The Pattern Pieces

Folder 2

The Pattern Energy

Simple structures reveal a profound pattern of energy.

The Pattern Energy is a compilation of Pattern Pieces covering wave aspects, motion aspects and gravity (constant acceleration) aspects of the Pattern. A Pattern Hamiltonian is also described.

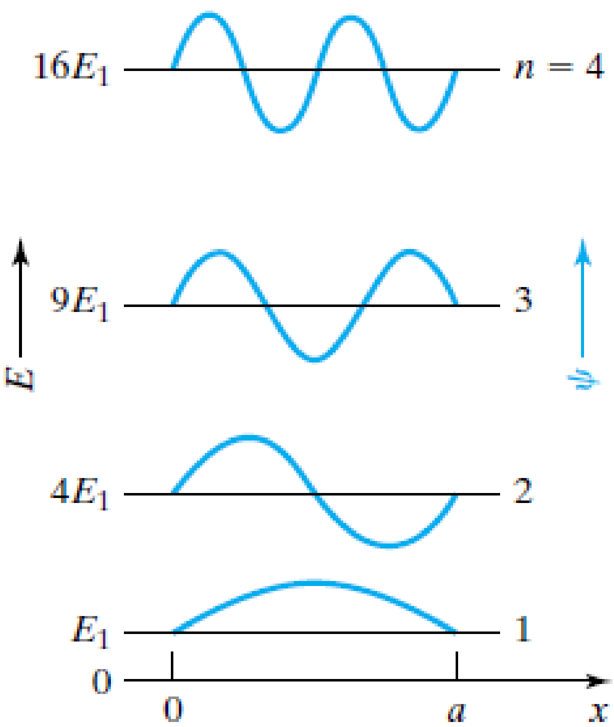
The Pattern idea includes both a Pattern generator and a generated Pattern. The generator implies that energy typically emanates from some kind of motion. The Pattern Cluster is the representation of the generator. A wave is normally associated with motion as well as gravity.

The common theme of Pattern motion as the source of energy is covered by the Pieces in this folder.

Standing Waves

In quantum mechanics the wavefunction gives the state of motion of a particle. The motion of a particle in a box is the typical example used to illustrate its movements.

Mathematical proofs together with sound reasoning result in a composite picture of energy levels and wavefunctions of the standing waves as represented as below. (A good reference in this regard is the Physics course of the Colorado University at www.colorado.edu. The picture below is from Chapter 7.)



The picture shows the first four energy levels. Each horisontal line indicates an energy level. The first four wave functions (Ψ) for a particle in a box are shown on the respective energy level. The energy at each level is given by $E_r = n^2E_1$. E_1 is the ground-state energy of the particle. The number of ground-state energy units (E_1) in each level equals the square of the number of nodes in each level.

Note that the wave functions are shown as if they are in one-dimensional box but in reality they are bent into a circle such that the two ends meet. The left and right ends of the the wavefunctions are therefore connected with the result that bottom wavefunction only has one node; the second has only two nodes, etc.

A quote from the course; "Notice how the number of nodes of the wave functions increases steadily with energy, this is what one should expect since more nodes mean shorter wavelength (..) and hence larger momentum and kinetic energy."

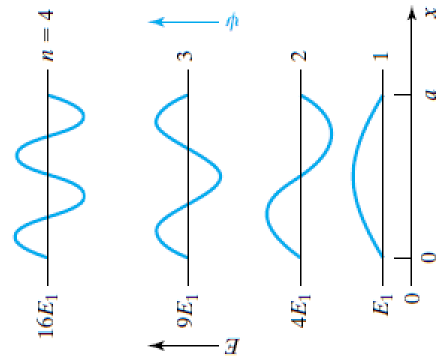
The nodes of the wavefunctions rather than the wavefunctions themselves could be used to represent the motion of a particle.

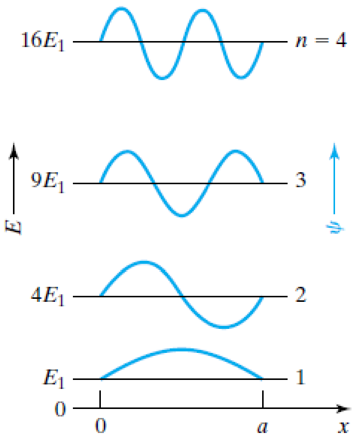
Standing Wave Nodes

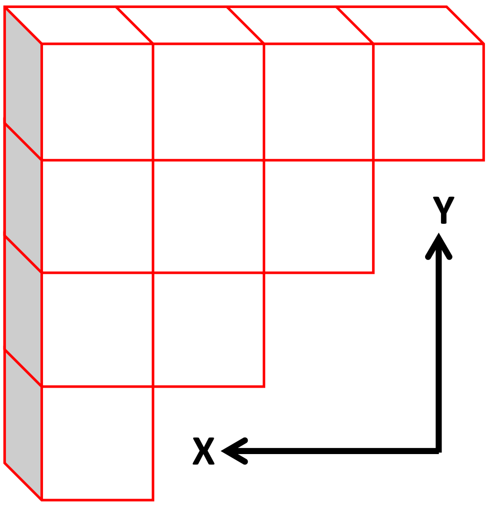
The small cubes of the Pattern Cube represent nodes of standing waves. The addition of nodes increases the frequency of the standing waves. The addition of nodes in 2D creates 2D waves and in 3D it causes 3D waves.

2D Node Module

The small cubes represent nodes. The module represents nodes increasing in 2D

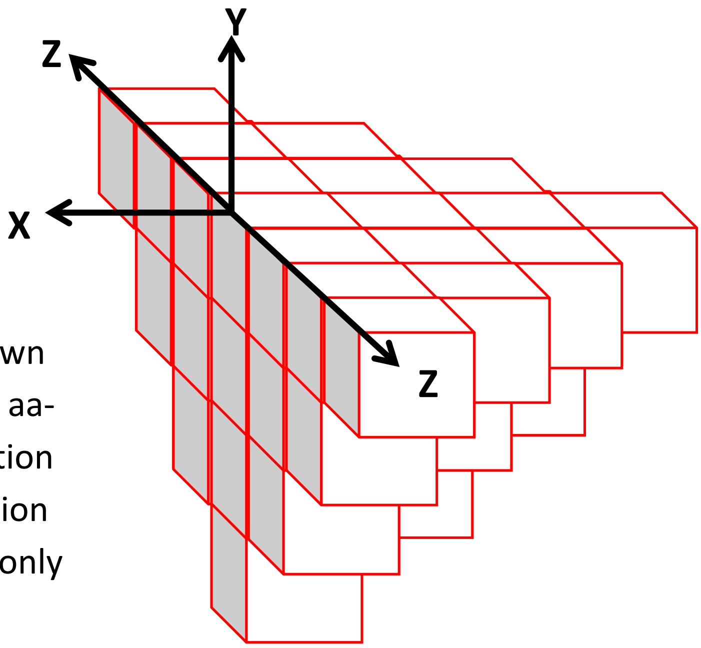






3D Node Module

The node module represents nodes increasing in 3D.



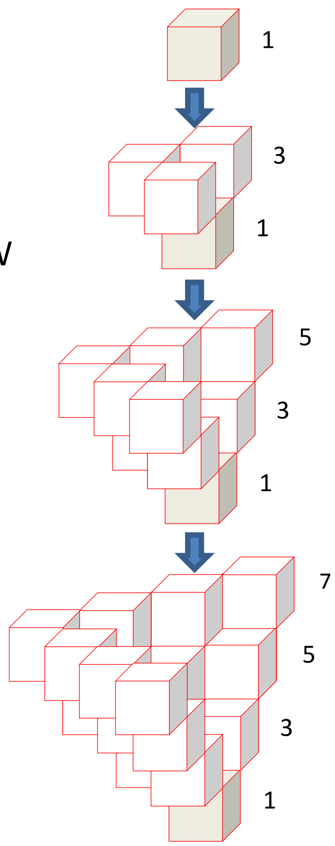
Note: This module is known as a bb-module (same as aa-module) in Pattern Equation terminology. For illustration purposes a module with only four layers is used here.

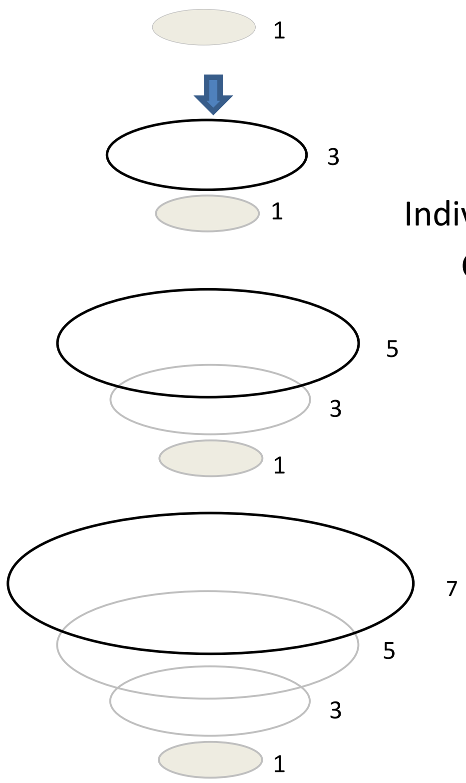
Standing Wave Node Cones

The node module of Pattern Piece P20:2 *Standing Wave Nodes* represents nodes that increase in three dimensions. A module would therefore create four concentric wave cones as shown below. Note that a pair of symmetric modules would create overlapping wave cones.

Individual Cones

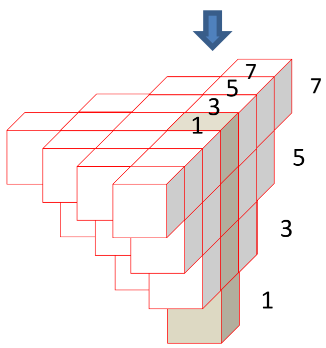
Individual SW Node Cones

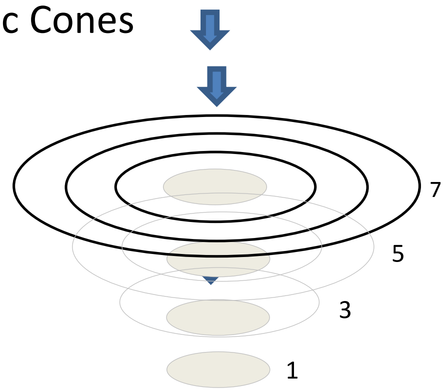




Individual SW Cones

Concentric Cones





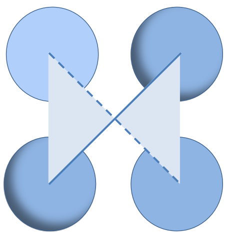
The light-cone of Special Relativity is the best known example of a wave cone as depicted here. However, the light-cone has both an upper and a lower cone whereas this example has only the upper cone.

Cluster Energy

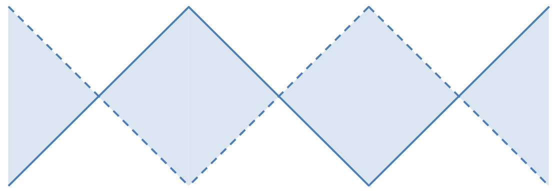
The Cluster motion consists of three simultaneous movements, i.e. vibration, spin and rotation.

The Spheres Vibrate

A SW node in a plane

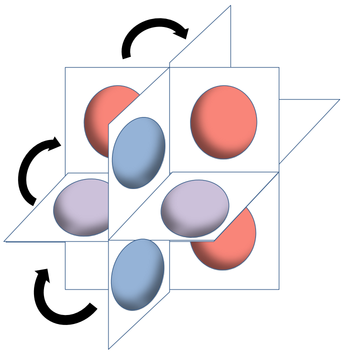


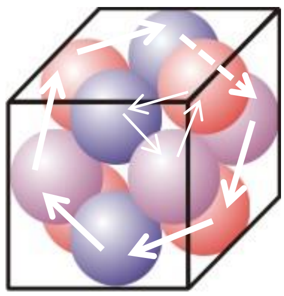
A 3-node SW in a plane

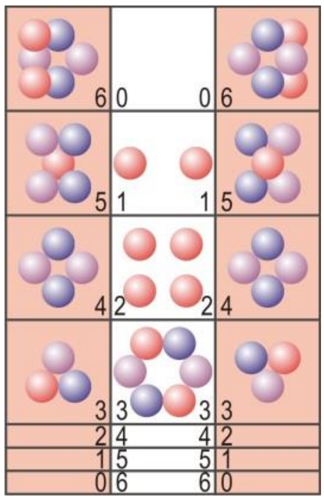


The Planes Spin

The three orthogonal planes spin as indicated. The spin causes four complex rotations. One such rotation is shown on the right.

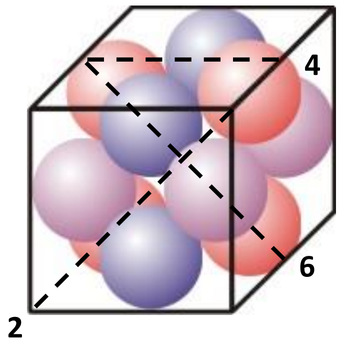




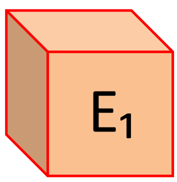


The Cluster Rotates

Slicing the Cluster as indicated yields the Code orbital configurations on the right. The Code reflects the complex rotation in which all 12 spheres (6 + 6) move inside the core (middle column) and then out again.



The Cluster therefore represents three types of movement, i.e. vibration, spin and rotation.
The vibration of pairs of spheres yields standing nodes.
The spin of the planes highlights four circles of spheres in the Cluster.
The complex rotation of the Cluster is evident from the Code configurations.
(See the next Pattern Piece P20:5 *The Pattern Code.*)

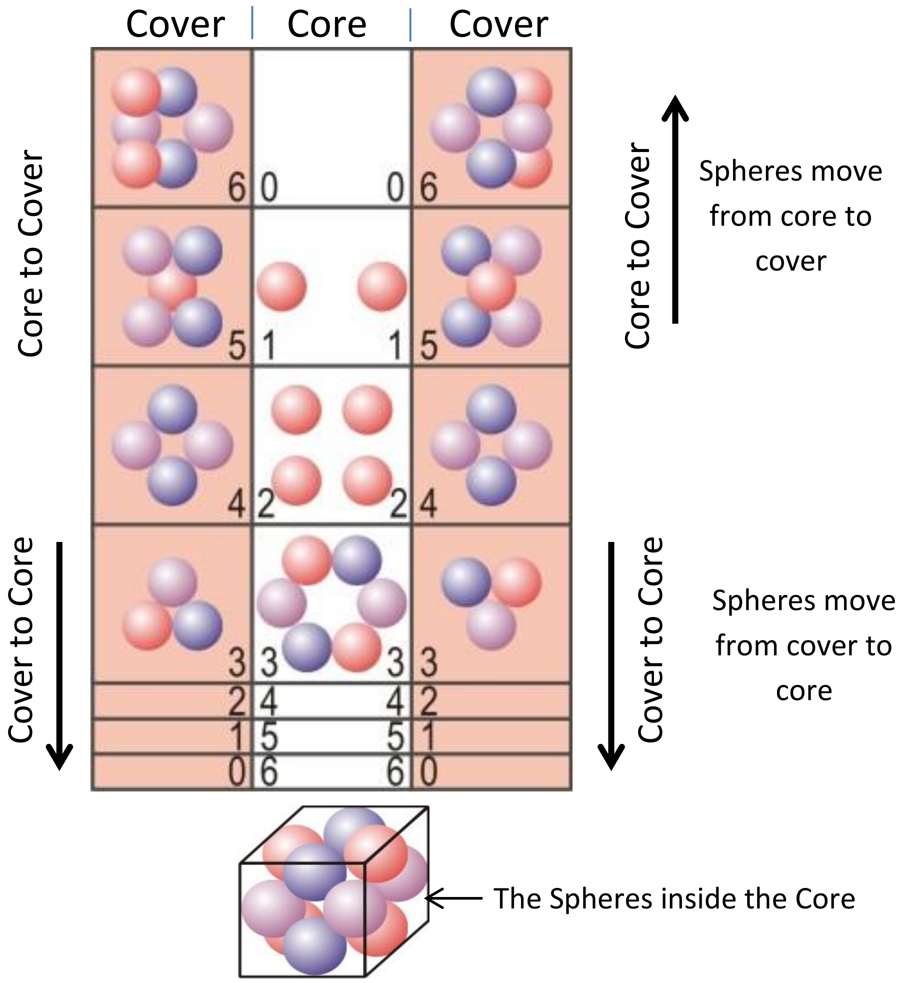


The Cluster represents the structure and motion of the Pattern. The Cluster's combined movement is represented by a cube, E_1, which is the unit energy cube.

The Pattern Code

The Pattern Code describes the rotation of the Cluster. The twelve spheres of the Cluster move in pairs of two spheres from the 'outside' (cover) to the 'inside' (core), and vice versa

The Code is the Pattern of the Cluster's In/Out Rotation



The cover to core movement and vice versa happens simultaneously. See Pattern Piece PP1:3 *The Pattern Equation.*

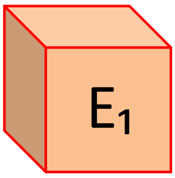
The rotation of the Cluster is one aspect of the energy generation of the Pattern. The other two are when the spheres vibrate and the planes spin.

The sphere configurations are the same as the atom orbital configurations. See Pattern Piece PP1:13 *The Pattern of Electron Orbitals*

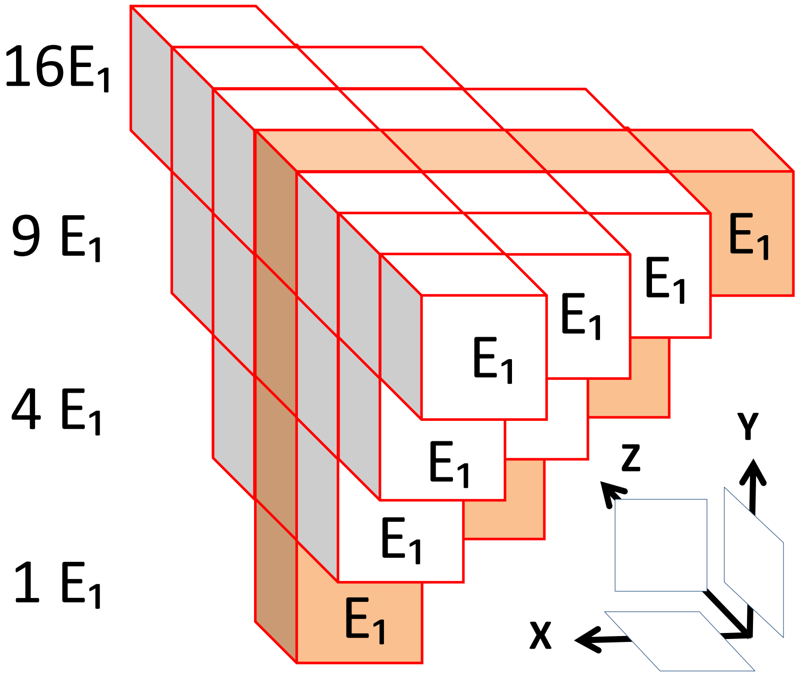
Note: The Cluster's twelve spheres could be viewed as an illusion created by the rapid movement of just two pairs of spheres lying in one of the three orthogonal planes of the Cluster.

The Pattern Energy (1)

The Cluster, as described in Pattern Piece P20:4 *Cluster Energy,* delivers an E_1 unit of energy (a quantum of energy?)



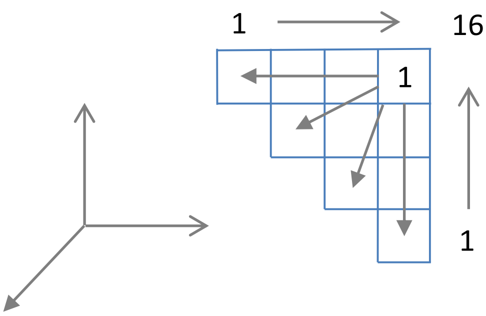
A wave cone module represents nodes increasing in three dimensions.



The X, Y, Z planes of the module.

The 3D module represents the result of the application of the Schrödinger equation for the first four energy levels. The module is a representation of the logical structure of waves.

The Pattern Paradox



The Pattern paradox refers to the observation that a quadratic sequence, 0,1,4,9,16, runs horizontally and vertically but also radially as shown by the arrows. The radial sequence starts at the centre cube of the module and ends with the 6 cubes on the two diagonal surfaces of the module.

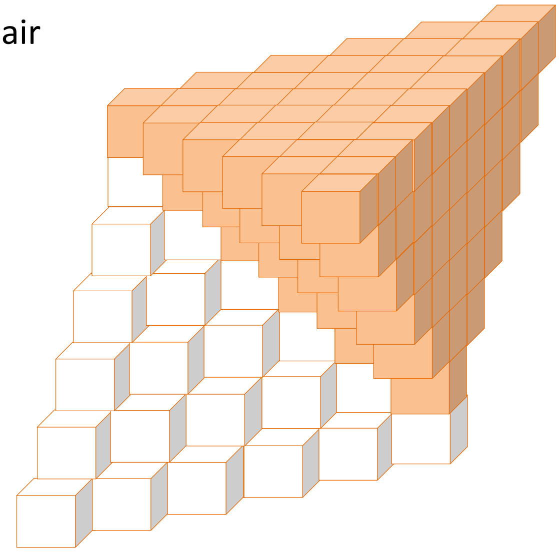
The paradox arises from the opposing forces in one module as shown in the vector diagram, left.

The Pattern Energy (2)

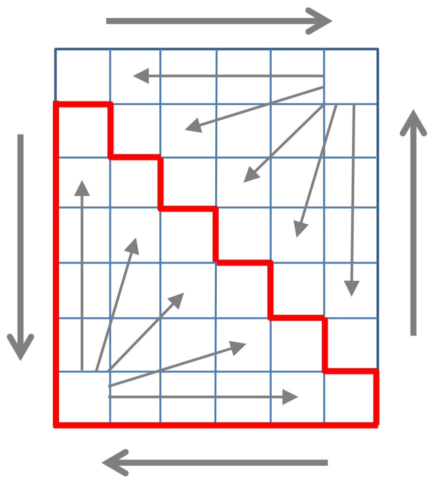
The energy distribution in a module pair is perfectly balanced

Module Pair

The Pattern paradox in a module pair configuration, such as in the drawing, reveals a balance of accelerations. The module pair is derived from both the aa-terms and the bb-terms of the squared Pattern equation.



The schematic below shows with arrows how the acceleration sequences, represented by the number of cubes in the module pair, balance each other. The drawing on the right shows the number of cubes in each layer of the module pair.



1	3	5	7	9	11
1	1	3	5	7	9
3	1	1	3	5	7
5	3	1	1	3	5
7	5	3	1	1	3
9	7	5	3	1	1
11	9	7	5	3	1

The balancing of the acceleration sequences of the module pair is significant because it means that Pattern energy is always controlled. It is only when an imbalance happen that the release of energy would cause an explosion of some kind.

Einstein was Almost Right

(Speculative Pattern Piece)

Einstein's famous equation is traditionally shortened to $E = mc^2$ due to a qualification that it then only applies to mass (m) at rest.

The full form of the equation is $E^2 = m^2c^4 + p^2c^2$ for cases where momentum (p) is relevant. This form is similar to the Pythagoras theorem, e.g. $a^2 + b^2 = c^2$.

The Pattern equation which includes transitional terms gives another perspective on this type of equation. The Pattern equation is $(a + b)^2 = c^2$ which equals $a^2 + ab + ba + b^2 = c^2$. The ab + ba terms are the transitional terms that are lacking in the Pythagoras example.

The transitional terms that are lacking in equation $E^2 = m^2c^4 + p^2c^2$ are $m^2c^4p^2c^2$ and $p^2c^2m^2c^4$.
(Traditional terms are combined terms that appear when the sum of two terms is squared, cubed, etc.)

However, the typical equation for (total) energy is $E = T + V$ (E = total energy, T = potential energy and V = kinetic energy.)

Therefore, if squared, $E^2 = T^2 + (TV + VT) + V^2$ (The transitional terms are shown in brackets.)

With the inclusion of the transitional terms the sum stays a constant, i.e the energy is conserved.

This constancy of the sum of the energy is not possible when only the squares of the potential and the kinetic energy are taken as is typically the case when the Pythagoras form ($a^2 + b^2 = c^2$) is used.

The full form of Einstein's equation conforms to the Pythagoras format, and is therefore lacking the transitional terms that would have resulted in a constant energy.

The importance of the transitional terms in this regard is the appearance of a combined type of energy.

Dirac's Gamma Matrices

The Pattern Cube is a geometry of 'ideal' quantum states (where mass, for example, is not considered), and where the Pattern states serve as a kind of generalized quantum number system.

However, the usual way to calculate and analyse quantum effects had been developed by PAM Dirac in 1928.

Dirac generalised Schrödinger's theory by starting with Einstein's equation,

$E^2 = (mc^2)^2 + (pc)^2$

He wanted to eliminate the possibility of a negative solution for the energy E by expressing the energy as a simple sum (without it being squared) of two parts, say a and b, e.g.

$E = a + b$

To achieve that he had to start with an equation of the same form, e.g. $E^2 = a^2 + b^2$, to which terms ab + ba are then added to change the equation into:

$E^2 = a^2 + ab + ba + b^2$

$E^2 = (a + b)^2$

$E = a + b$

However, this requires that a and b must be such that a x a = 1 and b x b = 1 while a x b = 0 and b x a = 0. Dirac used matrices, a kind of generalised number, to achieve the desired outcome. The solution was four matrices which is called Dirac's Gamma Matrices. (A fairly detailed explanation of this achievement by Dirac is contained in Appendix 2: **The Dirac Code** in the book *Antimatter* by Frank Close, published by Oxford Press).

Two remarkable consequences of Dirac's work were the appearance of the spin effect from the mathematics and also the (re-)appearance of negative energy, the exact consideration he tried to avoid!

The comparison of Dirac's work with the Pattern approach is quite simple: The Pattern, as expressed by the Pattern equation, yields similar results, but from first principles; it gives the simple sum without any clever tricks, it is also possible to cube (not only squared like Pythagoras!) the equation to deal with four-dimensional phenomena and the sum of all the variations of the equation is always a constant (e.g. important as the separation of Special Relativity and in the conservation of energy).

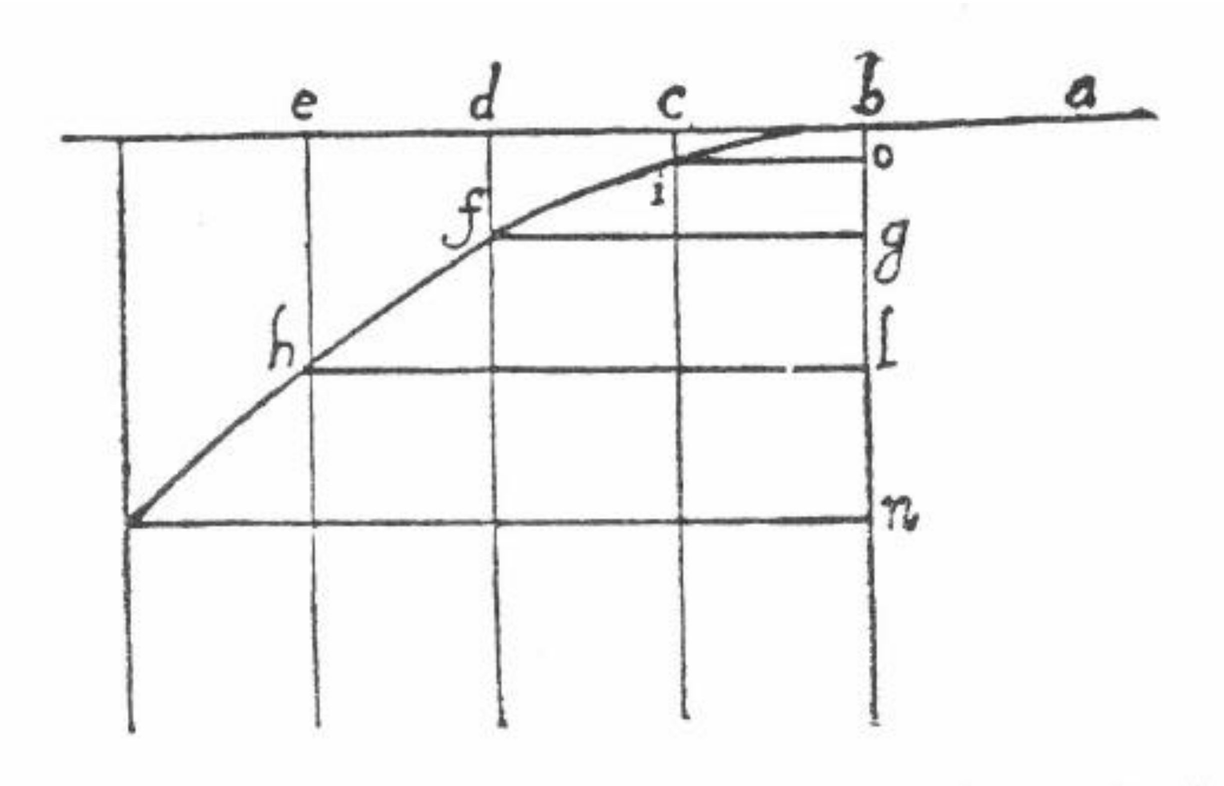
It had been shown in The Pattern Pieces PP1:9 *The Pattern and Pythagoras* that the Pattern equation as well as the Pythagoras equation could be derived from the Cosine Law but that the Pattern equation, with its sum a constant, c, is preferable to Pythagoras with respect to its ability to deal with higher-dimensional phenomena.

The Pattern of Gravity (1)

The Pattern of 1D gravity is given by the ‘odd numbers rule’ of Galileo.:

Time	Distance fallen		"Odd numbers Rule"
1	1	=	1
2	4	=	1 + 3
3	9	=	1 + 3 + 5
4	16	=	1 + 3 + 5 + 7
5	25	=	1 + 3 + 5 + 7 + 9
6	36	=	1 + 3 + 5 + 7 + 9 + 11

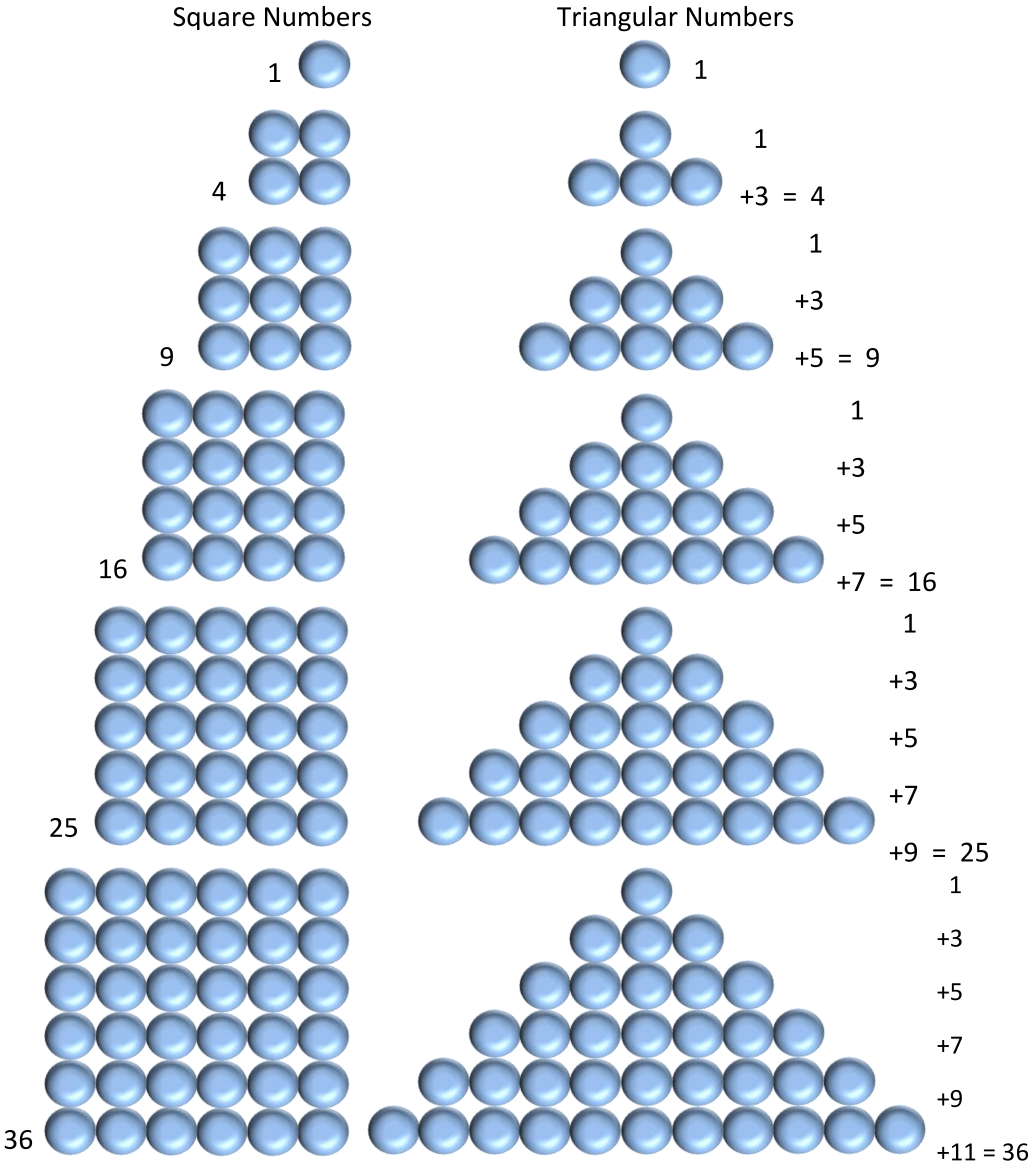
The following drawing is from Galileo’s notes. Time is from right to left indicated by a, b, c, d and e. The parabolic line shows the arc made by a falling object.



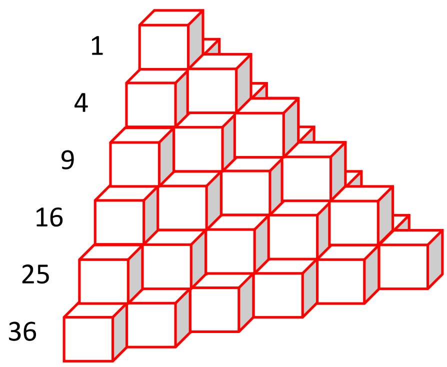
The Pattern of 1D gravity is therefore: $0^2, 1^2, 2^2, 3^2, 4^2, 5^2, 6^2, \ldots$

The Pattern of Gravity (2)

The Pattern of gravity could be represented by objects such as spheres, cubes, etc.



The spheres representing the triangular numbers could be turned into cubes. The cube sets representing each number could be stacked in layers as shown below to form a Pattern module.



Massive Gravity and Massless Gravity

(A Speculative Pattern Piece)

Massive gravity refers to gravity with massive objects, i.e. objects with mass. Then the following applies.

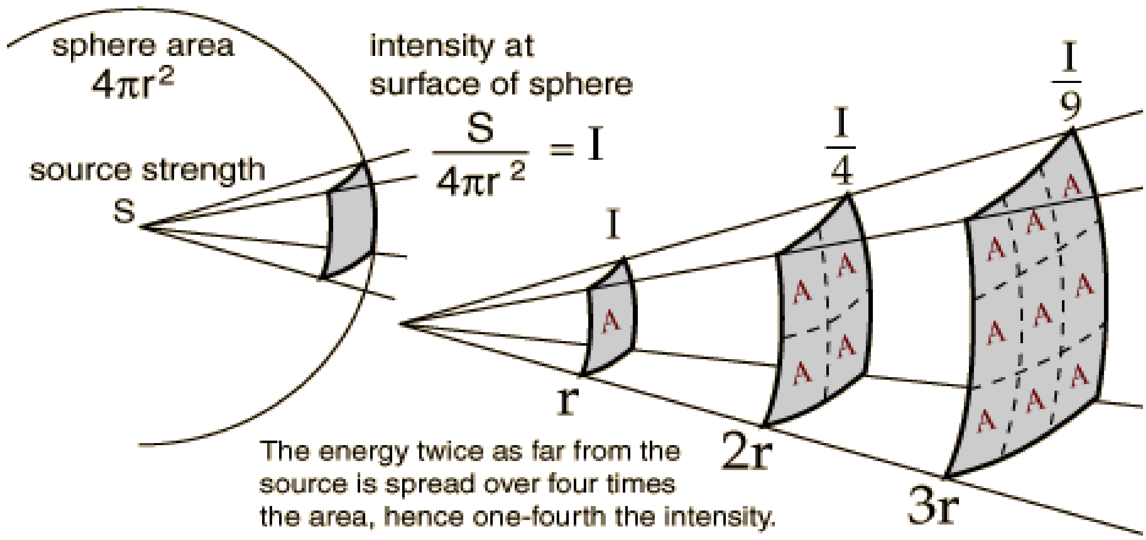
Time	**Distance fallen**		**"Odd Numbers Rule"**
1	1	=	1
2	4	=	3 + 1
3	9	=	5 + 3 + 1
4	16	=	7 + 5 + 3 + 1
5	25	=	9 + 7 + 5 + 3 + 1
6	36	=	11 + 9 + 7 + 5 + 3 + 1

With massless phenomena, such as light, the following rule applies.

Time	**"Solid" fallen**		**"Squared Numbers Rule"**
1	1	=	1
2	5	=	4 + 1
3	14	=	9 + 4 + 1
4	30	=	16 + 9 + 4 + 1
5	55	=	25 + 16 + 9 + 4 + 1
6	91	=	36 + 25 + 16 + 9 + 4 + 1

The 'solids' are effectively a succession of sphere areas that add up just like the distances above add up. (Solids are like layered onions.)

The area of a sphere is given by $4\pi r^2$ as shown in the Inverse Square Law diagram below.



In this sense gravity is like a cumulative (gravitational) wave.

Constant Acceleration and the Pattern (1)

(Speculative Pattern Piece)

Velocity (v) in a straight line motion is defined as the rate of change of position per unit of time, i.e.

Velocity v = distance units / time units

Acceleration (a) in a straight line motion is defined as the rate of change of velocity per unit of time, i.e.

Acceleration a = velocity / time units

Therefore a = distance units / time units^2

For certain distances, e.g. 1, 4, 9, 16, 25, 36, etc. which are the squared distance units 1^2, 2^2, 3^2, 4^2, 5^2, 6^2, etc. the acceleration equation becomes

a = distance units^2 / time units^2

i.e. a = distance *area* units / time *area* units

e.g. a = 1/1, 4/4, 9/9, etc.

Therefore a = 1, which represents unit constant acceleration.

Note that gravity, according to the odd-numbers rule of Galileo, conforms to the squared distance units above and gravity is therefore a particular (unitary?) type of acceleration.

The radial acceleration of an expanding sphere, like that of an inflating balloon, is simply the area (surface) of a sphere divided by time units^2, i.e.

$$a = 4\pi r^2 / \text{time units}^2$$

where r = integer radius of the sphere and the time units coincide with each integer radius.
The expansion at unit radii, i.e. r = 1, 2, 3, etc. at unit times is therefore;

$$a = 4\pi\, 1^2/1^2,\ 4\pi 2^2/2^2,\ 4\pi 3^2/3^2, \text{ etc.}$$

The constant radial acceleration of a sphere at unit radii per unit times is therefore equal to 4π (= constant).

Note that constant radial acceleration therefore equals constant linear acceleration.

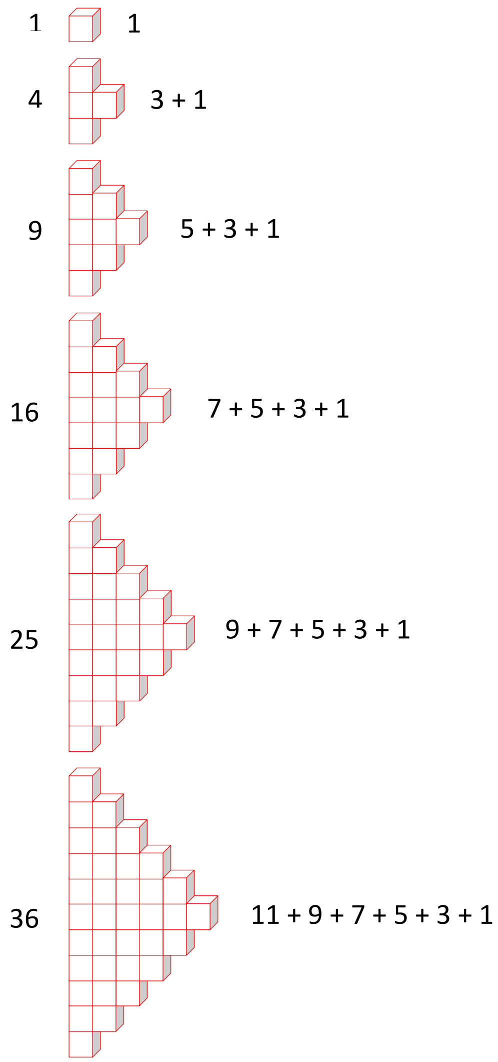
The constant linear acceleration of gravity could be restated as below.

Incremental Time	**Incremental Distance**		**"One-and-Two Numbers Rule"**
1	1	=	1
1	3	=	2 + 1
1	5	=	2 + 2 + 1
1	7	=	2 + 2 + 2 + 1
1	9	=	2 + 2 + 2 + 2 + 1
1	11	=	2 + 2 + 2 + 2 + 2 + 1

Constant Acceleration and the Pattern (2)

The constant linear acceleration of gravity could be restated in the Pattern context as follows.
For linear motion due to gravity the following odd numbers rule of Galileo applies.

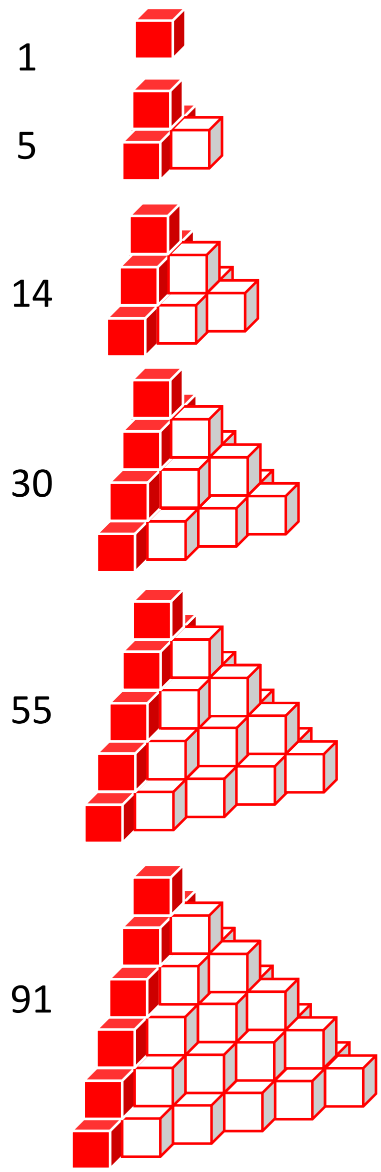
Time	**Distance (area) fallen**		**"Odd Numbers Rule"** (Accumulation of distances)
1	1	=	1
2	4	=	3 + 1
3	9	=	5 + 3 + 1
4	16	=	7 + 5 + 3 + 1
5	25	=	9 + 7 + 5 + 3 + 1
6	36	=	11 + 9 + 7 + 5 + 3 + 1



Constant Acceleration and the Pattern (3)

The Pattern module representation in the context of gravity could be called ‘gravity solids’.

Time	“Solid” fallen		“Squared Numbers Rule” (Accumulation of areas)
1	1	=	1
2	5	=	4 + 1
3	14	=	9 + 4 + 1
4	30	=	16 + 9 + 4 + 1
5	55	=	25 + 16 + 9 + 4 + 1
6	91	=	36 + 25 + 16 + 9 + 4 + 1



This result could perhaps be called the (Inverse) Cube Law akin to the well-known (Inverse) Square Law.

The Pattern Hamiltonian

Conventional mathematical methods could be used to represent the Pattern. In this instance, the Hamiltonian function is used to represent the Pattern series. The Hamiltonian (H) is a function of position q and momentum p of a system. The form of H characterises a particular system. The Pattern Hamiltonian's form is described here.

The Pattern equation, a + b = c, uses a and b as variables; variables that complement each other to yield certain constants. For the Pattern representations (also the Pattern series) only integers (the Pattern Code values) could be used as substitutes for the a and the b variables.

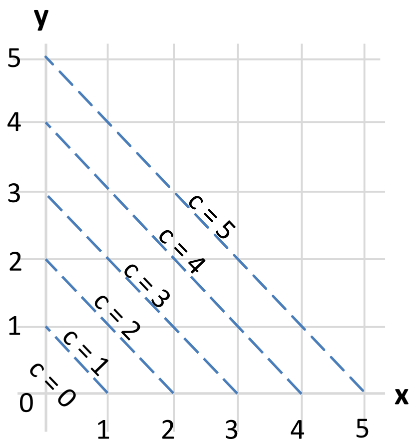
Cartesian coordinates could be used to represent the Pattern series. The a and b variables are replaced by the y and x coordinates of a Cartesian representation. The Pattern series up to c = 5 is shown on the left, below. Graphs for each value of c (constant) are shown on the right.

The Pattern Series

a + b = c

	a,b
For **c = 0**	0,0
For **c = 1**	1,0
	0,1
For **c = 2**	2,0
	1,1
	0,2
For **c = 3**	3,0
	2,1
	1,2
	0,3
For **c = 4**	4,0
	3,1
	2,2
	1,3
	0,4
For **c = 5**	5.0
	4,1
	3,2
	2,3
	1,4
	0,5

The Pattern Series expressed by y and x coordinates in the place of the a and b variables.



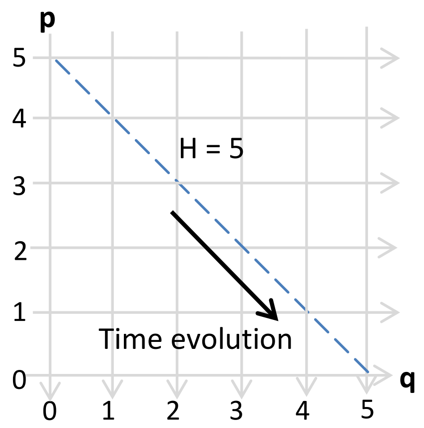
Furthermore, it is possible to replace the two orthogonal axes, y and x with p and q, in order to represent Hamiltonian functions of both p and q. The p axis represents the momentum of the particle and the q axis represents the position of a particle, both in phase space. The horisontal and vertical flows of p and q are indicated by the horisontal and vertical (matrix) arrows. (A particularly elegant explanation of Hamiltonian functions is given in Chapter 8 of Giovanni Vignale's 2011 book *The Beautiful Invisible*.)

The next diagram shows the generator of the time evolution, the Pattern Hamiltonian, p + q = H.

The Pattern Hamiltonian H = 5

p	q
5	0
4	1
3	2
2	3
1	4
0	5

Flow

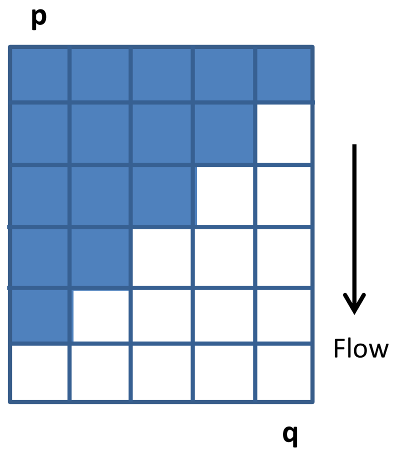


It is clear that the time evolution of q and p does not change the value of H and H is therefore a constant of motion. This constant of motion is the energy of a system: energy that does not change over time. The Pattern Hamiltonian has constant energy values of 0, 1, 2, 3, 4, 5, 6, etc.

A cellular representation of H = 5 is shown below. A cellular representation uses only basic geometric shapes, such as the square, circle, cube and sphere as symbols to express and relate mathematical entities.

A cellular representation of H = 5

p	q
5	0
4	1
3	2
2	3
1	4
0	5



The pyramid plates of the Pattern represent two sets of symmetric H = 0, 1, 2, 3, 4, 5 and 6 in the cellular representation format. Note that the plates exhibit an extended version of the Pattern series with an additional sequence added to each end of a plate.

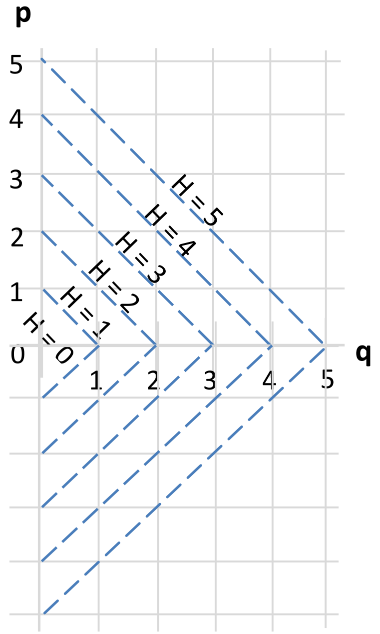
The Pyramid Plate Pairs

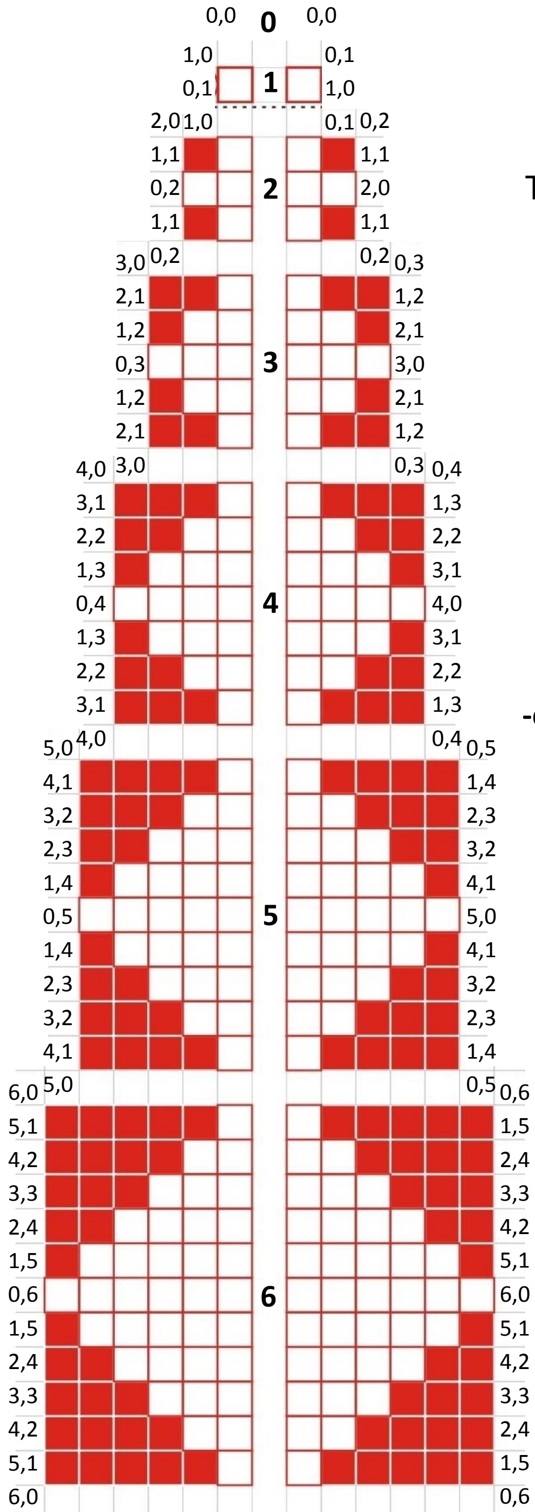
for c = 0, 1, 2, 3, 4, 5 and 6

The Pattern Hamiltonian

$p + q = H$

for H = 0, 1, 2, 3, 4 and 5

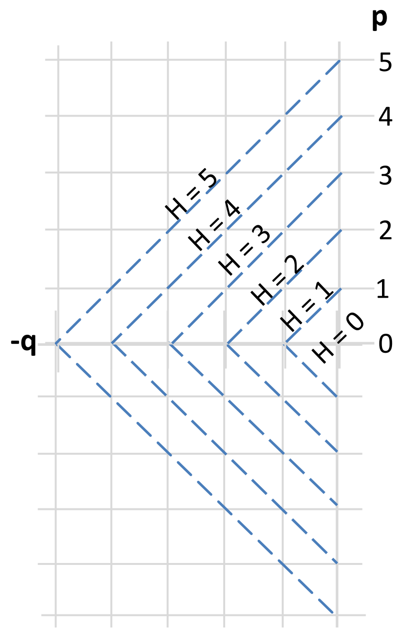




The Pattern Hamiltonian

$H = q + p$

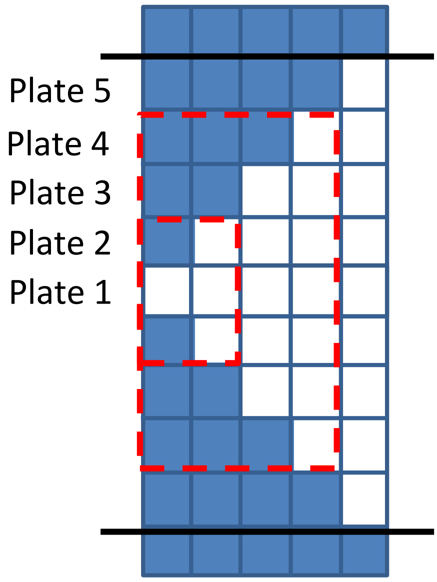
for H = 0, 1, 2, 3, 4 and 5



Although it is clear that each successive plate (left plates, say) represents a higher energy level it is not so obvious that each plate also incorporates all the lower plates.

For illustration Plate 2 and Plate 4 that are 'contained' in Plate 5 are indicated below by dotted lines.

Plate 5 contains the lower numbered plates



Note that Plate 5 does not contain the top and bottom rows of cells but that the Pattern series reflects those cells as well.

Each plate pair represents a different (constant) energy level with each cell representing one 'energy unit'.

Other observations are that the energies are quantised and that the energy levels are equally spaced.

Due to the linearity of the Hamiltonians it seems that the Pattern pyramid represents a three-dimensional Pattern Hamiltonian.

In conclusion it is perhaps not presumptuous to suggest the idea of a Pattern Mechanics.

Classical mechanics > Hamiltonian mechanics > Quantum mechanics > Pattern mechanics

CM > HM > QM > PM