\nu_\mu$	< 170 keV
Muon antineutrino	$\bar{\nu}_\mu$	< 170 keV
<b>Generation 3</b>		
Tau neutrino	$\nu_\tau$	< 15.5 MeV
Tau antineutrino	$\bar{\nu}_\tau$	< 15.5 MeV

There are three known types (*flavors*) of neutrinos: electron neutrino  $\nu_e$ , muon neutrino  $\nu_\mu$  and tau neutrino  $\nu_\tau$ , named after their partner [leptons](#) in the [Standard Model](#) (see table above). The current best measurement of the number of neutrino types comes from observing the decay of the [Z boson](#). This particle can decay into any light neutrino and its antineutrino, and the more types of light neutrinos<sup>[nb 5]</sup> available, the shorter the lifetime of the Z boson. Measurements of the Z lifetime have shown that the number of light neutrino types is 3.<sup>[14]</sup>

The correspondence between the six [quarks](#) in the Standard Model and the six leptons, among them the three neutrinos, suggests to physicists' intuition that there should be exactly three types of neutrino. However, actual proof that there are only three kinds of neutrinos remains an elusive goal of particle physics.

The possibility of [sterile neutrinos](#)—relatively light neutrinos which do not participate in the weak interaction but which could be created through flavor oscillation (see below)—is unaffected by these Z-boson-based measurements, and the existence of such particles is in fact hinted by experimental data from the [LSND](#) experiment. However, the currently running [MiniBooNE](#) experiment suggested, until recently, that sterile neutrinos are not required to explain the experimental data,<sup>[20]</sup> although the latest research into this area is on-going and anomalies in the MiniBooNE data may allow for exotic neutrino types, including sterile neutrinos.<sup>[21]</sup> A recent re-analysis of reference electron spectra data from the [Institut Laue-Langevin](#)<sup>[22]</sup> has also hinted at a fourth, sterile neutrino.<sup>[23]</sup>

Recently analyzed data from the [Wilkinson Microwave Anisotropy Probe](#) of the [cosmic background radiation](#) is compatible with either three or four types of neutrinos. It is hoped that the addition of two more years of data from the probe will resolve this uncertainty.<sup>[24]</sup>

### **Antineutrinos**

Antineutrinos are the [antiparticles](#) of neutrinos, which are [neutral](#) particles produced in [nuclear beta decay](#). These are emitted during [beta particle](#) emissions, when a neutron turns into a proton. They have a [spin](#) of  $\frac{1}{2}$ , and are part of the [lepton](#) family of particles.

The antineutrinos observed so far all have right-handed [helicity](#) (i.e. only one of the two possible spin states has ever been seen), while the neutrinos are left-handed. Antineutrinos, like neutrinos, interact with other [matter](#) only through the [gravitational](#) and [weak forces](#), making them very difficult to detect experimentally. [Neutrino oscillation](#) experiments indicate that antineutrinos have [mass](#), but beta decay experiments constrain that mass to be very small.

A neutrino-antineutrino interaction has been suggested in attempts to form a composite photon with the [neutrino theory of light](#).

Because antineutrinos and neutrinos are neutral particles it is possible that they are actually the same particle. Particles which have this property are known as [Majorana particles](#).

If neutrinos are indeed Majorana particles then the [neutrinoless double beta decay](#), as well as a range of other lepton number violating phenomena, are allowed. Several experiments have been proposed to search for this process.

Researchers around the world have begun to investigate the possibility of using antineutrinos for reactor monitoring in the context of preventing the [proliferation of nuclear weapons](#).<sup>[25][26][27]</sup>

Antineutrinos were first detected as a result of their interaction with protons in a large tank of water. This was installed next to a nuclear reactor as a controllable source of the antineutrinos.

(See: [Cowan–Reines neutrino experiment](#))

### **Flavor oscillations**[\[edit source\]](#)

Neutrinos are most often created or detected with a well defined [flavor](#) (electron, muon, tau). However, in a phenomenon known as neutrino flavor oscillation, neutrinos are able to oscillate among the three available flavors while they propagate through space.

Specifically, this occurs because the neutrino flavor [eigenstates](#) are not the same as the neutrino mass eigenstates (simply called 1, 2, 3). This allows for a neutrino that was produced as an electron neutrino at a given location to have a calculable probability to be detected as either a muon or tau neutrino after it has traveled to another location.

This [quantum mechanical](#) effect was first hinted by the discrepancy between the number of electron neutrinos detected from the [Sun's](#) core failing to match the expected numbers, dubbed as the "[solar neutrino problem](#)".

In the [Standard Model](#) the existence of flavor oscillations implies nonzero differences between the neutrino masses, because the amount of mixing between neutrino flavors at a given time depends on the differences between their squared masses.

There are other possibilities in which neutrino can oscillate even if they are massless. If Lorentz invariance is not an exact symmetry, neutrinos can experience [Lorentz-violating oscillations](#).<sup>[28]</sup>

It is possible that the neutrino and antineutrino are in fact the same particle, a hypothesis first proposed by the Italian physicist [Ettore Majorana](#). The neutrino could transform into an antineutrino (and vice versa) by flipping the orientation of its [spin](#) state.<sup>[29]</sup>

This change in spin would require the neutrino and antineutrino to have nonzero mass, and therefore travel slower than light, because such a spin flip, caused only by a change in point of view, can take place only if [inertial frames of reference](#) exist that move faster than the particle: such a particle has a spin of one orientation when seen from a frame which moves slower than the particle, but the opposite spin when observed from a frame that moves faster than the particle.

On July 19, 2013 the results from the [T2K experiment](#) presented at the [European Physical Society](#) Conference on High Energy Physics in Stockholm, Sweden, confirmed the [Neutrino oscillation](#) theory.<sup>[30][31]</sup>

### **Speed**[\[edit source\]](#)

Before neutrinos were found to oscillate, they were generally assumed to be massless, propagating at the [speed of light](#). According to the theory of [special relativity](#), the question of neutrino [velocity](#) is closely related to their [mass](#). If neutrinos are massless, they must travel at the speed of light. However, if they have mass, they cannot reach the speed of light.

Also some [Lorentz violating](#) variants of [quantum gravity](#) might allow faster-than-light neutrinos. A comprehensive framework for Lorentz violations is the [Standard-Model Extension](#) (SME).

In the early 1980s, first measurements of neutrino speed were done using pulsed [pion](#) beams (produced by pulsed proton beams hitting a target). The pions decayed producing neutrinos, and the neutrino interactions observed within a time window in a detector at a distance were consistent with the speed of light.

This measurement was repeated in 2007 using the [MINOS](#) detectors, which found the speed of 3 [GeV](#) neutrinos to be  $1.000051(29) c$  at 68% confidence level, and at 99% confidence level a range between  $0.999976 c$  and  $1.000126 c$ .

The central value is higher than the speed of light and is consistent with superluminal velocity; however, the uncertainty is great enough that the result also does not rule out speeds less than or equal to light at this high confidence level.

This measurement set an upper bound on the mass of the muon neutrino of 50 MeV at 99% [confidence](#).<sup>[32][33]</sup> The detectors for the project are being upgraded, and new results are not expected until at least 2012.

The same observation was made, on a somewhat larger scale, with [supernova 1987A](#) (SN 1987A). 10-MeV antineutrinos from the supernova were detected within a time window that was consistent with a speed of light for the neutrinos. So far, the question of neutrino masses cannot be decided based on measurements of the neutrino speed.

In September 2011, the [OPERA collaboration](#) released calculations showing velocities of 17-GeV and 28-GeV neutrinos exceeding the speed of light in their experiments (see [Faster-than-light neutrino anomaly](#)). In November 2011, OPERA repeated its experiment with

changes so that the speed could be determined individually for each detected neutrino.

The results showed the same faster-than-light speed. However, in February 2012 reports came out that the results may have been caused by a loose fiber optic cable attached to one of the atomic clocks which measured the departure and arrival times of the neutrinos. An independent recreation of the experiment in the same laboratory by [ICARUS](#) found no discernible difference between the speed of a neutrino and the speed of light.<sup>[34]</sup>

In June 2012, CERN announced that new measurements conducted by four Gran Sasso experiments (OPERA, ICARUS, [Borexino](#) and [LVD](#)) found agreement between the speed of light and the speed of neutrinos, finally refuting the initial OPERA result.<sup>[35]</sup>

That neutrinos are massless. However the experimentally established phenomenon of neutrino oscillation, which mixes neutrino flavour states with neutrino mass states (analogously to [CKM mixing](#)), requires neutrinos to have nonzero masses.<sup>[20]</sup>

Massive neutrinos were originally conceived by [Bruno Pontecorvo](#) in the 1950s. Enhancing the basic framework to accommodate their mass is straightforward by adding a [right-handed Lagrangian](#).

This can be done in two ways. If, like other fundamental Standard Model particles, mass is generated by the [Dirac mechanism](#), then the framework would require a [SU\(2\) singlet](#). This particle would have no other Standard Model interactions (apart from the [Yukawa interactions](#) with the neutral component of the [Higgs doublet](#)), so is called a sterile neutrino. Or, mass can be generated by the [Majorana mechanism](#), which would require the neutrino and antineutrino to be the same particle.

The strongest upper limit on the masses of neutrinos comes from [cosmology](#): the [Big Bang](#) model predicts that there is a fixed ratio between the number of neutrinos and the number of [photons](#) in the [cosmic microwave background](#). If the total energy of all three types of neutrinos exceeded an average of 50 [eV](#) per neutrino, there would be so much mass in the universe that it would collapse.<sup>[citation needed]</sup>

This limit can be circumvented by assuming that the neutrino is unstable; however, there are limits within the Standard Model that make this difficult. A much more stringent constraint comes from a careful analysis of cosmological data, such as the cosmic microwave background radiation, [galaxy surveys](#), and the [Lyman-alpha forest](#). These indicate that the summed masses of the three neutrino varieties must be less than 0.3 eV.<sup>[36]</sup>

In 1998, research results at the [Super-Kamiokande](#) neutrino detector determined that neutrinos can oscillate from one flavor to another, which requires that they must have a nonzero mass.<sup>[37]</sup> While this shows that neutrinos have mass, the absolute neutrino mass scale is still not known.

This is because neutrino oscillations are sensitive only to the difference in the squares of the masses.<sup>[38]</sup> The best estimate of the difference in the squares of the masses of mass eigenstates 1 and 2 was published by [KamLAND](#) in 2005:  $\Delta m_{21}^2 = 0.000079 \text{ eV}^2$ .<sup>[39]</sup> In 2006, the [MINOS](#) experiment measured oscillations from an intense muon neutrino beam, determining the difference in the squares of the masses between neutrino mass eigenstates 2 and 3.

The initial results indicate  $|\Delta m_{32}^2| = 0.0027 \text{ eV}^2$ , consistent with previous results from Super-Kamiokande.<sup>[40]</sup> Since  $|\Delta m_{32}^2|$  is the difference of two squared masses, at least one of them has to have a value which is at least the square root of this value.

Thus, there exists at least one neutrino mass eigenstate with a mass of at least 0.04 eV.<sup>[41]</sup>

In 2009 lensing data of a galaxy cluster were analyzed to predict a neutrino mass of about 1.5 eV.<sup>[42]</sup> All neutrino masses are then nearly equal, with neutrino oscillations of order meV.

They lie below the Mainz-Troitsk upper bound of 2.2 eV for the electron antineutrino.<sup>[43]</sup> The latter will be tested in 2015 in the [KATRIN](#) experiment, that searches for a mass between 0.2 eV and 2 eV.

A number of efforts are under way to directly determine the absolute neutrino mass scale in laboratory experiments. The methods applied involve nuclear beta decay ([KATRIN](#) and [MARE](#)) or [neutrinoless double beta decay](#) (e.g. [GERDA](#), [CUORE/Cuoricino](#), [NEMO-3](#) and others).

On 31 May 2010, [OPERA](#) researchers observed the first [tau neutrino](#) candidate event in a [muon neutrino](#) beam, the first time a transformation in neutrinos had been observed, giving evidence that they have mass.<sup>[44]</sup>

In July 2010 the 3-D MegaZ DR7 galaxy survey reported that they had measured a limit of the combined mass of the three neutrino varieties to be less than 0.28 eV.<sup>[45]</sup> A tighter upper bound yet for this sum of masses, 0.23 eV, was reported in March 2013 by the [Planck collaboration](#).<sup>[46]</sup>

If the neutrino is a [Majorana particle](#), the mass can be calculated by finding the [half life](#) of [neutrinoless double-beta decay](#) of certain nuclei.

The lowest upper limit, on the Majorana mass of the neutrino, has been set by [EXO-200](#) 140–380 meV<sup>[47]</sup>

### Size[\[edit source\]](#)

The physical size of neutrinos can be defined using their electroweak radius (apparent size in [electroweak interaction](#)). The average electroweak characteristic size is  $\langle r^2 \rangle = n \times 10^{-33} \text{ cm}^2$  ( $n \times 1$  [nanobarn](#)), where  $n = 3.2$  for electron neutrino,  $n = 1.7$  for muon neutrino and 1.0 for tau neutrino; it depends on no other properties than mass.<sup>[48]</sup>

However, this is best understood as being relevant only to probability of scattering. Since the neutrino does not interact electromagnetically, and is defined quantum mechanically by a wavefunction instead of a single point in space, it does not have a size in the same sense as everyday objects.<sup>[49]</sup>

### Handedness[\[edit source\]](#)

Experimental results show that (nearly) all produced and observed neutrinos have left-handed [helicities](#) (spins antiparallel to [momenta](#)), and all antineutrinos have right-handed helicities, within the margin of error. In the massless limit, it means that only one of two possible [chiralities](#) is observed for either particle. These are the only chiralities included in the [Standard Model](#) of particle interactions.

It is possible that their counterparts (right-handed neutrinos and left-handed antineutrinos) simply do not exist. If they do, their properties are substantially different from observable neutrinos and antineutrinos. It is theorized that they are either very heavy (on the order of [GUT scale](#)—see [Seesaw mechanism](#)), do not participate in weak interaction (so-called [sterile neutrinos](#)), or both.

The existence of nonzero neutrino masses somewhat complicates the situation. Neutrinos are produced in weak interactions as chirality eigenstates. However, chirality of a massive particle is not a constant of motion; helicity is, but the chirality operator does not share eigenstates with the helicity operator.

Free neutrinos propagate as mixtures of left- and right-handed helicity states, with mixing amplitudes on the order of  $m_\nu/E$ . This does not significantly affect the experiments, because neutrinos involved are nearly always ultrarelativistic, and thus mixing amplitudes are vanishingly small. For example, most solar neutrinos have energies on the order of 100 keV–1 MeV, so the fraction of neutrinos with "wrong" helicity among them cannot exceed  $10^{-10}$ .<sup>[50][51]</sup>

### Sources[\[edit source\]](#)

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## Artificial<sup>[edit source]</sup>

[Nuclear reactors](#) are the major source of human-generated neutrinos. Antineutrinos are made in the beta-decay of neutron-rich daughter fragments in the fission process. Generally, the four main isotopes contributing to the antineutrino flux are [235U](#), [238U](#), [239Pu](#) and [241Pu](#) (i.e. via the antineutrinos emitted during [beta-minus decay](#) of their respective fission fragments). The average nuclear fission releases about 200 MeV of energy, of which roughly 4.5% (or about 9 MeV)<sup>[52]</sup> is radiated away as antineutrinos.

For a typical nuclear reactor with a thermal power of 4,000 [MW](#), meaning that the core produces this much heat, and an electrical power generation of 1,300 MW, the total power production from fissioning atoms is actually 4,185 MW, of which 185 MW is radiated away as antineutrino radiation and never appears in the engineering.

This is to say, 185 MW of fission energy is *lost* from this reactor and does not appear as heat available to run turbines, since the antineutrinos penetrate all building materials essentially without any trace, and disappear.<sup>[nb 6]</sup>

The antineutrino energy spectrum depends on the degree to which the fuel is burned (plutonium-239 fission antineutrinos on average have slightly more energy than those from uranium-235 fission), but in general, the *detectable* antineutrinos from fission have a peak energy between about 3.5 and 4 MeV, with a maximum energy of about 10 MeV.<sup>[53]</sup> There is no established experimental method to measure the flux of low energy antineutrinos.

Only antineutrinos with an energy above threshold of 1.8 MeV can be uniquely identified (see *neutrino detection* below). An estimated 3% of all antineutrinos from a nuclear reactor carry an energy above this threshold.

Thus, an average nuclear power plant may generate over  $10^{20}$  antineutrinos per second above this threshold, but also a much larger number ( $97\%/3\% = \sim 30$  times this number) below the energy threshold, which cannot be seen with present detector technology.

Some [particle accelerators](#) have been used to make neutrino beams. The technique is to smash [protons](#) into a fixed target, producing charged [pions](#) or [kaons](#). These unstable particles are then magnetically focused into a long tunnel where they decay while in flight.

Because of the [relativistic boost](#) of the decaying particle the neutrinos are produced as a beam rather than isotropically. Efforts to construct an accelerator facility where neutrinos are produced

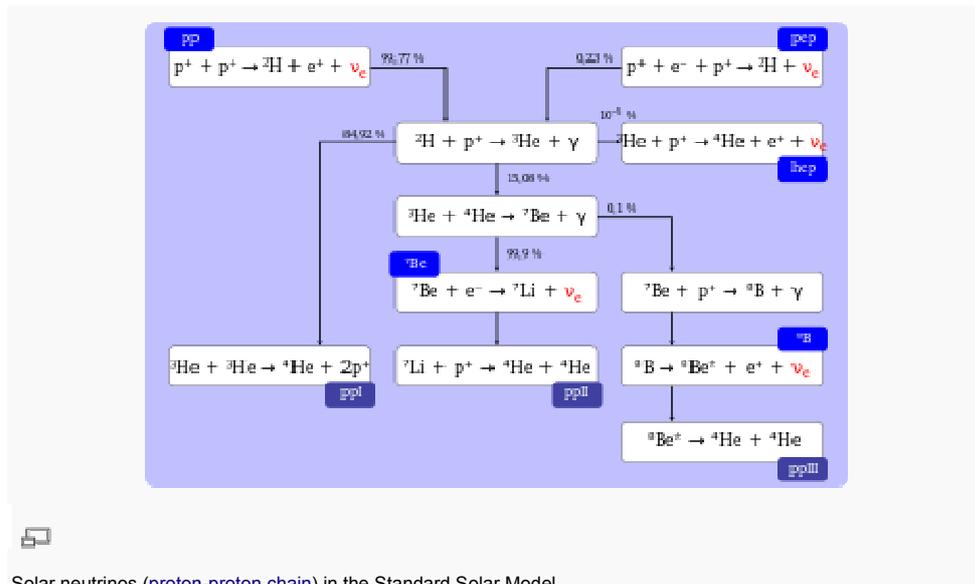
through [muon](#) decays are ongoing.<sup>[54]</sup> Such a setup is generally known as a *neutrino factory*.

[Nuclear bombs](#) also produce very large quantities of neutrinos. [Fred Reines](#) and [Clyde Cowan](#) considered the detection of neutrinos from a bomb prior to their search for reactor neutrinos; a fission reactor was recommended as a better alternative by Los Alamos physics division leader J.M.B. Kellogg.<sup>[55]</sup>

### Geologic<sup>[edit source]</sup>

Neutrinos are part of the natural [background radiation](#). In particular, the decay chains of [238U](#) and [232Th](#) isotopes, as well as [40K](#), include [beta decays](#) which emit antineutrinos. These so-called [geoneutrinos](#) can provide valuable information on the Earth's interior.

A first indication for geoneutrinos was found by the [KamLAND](#) experiment in 2005. KamLAND's main background in the geoneutrino measurement are the antineutrinos coming from reactors. Several future experiments aim at improving the geoneutrino measurement and these will necessarily have to be far away from reactors.



### Atmospheric<sup>[edit source]</sup>

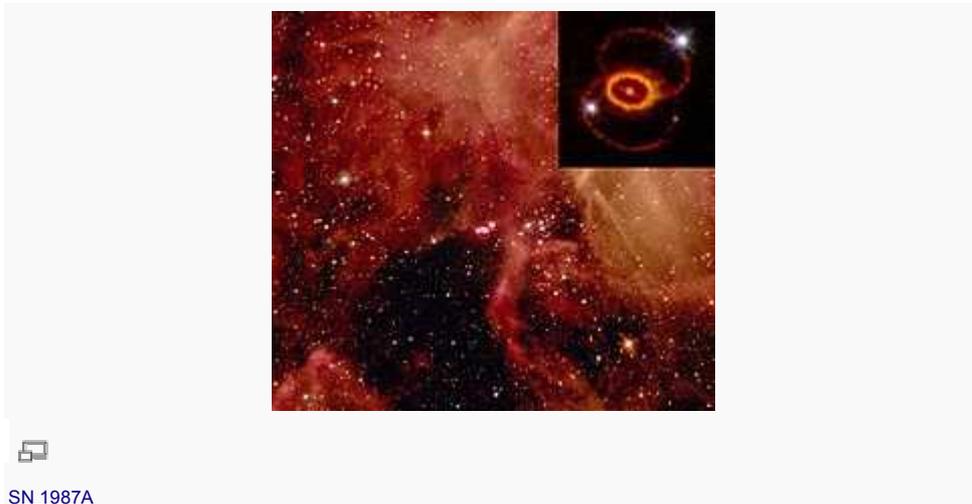
Atmospheric neutrinos result from the interaction of [cosmic rays](#) with atomic nuclei in the [Earth's atmosphere](#), creating showers of particles, many of which are unstable and produce neutrinos when they decay. A collaboration of particle physicists from [Tata Institute of Fundamental Research](#) (India), [Osaka City University](#) (Japan) and [Durham University](#) (UK) recorded the first cosmic ray neutrino interaction in an underground laboratory in [Kolar Gold Fields](#) in India in 1965.

### Solar<sup>[edit source]</sup>

Solar neutrinos originate from the [nuclear fusion](#) powering the [Sun](#) and other stars. The details of the operation of the Sun are explained by the [Standard Solar Model](#). In short: when four protons fuse to become one [helium](#) nucleus, two of them have to convert into neutrons, and each such conversion releases one electron neutrino.

The Sun sends enormous numbers of neutrinos in all directions. Each second, about 65 [billion](#) ( $6.5 \times 10^{10}$ ) solar neutrinos pass through every square centimeter on the part of the Earth that faces the Sun.<sup>[2]</sup> Since neutrinos are insignificantly absorbed by the mass of the Earth, the surface area on the side of the Earth opposite the Sun receives about the same number of neutrinos as the side facing the Sun.

### Supernovae[\[edit source\]](#)



In 1966 Colgate and White<sup>[56]</sup> calculated that neutrinos carry away most of the gravitational energy released by the collapse of massive stars, events now categorized as [Type Ib and Ic](#) and [Type II supernovae](#). When such stars collapse, matter [densities](#) at the core becomes so high ( $10^{17}$  kg/m<sup>3</sup>) that the [degeneracy](#) of electrons is not enough to prevent protons and electrons from combining to form a neutron and an electron neutrino.

A second and more important neutrino source is the thermal energy (100 billion [kelvins](#)) of the newly formed neutron core, which is dissipated via the formation of neutrino-antineutrino pairs of all flavors.<sup>[57]</sup>

Colgate and White's theory of supernova neutrino production was confirmed in 1987, when neutrinos from [supernova 1987A](#) were detected.

The water-based detectors [Kamiokande II](#) and [IMB](#) detected 11 and 8 antineutrinos of thermal origin,<sup>[57]</sup> respectively, while the scintillator-based [Baksan](#) detector found 5 neutrinos ([lepton number](#) =

1) of either thermal or electron-capture origin, in a burst lasting less than 13 seconds.

The neutrino signal from the supernova arrived at earth several hours before the arrival of the first electromagnetic radiation, as expected from the evident fact that the latter emerges along with the shock wave. The exceptionally feeble interaction with normal matter allowed the neutrinos to pass through the churning mass of the exploding star, while the electromagnetic photons were slowed.

Because neutrinos interact so little with matter, it is thought that a supernova's neutrino emissions carry information about the innermost regions of the explosion. Much of the *visible* light comes from the decay of radioactive elements produced by the supernova shock wave, and even light from the explosion itself is scattered by dense and turbulent gases.

Neutrinos, on the other hand, pass through these gases, providing information about the supernova core (where the densities *were* large enough to influence the neutrino signal).

Furthermore, the neutrino burst is expected to reach Earth before any electromagnetic waves, including visible light, gamma rays or radio waves. The exact time delay depends on the velocity of the shock wave and on the thickness of the outer layer of the star.

For a Type II supernova, astronomers expect the neutrino flood to be released seconds after the stellar core collapse, while the first electromagnetic signal may emerge hours later. The [SNEWS](#) project uses a network of neutrino detectors to monitor the sky for candidate supernova events; the neutrino signal will provide a useful advance warning of a star exploding in the Milky Way.

**Supernova remnants**[\[edit source\]](#)

The energy of supernova neutrinos ranges from a few to several tens of MeV. However, the sites where [cosmic rays](#) are accelerated are expected to produce neutrinos that are at least one million times more energetic, produced from turbulent gaseous environments left over by supernova explosions: the [supernova remnants](#).

The origin of the cosmic rays was attributed to supernovas by [Walter Baade](#) and [Fritz Zwicky](#); this hypothesis was refined by [Vitaly L. Ginzburg](#) and [Sergei I. Syrovatsky](#) who attributed the origin to supernova remnants, and supported their claim by the crucial remark, that the cosmic ray losses of the Milky Way is compensated, if the efficiency of acceleration in supernova remnants is about 10 percent.

Ginzburg and Syrovatskii's hypothesis is supported by the specific mechanism of "shock wave acceleration" happening in supernova

remnants, which is consistent with the original theoretical picture drawn by [Enrico Fermi](#), and is receiving support from observational data.

The very high energy neutrinos are still to be seen, but this branch of neutrino astronomy is just in its infancy. The main existing or forthcoming experiments that aim at observing very high energy neutrinos from our galaxy are [Baikal](#), [AMANDA](#), [IceCube](#), [ANTARES](#), [NEMO](#) and [Nestor](#).

Related information is provided by [very high energy gamma ray](#) observatories, such as [VERITAS](#), [HESS](#) and [MAGIC](#). Indeed, the collisions of cosmic rays are supposed to produce charged pions, whose decay give the neutrinos, and also neutral pions, whose decay give gamma rays: the environment of a supernova remnant is transparent to both types of radiation.

Still higher energy neutrinos, resulting from the interactions of extragalactic cosmic rays, could be observed with the [Pierre Auger Observatory](#) or with the dedicated experiment named [ANITA](#).

**Big Bang**[\[edit source\]](#)

*Main article: [Cosmic neutrino background](#)*

It is thought that, just like the [cosmic microwave background radiation](#) left over from the [Big Bang](#), there is a background of low energy neutrinos in our Universe. In the 1980s it was proposed that these may be the explanation for the [dark matter](#) thought to exist in the universe. Neutrinos have one important advantage over most other dark matter candidates: we know they exist. However, they also have serious problems.

From particle experiments, it is known that neutrinos are very light. This means that they easily move at speeds close to the [speed of light](#). Thus, dark matter made from neutrinos is termed "[hot dark matter](#)".

The problem is that being fast moving, the neutrinos would tend to have spread out evenly in the [universe](#) before cosmological expansion made them cold enough to congregate in clumps. This would cause the part of [dark matter](#) made of neutrinos to be smeared out and unable to cause the large [galactic](#) structures that we see.

Further, these same galaxies and [groups of galaxies](#) appear to be surrounded by dark matter that is not fast enough to escape from those galaxies. Presumably this matter provided the gravitational nucleus for [formation](#). This implies that neutrinos make up only a small part of the total amount of dark matter.

From cosmological arguments, relic background neutrinos are estimated to have density of 56 of each type per cubic centimeter and

temperature 1.9 K( $1.7 \times 10^{-4}$  eV) if they are massless, much colder if their mass exceeds 0.001 eV.

Although their density is quite high, due to extremely low neutrino cross-sections at sub-eV energies, the relic neutrino background has not yet been observed in the laboratory. In contrast, [boron-8](#) solar neutrinos—which are emitted with a higher energy—have been detected definitively despite having a space density that is lower than that of relic neutrinos by some 6 orders of magnitude.

Detection[\[edit source\]](#)

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*Main article:* [Neutrino detector](#)

Neutrinos cannot be detected directly, because they do not ionize the materials they are passing through (they do not carry electric charge and other proposed effects, like the MSW effect, do not produce traceable radiation). A unique reaction to identify antineutrinos, sometimes referred to as [inverse beta decay](#), as applied by Reines and Cowan (see below), requires a very large detector in order to detect a significant number of neutrinos.

All detection methods require the neutrinos to carry a minimum threshold energy. So far, there is no detection method for low energy neutrinos, in the sense that potential neutrino interactions (for example by the MSW effect) cannot be uniquely distinguished from other causes. Neutrino detectors are often built underground in order to isolate the detector from [cosmic rays](#) and other background radiation.

Antineutrinos were first detected in the 1950s near a nuclear reactor. [Reines](#) and [Cowan](#) used two targets containing a solution of [cadmium chloride](#) in water. Two scintillation detectors were placed next to the cadmium targets.

Antineutrinos with an energy above the threshold of 1.8 MeV caused charged current interactions with the protons in the water, producing positrons and neutrons. This is very much like  $\beta^+$  decay, where energy is used to convert a proton into a neutron, a [positron](#) ( $e^+$ ) and an [electron neutrino](#) ( $\nu_e$ ) is emitted:

From known  $\beta^+$  decay:

Energy + p  $\rightarrow$  n +  $e^+$  +  $\nu$

e

In the Cowan and Reines experiment, instead of an outgoing neutrino, you have an incoming antineutrino ( $\bar{\nu}_e$ ) from a nuclear reactor:

Energy (>1.8 MeV) + p +  $\bar{\nu}_e$

$e^+$   $\rightarrow$  n +  $e^+$

The resulting positron annihilation with electrons in the detector material created photons with an energy of about 0.5 MeV. Pairs of photons in coincidence could be detected by the two scintillation detectors above and below the target. The neutrons were captured by cadmium nuclei resulting in gamma rays of about 8 MeV that were detected a few microseconds after the photons from a positron annihilation event.

Since then, various detection methods have been used. [Super Kamiokande](#) is a large volume of water surrounded by [photomultiplier tubes](#) that watch for the [Cherenkov radiation](#) emitted when an incoming neutrino creates an [electron](#) or [muon](#) in the water.

The [Sudbury Neutrino Observatory](#) is similar, but uses [heavy water](#) as the detecting medium, which uses the same effects, but also allows the additional reaction any-flavor neutrino photo-dissociation of deuterium, resulting in a free neutron which is then detected from gamma radiation after chlorine-capture.

Other detectors have consisted of large volumes of [chlorine](#) or [gallium](#) which are periodically checked for excesses of [argon](#) or [germanium](#), respectively, which are created by electron-neutrinos interacting with the original substance. [MINOS](#) uses a solid plastic [scintillator](#) coupled to photomultiplier tubes, while [Borexino](#) uses a liquid [pseudocumene](#) scintillator also watched by photomultiplier tubes and the proposed [NOvA](#) detector will use liquid scintillator watched by [avalanche photodiodes](#). The [IceCube Neutrino Observatory](#) uses 1 km<sup>3</sup> of the [Antarctic ice sheet](#) near the [south pole](#) with photomultiplier tubes distributed throughout the volume.

Motivation for scientific interest

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Neutrinos' low mass and neutral charge mean they interact exceedingly weakly with other particles and fields. This feature of weak interaction interests scientists because it means neutrinos can be used to probe environments that other radiation (such as light or radio waves) cannot penetrate.

Using neutrinos as a probe was first proposed in the mid 20<sup>th</sup> century as a way to detect conditions at the core of the Sun. The solar core cannot be imaged directly because electromagnetic radiation (such as light) is diffused by the great amount and density of matter surrounding the core.

On the other hand, neutrinos pass through the Sun with few interactions. Whereas photons emitted from the solar core may require 40,000 years to diffuse to the outer layers of the Sun, neutrinos generated in stellar fusion reactions at the core cross this distance practically unimpeded at nearly the speed of light.<sup>[58][59]</sup>

Neutrinos are also useful for probing astrophysical sources beyond our solar system because they are the only known particles that are not significantly attenuated by their travel through the interstellar medium.

Optical photons can be obscured or diffused by dust, gas, and background radiation. High-energy cosmic rays, in the form of swift protons and atomic nuclei, are unable to travel more than about 100 megaparsecs due to the Greisen–Zatsepin–Kuzmin limit (GZK cutoff). Neutrinos, in contrast, can travel even greater distances barely attenuated.<sup>[citation needed]</sup>

The galactic core of the Milky Way is fully obscured by dense gas and numerous bright objects. Neutrinos produced in the galactic core might be measurable by Earth-based neutrino telescopes.<sup>[citation needed]</sup>

Another important use of the neutrino is in the observation of supernovae, the explosions that end the lives of highly massive stars. The core collapse phase of a supernova is an extremely dense and energetic event.

It is so dense that no known particles are able to escape the advancing core front except for neutrinos. Consequently, supernovae are known to release approximately 99% of their radiant energy in a short (10-second) burst of neutrinos.<sup>[60]</sup> These neutrinos are a very useful probe for core collapse studies.

The rest mass of the neutrino (see above) is an important test of cosmological and astrophysical theories (see Dark matter). The neutrino's significance in probing cosmological phenomena is as great as any other method, and is thus a major focus of study in astrophysical communities.<sup>[61]</sup>

The study of neutrinos is important in particle physics because neutrinos typically have the lowest mass, and hence are examples of the lowest energy particles theorized in extensions of the Standard Model of particle physics.

# The Vrithi

Vedic Physics regards the photon as simply the manifestation stage of a particle life cycle, comparable to the neutrino.

Sathwa is the interaction which operates outward at the maximum rate with the required intensity and energy to transmit the interaction beyond the level of the first octet of interactions past the nuclear boundary that is in a fluidic or flexible state;

Raja is the interaction in the transition region of seven oscillatory plus the first forming the octet of interactions; that shuttles inward or outward to transfer the interactions from the nuclear boundary to the second radial boundary and vice-versa;

Thaama is the decelerating interaction acting inward, which forms the static nuclear boundary;

Natural phenomena operate as a spectrum of 8 levels (which explains Bott Periodicity). As the fundamental dynamic state is an oscillatory activity, the first state must cover the increment from level one to two. The expansive state of the oscillation will rise as  $2^3 = 8$ . Hence, as these are distinct phases of activity levels, they present phenomena at 8 stages at the fundamental level.

Of these 8 expansive stages, 3 levels form coherent states by combining, which become the building blocks for the 5 remaining states. If the 8 states are termed as a horizontal or sequential process, then the combination of three plus the remaining five create transition states by using the 3 synchronised levels as unitary base states for the five. Then finally when all 7 levels combine into a single coherent form (Octionic), within the spectrum of 8, it is a free and mobile state totally dependent on itself. It marks the initiating phase of a unit of mobile or free phenomena.

The seven levels form a spectrum like light, sound etc. Each has a distinctive characteristic of identification. When all these seven levels combine into a coherent

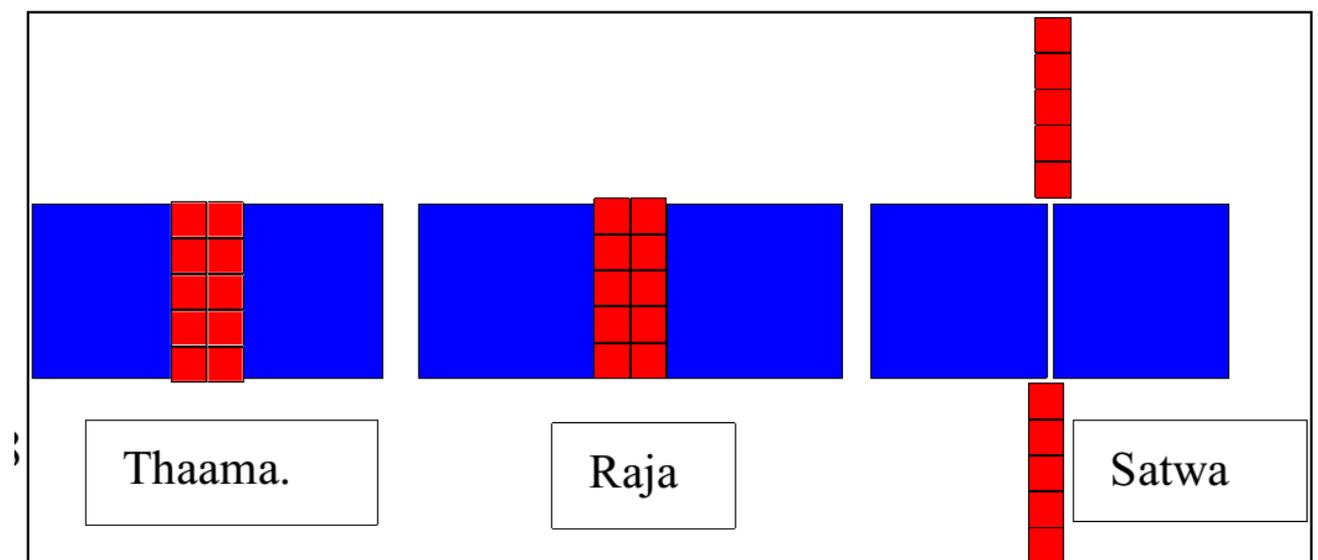
ensemble and radiate, this forms a vrithi. For example, light has photons, sound has phonons, and at the subatomic, atomic and molecular levels, the gluons, mesons and bosons and so on.

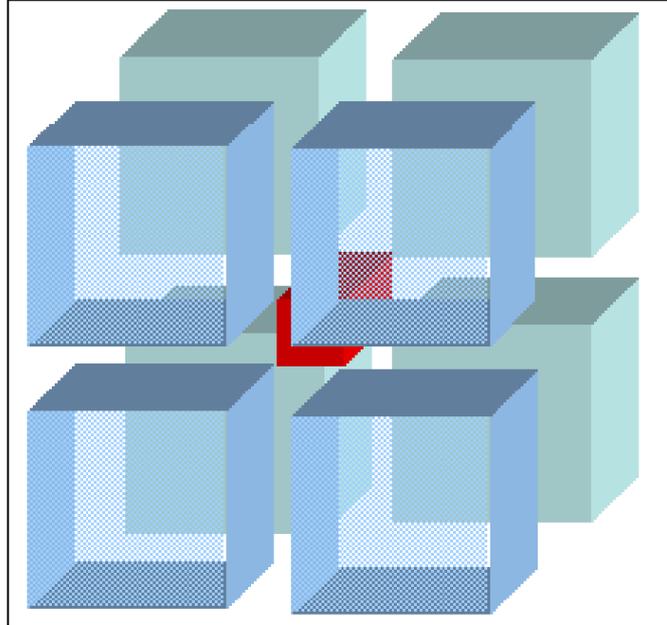
Vrithi is the resultant interaction that is radiated in the form of a self-sustained vortex of radiant energy created by the permutations and combinations of the previous three levels of interactions to transfer interaction or radiate energy.

The expansive Sathvik mode increases from its balanced internal oscillatory count rate of C at power index 8 (Suthra 22) to power index 11 (Suthra 23)  $8 + 3 = 11$  and is an accelerative radiating unit containing a self - sustaining vortex created by combinational interactions with the Thaama compressive state and Raja polarizing modes.

The following equation shows the mathematical formula for the Vrithi:

$$8+3=11 \quad 16-11=5 \quad 5+11=16 \quad c^2 \frac{4\pi^2}{7} = \text{Vrithi} = \text{photon}$$





**The red cube is the moolakaprithi .**

The moolakaprithi is shown as the red cube in the diagram and displays the cubic form maintained by the 8 vibrating larger blue cubes. That red cube can be described in terms of interactive counts of vibrations in a cyclic-period, assuming that all the eight blue cubes interact in the same location. The size of the red cube has a specific numerical relationship to the larger cube. It can be numerically related in powers of 2 or

$$2^N \text{ or } (2^3)^N = 8^N$$

The larger blue cube can now be considered as just the combination of the smaller - sized red cubes. The collection of red cubes act as a blue cube by vibrating together as a coherent, synchronous, group displaying Thaamasic simultaneous activity.

If the coherent and synchronised state of interacting or vibrating together simultaneously is disrupted, then that position produces the effect of the red cube. It then becomes a cube vibrating out of step or synchrony. It becomes a cube that does not remain in the same state or location as the rest and which displays a different condition.

This is the fundamental condition of commencement of activity called Moolaprakrithi. Moolaprakrithi - the red cube is not a cube - but a state of a cube in an active state or a state different from the rest.

It is a vibrating form that exists only because other vibrating cubes exist, and is a

holographic form. The meeting point of three axes shares a single point, which in reality is a cubic point. It is the fundamental concept of a unit of charge in Physics called a Purusha. An important change of condition takes place at this interactive interface. The impact between two cubes can result in 3 states of interactive reactions as defined in the Guna Theorems.

There follows instantaneous separation on impact, as an inelastic reaction of the Sathwa state. Or it may elastically vibrate and remain in a resonant Raja state.

Finally, the states may combine to attain a uniform, singular, synchronous and coherent state of activity, as one larger cube in the Thaama state. The Sathwa state shows the radiation of a set of Moolaprakrithis as Vrithis (coherent particle states)) on sudden or inelastic collision.

The Raja state shows the resonant harmony of two sets of Moolaprakrithis interacting simultaneously at the same rate as a bound state. The Thaama state shows the absorption of two sets of Moolaprakrithis in a higher state of activity as superposing, compressing, or denser states.

If the red cube Moolaprakrithi is considered the elemental unitary state, then larger cubes can be created as multiples of the elemental unitary state, as vibrant but coherent and unitary states.

The Moolaprakrithi is a cube of space in a vibratory state and the non - vibratory state of this same unit of space cannot remain in that size because of the axiomatic nature of Guna interactions. For this reason, the elemental components in space combine, agglomerate, or join together as a larger, self-limiting unit of space, which can remain static, coherent, passive or non - manifest etc.

There is a single Guna law that acts in identical ways at every agglomerate level of phenomena. At each level there exist the same proportionate limits of maximum and minimum interactive counts, but the form and size may vary to attain balance at each level.

Saying it another way, perpetual self - similar oscillatory activity comes to a stop naturally only at the Purusha level. For this reason it is called the Andha - Thaamshra or dark and dense state of Super - posed vibrations in space. The Guna principles explain why and how this has to be. When the oscillatory state becomes undetectable by super - positioning of counts, then communication with that state is cut off and the state enters into an isolated, black hole state.

The ability to discriminate the interval between interactive counts disappears, and it superposes on the previous count. This is the black hole state in Physics. Therefore every unit of quiescent, apparently static, barely resonant and non - manifest unit of

space is a Purusha - a massive black hole, a potential state of dormant, internal, stress and trans - migrational activity of elemental components in space. Conceptually, the black hole state behaves exactly like deep - sea components.

The natural drift of active states towards lower or reduced activity levels is purely due to the action and reaction counts not being cyclically equal. As an example: if a 20 interactions per cycle (ipc) unit interacts with a 10 ipc unit, the 20 ipc will move in towards the 10 ipc unit, because for every 2 counts, there is only one reacting count, to attain a balance of counts.

This is the fundamental cause of transmigration of counts between any two different count rate states. It is the only reason that all identified forces in Physics, like gravity, electromagnetic, weak and strong accelerate from a higher interactive count rate to a lower one.

At the basic elemental level, this drift of Moolaprakrithy counts towards the Purusha coherent states is observed as a gravitating phenomenon. At intermediate levels, this type of migration of counts display the Linga/Bhaava and Abiman/Ahankar changes in the Thaama-Raja-Sathwa Guna characteristics, which represent the strong, weak and electro - magnetic interactive spectrum.

# Conclusion

The previous section explains the true cause of gravity, as well as the strong and weak forces in Quantum nuclear physics, not to mention the electro - magnetic spectrum. Ours is a holographic, combinatorial universe, and the photon merely the visible portion of the life cycle of particles.

Since contemporary scientists fail to understand these simple principles, they spend their entire lives chasing phantom TOE and GUT. Instead they tilt at windmills after the manner of Don Quijote de la Mancha, the feudalistic old knight who failed to realize that the world had changed around him. In the same way, lacking a proper understanding of our combinatorial universe, scientists spend their careers in misguided attempts to discover what doesn't exist.

Vedic Physics can help to guide western physics by showing what exists and what does not exist. The following excerpt from a book on Vedic Physics provides extremely helpful information:

“Gravitating down from the outer lip to attain a balance. The Prakrithi or hadronic state loses its denser super - positioned count to progressively take a curved path while the Vikrithi state loses its rate of displacement to eventually attain a superposed coherent or synchronous or superposed potential state. The balance is shown exactly at  $2.3e-30$  fraction of a cyclic count.

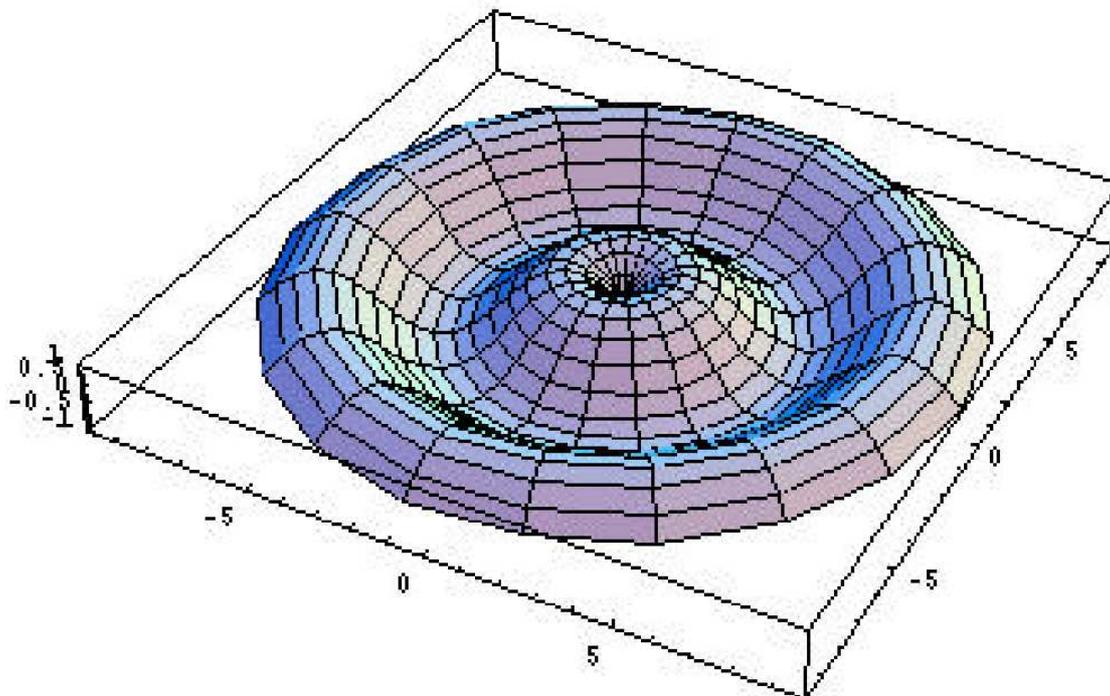
“It is worth noting the subtle mechanism of control in maintaining the balance. The PM (Neutron/Proton etc) side has a fixed ratio of  $7/(k-1)$ , whereas the vector Anis is a variable that matches the standing wave harmonic of  $2n$ , to maintain this balance on the Electron to Neutrino section over the outer rim.

“The Electron  $M_e$  and Neutrino  $N_e$  are separated by the resonant potential difference caused by the nodal separation. While the Electron at the first Abhimaan potential-well balances the Proton- Neutron configuration, the 7 - Neutrino spectrum shown in the Raja Bhoothani region, balances the green Ahankar transition zone. Beyond it in the purple Sathwa state, the well - known hydrogen spectrum, where the radiant zone commences

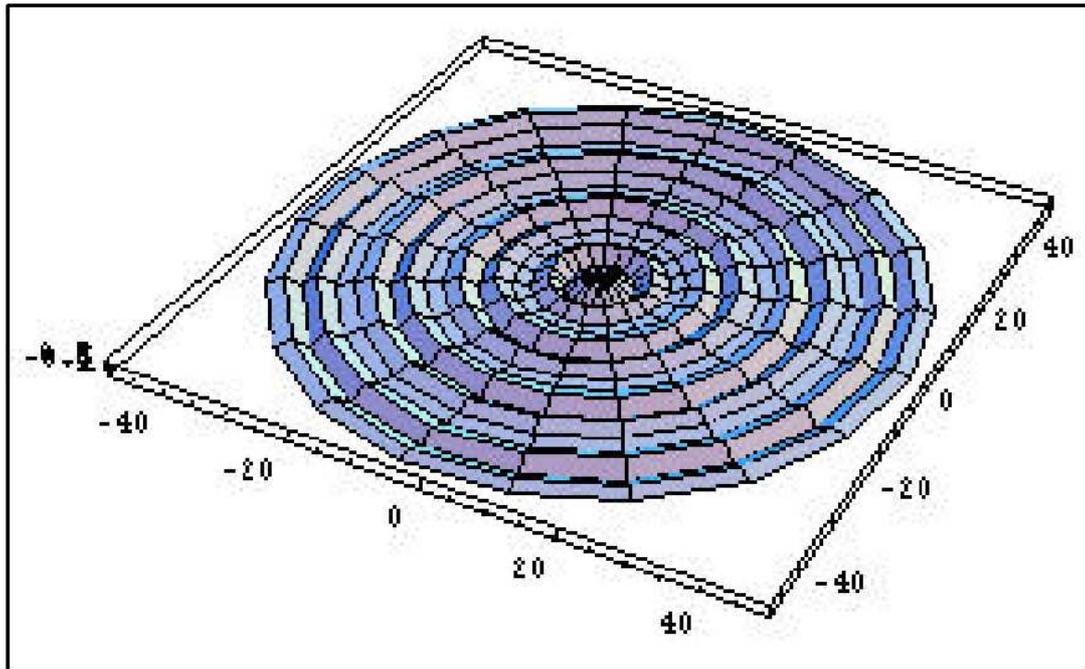
“A notable point at this exotic interface of the Ahankar region, is that the potential changes by breaking resonance between the two axes in the Raja resonant region across a  $k-1$  gap to radiate Vrithis or Photons. The proof is in the mass-energy value of the 7<sup>th</sup> neutrino of 53.2 electron volts (EV) to the 13.6 EV of the hydrogen radiant spectrum.

By placing the diagram as the enlarged region in the central zone of the following

diagram, Planck's Constant, with a potential value of 7 Ne or 372 EV, resides in the hole, while the Ne of 53.2 EV stays at the bottom of the well and the Hydrogen spectrum of 13.6 EV radiates from the outer lip through 7 nodal levels shown in the bottom diagram.



“The mechanism of spontaneous creation of various particle states depends on density of interactive stable counts in each region. Neutron and Proton states are just the interactive counts at the top or bottom of the inner side of the well. The Leptonic Electron or Neutrino states are similar bottom or top positions on the outer rim of the well. Similarly Planck's Constant of 7 Ne and Ne are the top and bottom states of the inner side of the well, while the Vrithi or photon of Ne (k-1) value radiate from the outer rim.”



In this way, Vedic Physics puts nuclear physics into proper perspective, which should aid researchers, if only they would pay attention. From the explanation and diagram above, we may see precisely where the Vrithi fits into the scheme of Vedic Nuclear Physics. For it is only with a proper understanding of the true nature of the photon that we can make educated guesses or axiomatic theorems about the Universe.

# Bibliography

Wikipedia entries

## Appendix I

### Planck's Constant

Values of $h$	Units	Ref.
$6.62606957(29) \times 10^{-34}$	<a href="#"><u>J·s</u></a>	<a href="#">[1]</a>
$4.135667516(91) \times 10^{-15}$	<a href="#"><u>eV·s</u></a>	<a href="#">[1]</a>
$2\pi$	<a href="#"><u><math>E_P \cdot t_P</math></u></a>	
Values of $\hbar$	Units	Ref.
$1.054571726(47) \times 10^{-34}$	<a href="#"><u>J·s</u></a>	<a href="#">[1]</a>
$6.58211928(15) \times 10^{-16}$	<a href="#"><u>eV·s</u></a>	<a href="#">[1]</a>
1	<a href="#"><u><math>E_P \cdot t_P</math></u></a>	def
Values of $hc$	Units	Ref.
$1.98644568 \times 10^{-25}$	<a href="#"><u>J·m</u></a>	
1.23984193	<a href="#"><u>eV·<math>\mu\text{m}</math></u></a>	
$2\pi$	<a href="#"><u><math>E_P \cdot \lambda_P</math></u></a>	

Plaque at the [Humboldt University of Berlin](#): "Max Planck, discoverer of the elementary quantum of action  $h$ , taught in this building from 1889 to 1928."

The **Planck constant** (denoted  $h$ , also called **Planck's constant**) is a [physical constant](#) that is the [quantum](#) of [action](#) in [quantum mechanics](#). The Planck constant was first described as the [proportionality constant](#) between the [energy](#) ( $E$ ) of a [photon](#) and the [frequency](#) ( $\nu$ ) of its associated [electromagnetic wave](#). This relation between the energy and frequency is called the **Planck relation**:

Since the [frequency](#)  $\nu$ , [wavelength](#)  $\lambda$ , and [speed of light](#)  $c$  are related by  $\lambda\nu = c$ , the Planck relation for a photon can also be expressed as

The above equation leads to another relationship involving the Planck constant. Given  $p$  for the linear [momentum](#) of a particle, the [de Broglie wavelength](#)  $\lambda$  of the particle is given by

In applications where frequency is expressed in terms of [radians](#) per second ("[angular frequency](#)") instead of [cycles per second](#), it is often useful to absorb a factor of  $2\pi$  into the Planck constant. The resulting constant is called the **reduced Planck constant** or **Dirac constant**. It is equal to the Planck constant divided by  $2\pi$ , and is denoted  $\hbar$  ("**h-bar**"):

The energy of a photon with angular frequency  $\omega$ , where  $\omega = 2\pi\nu$ , is given by

The reduced Planck constant is the quantum of [angular momentum](#) in quantum mechanics.

The Planck constant is named after [Max Planck](#), the founder of [quantum theory](#), who discovered it in 1900, and who coined the term "Quantum". Classical [statistical mechanics](#) requires the existence of  $h$  (but does not define its value).<sup>[2]</sup> Planck discovered that physical [action](#) could not take on any indiscriminate value. Instead, the action must be some multiple of a very small quantity (later to be named the "[quantum](#) of action" and now called Planck's constant). This inherent [granularity](#) is counterintuitive in the everyday world, where it is possible to "make things a little bit hotter" or "move things a little bit faster". This is because the quanta of action are very, very small in comparison to everyday [macroscopic](#) human experience. Hence, the granularity of nature appears smooth to us.

Thus, on the macroscopic scale, quantum mechanics and classical physics converge at the [classical limit](#). Nevertheless, it is impossible, as Planck discovered, to explain some phenomena without accepting the fact that action is quantized. In many cases, such as for monochromatic light or for atoms, this quantum of action also implies that only certain energy levels are allowed, and values in-between are forbidden.<sup>[3]</sup> In 1923, [Louis de Broglie](#) generalized the Planck relation by postulating that the Planck constant represents the proportionality between the momentum and the quantum wavelength of not just the photon, but the quantum wavelength of any particle. This was confirmed by experiments soon afterwards.

The Planck constant of [action](#) has the [dimensionality](#) of [specific relative angular momentum](#) (areal momentum) or [angular momentum](#)'s intensity. In [SI units](#), the Planck constant is expressed in [joule seconds](#) (J·s) or ([N·m·s](#)).

The value of the Planck constant is:<sup>[1]</sup>

The value of the reduced Planck constant is:

The two digits inside the parentheses denote the [standard uncertainty](#) in the last two digits of the value. The figures cited here are the 2010 [CODATA](#) recommended values for the constants and their uncertainties. The 2010 CODATA results were made available in June 2011<sup>[4]</sup> and represent the best-known, internationally-accepted values for these constants, based on all data available as of 2010. New CODATA figures are scheduled to be published approximately every four years.

Significance of the value [\[edit\]](#)

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The Planck constant is related to the quantization of light and matter. Therefore, the Planck constant can be seen as a [subatomic](#)-scale constant. In a unit system adapted to subatomic scales, the [electronvolt](#) is the appropriate unit of energy and the Petahertz the appropriate unit of frequency. [Atomic units](#) systems are based (in part) on the Planck's constant.

The numerical value of the Planck constant depends entirely on the system of units used to measure it. When it is expressed in SI units, it is one of the smallest constants used in physics. This reflects the fact that *on a scale adapted to humans*, where energies are typically of the order of kilojoules and times are typically of the order of seconds or minutes, Planck's constant (the quantum of action) is very small.

Equivalently, the smallness of Planck's constant reflects the fact that everyday objects and systems are made of a *large* number of particles. For example, green light with a [wavelength](#) of 555 [nanometres](#) (the approximate wavelength to which human eyes are most sensitive) has a frequency of 540 THz ( $540 \times 10^{12}$  [Hz](#)).

Each [photon](#) has an energy  $E$  of  $h\nu = 3.58 \times 10^{-19}$  J. That is a very small amount of energy in terms of everyday experience, but everyday experience is not concerned with individual photons any more than with individual atoms or molecules. An amount of light compatible with everyday experience is the energy of one [mole](#) of photons; its energy can be calculated by multiplying the photon energy by the [Avogadro constant](#),  $N_A \approx 6.022 \times 10^{23} \text{ mol}^{-1}$ . The result is that green light of wavelength 555 nm has an energy of 216 kJ/mol, a typical energy of everyday life.

Contact

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**Some men see things as they are and say *why?* I dream things that never were and say *why not?***

**Let's dedicate ourselves** to what the Greeks wrote so many years ago: **to tame the savageness of man and make gentle the life of this world.** Let us dedicate ourselves to that, and say a prayer for our country and for our people.

**Robert Francis Kennedy**