

What is Spin ?

Physicists seem to have difficulties describing - or deciding - what this property of elementary particles is - in reality. This could leave the field free for some guesswork!

Still, the mathematical definition is clear, and here are some aspects of physicists in different sources:

1) Spin is *not really a movement of rotation*; it should be physically false to say it was. This is emphasised.

2) Spin is defined as a kind of angular momentum of elementary particles, in a direction where this is maximal. It gets the same physical quantity as h , (Js), **Planck's constant, and is quantified in a way which makes it either an integer of the expression $\mathbf{h/2\pi}$ or one-half of it.**

This quantum number for elementary particles was invented by Pauli to explain his "exclusion principle": the fact that no two electrons in an atom can have all properties in common.*

The spin quantum number is expressed in units of $\mathbf{h/2\pi}$.

* This Pauli exclusion principle, essential in modern physics, could in the dimension model here be interpreted as an expression for the fundamental postulate of polarisations through a dimension chain. Cf. all other quantum numbers in e-shells.

3) According to **Hawking (*later readings*) spin concerns the view of an observer and expresses how much a particle or quantum has to be rotated to look the same again: half a rev, 180° , (or less), or **1** rev, 360° , or 2 revolutions. The latest implies the quantum number $1/2$ (for fermions), which gives the quantum number $\mathbf{h/4\pi}$, $\mathbf{4\pi} = 2$ times the circumference of a circle, 720° .**

4) According to the physicist **Newman spin can be put in connection with a centrifugal force and a coriolis force. (No more said about this in the reference.)**

Rotation in the form of structure?

Is it possible to unite these different aspects?

(Some parts from the page about Charge repeated here.)

In some way it sounds like the invisible blood system in animals, developed from a simple string to a doubled system to heart and lungs in higher animals.

We could start with a suggestion that spin is a kind of rotation form of the structure itself, which should be in accordance with Hawking's view:

the form possible to analyse as shaped by bound motions.

It would agree too with the general aspects in the dimension model here:

With analysis optional, structures as assumed 2-dimensional "particles" would be possible to analyse in terms of motions too, or 1-dimensional curves as potentials with direction.

Structure, d-degree:

$$5 \rightarrow 4 \rightarrow 3 \rightarrow 2 \rightarrow 1 \rightarrow 0/00$$

$$0/00 \leftarrow 1 \leftarrow 2 \leftarrow 3 \leftarrow 4 \leftarrow 5 \text{ degree of Motions}$$

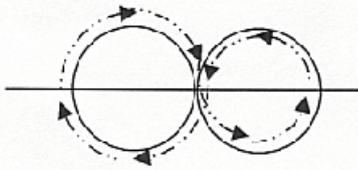
With the view on atomic "particles" born out of "inverted" vector fields and forces, it's not astonishing to find concepts as momentum and direction appropriate for the structure itself.

The spin numbers $2 - 1 - \frac{1}{2}$ also supports the idea of halvings in the hypothesis about angle steps - but in opposite direction than presumed in presentation of the model in connection with structures! From 180° (graviton) to $360^\circ \rightarrow$ (photon) to $720^\circ \rightarrow$ (fermions, the more "material" particles). Yet, this could be said to imply a way towards a stepwise more specified direction according to the postulated principle in this model.

Suppose motions, doubled, form 1-dimensional potentials - or "vector lines" - which were attributed motions in 4 d-degrees according to our simple postulates:

Rotation is a 2-dimensional motion, and an "impossible" or imaginary, simultaneous rotation in two different planes, or complementary directions, could perhaps express such a 4-dimensional rotation of the structure?

Each curved surface or wave form has an inside and an outside - as complementary "poles". A simple sine wave, one wavelength and return, can illustrate how a particle has to be turned 2 revolutions (720°) to come back to the same "starting point again", or look the same again (From page about Charge.)



It means that the fermions with spin $1/2$ could be interpreted as a combination of the complementary poles of d-degree 2 (as "inside" and "outside" here, or "convex-concave"). One revolution to the right, one inside to the left. Opposite directions of the revolutions should represent the opposite spins of electron pairs in an orbital around the atom.

(Compare perhaps the similar forms: { $\mathbf{OO}=\$ }, in cilia on superposed levels of biology, organelles for external motions?!)

With the illustration of a twisted band (a Möbiös band) loop, 2-dimensional, the outside in one loop becomes the inside of the other

A sine wave can be described as a circular plane that has been broken open, read polarised. We get a wave* in outward direction of the dimension chain. In inward direction we can imagine one loop invaginating into the other, giving a double "membrane", a more "material" structure, as said on the page about Charge.

* On the open sea there not seldom arise "monster waves", which lately has been explained through evolution of Schrödinger's wave functions for the probability of electrons' existence somewhere. Perhaps fermions with spin $1/2$ could be interpreted as such breaking monster waves in microcosm ?

In the gastrulation of an embryo (see Charge) we have an invagination from the vegetative pole (without any over-crossing, forming via mesoderm an inside layer of the skin, while material from the animal pole grows to form the outside layer of the skin.

How if we should see the 180° polarity between the animal and vegetative pole in the early phase of the embryo as representation of spin 2 of the assumed graviton - in relation to the F_A force. And the simple spherical polarity of 360° of inside-outside in the gastrula as representative for spin 1 of the photon, the quantum of the EM-field ? (Cf. booklet Biology.)

In connection with cells:

Motions as polarised lines according to the definition in this model, could also be thought of as generating, step by step, their own 1-dimensional structure of a pathway, in a similar way as cells, copying themselves with help of the surroundings (the anti-centre pole), and dividing, produce a long row of equals, as steps, - forming a "line" and a surface on the biological level. This said as an illustration of motions going into structures (without any rotation of the structure as a whole).

In any case, spin has been called an intrinsic property and is attributed to both quanta of forces (bosons) and quanta as protons, electrons etc. (the fermions).

In this model it could probably express direction and structure of motions in the counterdirected chain of motions.

This spin property seems to be both useful and **necessary to express the polarisation principle**, at least in three steps: from $2 \rightarrow 1 \rightarrow 1/2 \rightarrow +/- 1/2$.

It is obviously not a simple result of polarisation in charges $+/-$. Not connected with mass either (neutrinos are attributed spin $1/2$, but perhaps only as a loss ?)

Centrifugal and Coriolis "forces":

What about Newman's view that spin is connected with a centrifugal force and a coriolis force? Both these "forces" are seen as fictitious ones in classical physics. They are both experienced as results of a real rotation motion.

The **centrifugal force** is outward directed (anti-parallel to gravitation in macrocosm and equal in strength, but reveals itself - if the bond inwards should be cut off - as a tangential direction or vector (that is in 90° to the inward direction). One has called it an effect of "inertia".

Could it possibly be underestimated as a force,

- with a new recognition of expanding Vacant Space as an F_A -force,
- with the interpretation of matter as constituted of built-in "vacant space" too,
- with carriers of forces as partly interaction with these surrounding counterpole,
- and if we interpret rotation as a result of a combination of both the gravitational force F_G and this F_A -force?

We have in this model too assumed that the d-degree step $4 \rightarrow 3$ implies an angle turning from 180° to 90° , as in the case of the centrifugal effect. The angle step could have impact also on the F_A -force or Space.

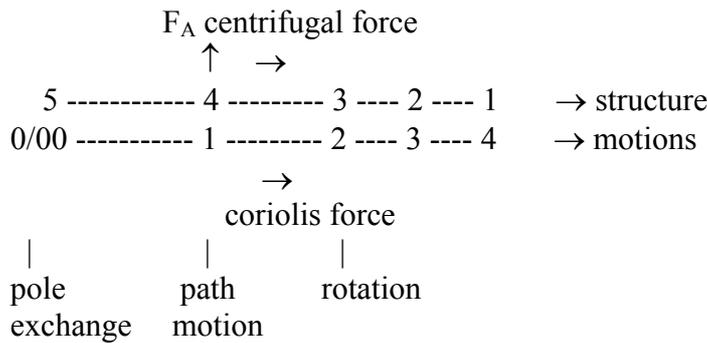
And what "inertia", connected with mass, could we attribute to quanta of forces?

The rather unsubstantial or apparently powerless **Coriolis force** has a similar character:

It can be described as that turning towards rotation which a straight path way (with uniform velocity) shapes itself to, when put in relation to a rotating spherical surface and goes in right angle to the rotation. (Also called an effect of inertia).

(The way of the Gulf Stream for instance - and of winds on the earth are examples of its effects.) Hence, it's also an effect of rotation and implies angle turnings - and a relation to the surroundings - as the centrifugal force.

(Seen as a kind of relative forces, they seem to have relations to Einstein's transformations of laws between co-ordinate system in rest and in motion in his general relativity theory.)



Spin compared with other physical quantities:

Defying the fact that spin isn't depending on mass or charge, what does Planck's constant h - and spin - look like, translated into other physical quantities as Mass M , Distance D and Time T ,? According to classical physics we get:

$$\frac{M \times D}{T \times T} \quad \text{mechanical force} \quad \text{---} \quad \frac{D \times D \times M}{T} \quad \text{spin}$$

Ignoring first the 2π -factor in the denominator of spin, we can see one Time factor of Force through inversion transformed* to a Distance factor in spin. We could in this operation see a step from d-degree 0/00 of motion with Time as a property, inwards to d-degree 1, less of motion, more o a structure.

**(Einstein mentions how a difference in time can be translated to a difference in distances in the transformations between different reference systems - but of course not in connction with "inversions".)*

With the 2π -factor interpreted as a Distance factor, we get a relation as between acceleration and velocity, in "inverted" or negative forms connected with Mass and Charge respectively, in d-degree step 2-3 according to hypotheses on those pages.

We get too that

$$(\text{Planck's constant}) = (\text{Magnetic flux}) \times (\text{Charge})$$

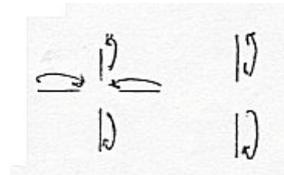
Compare the statement by a physicist that the magnetic moment "totally depends on the spin of the photon". (The concept Charge disappears in the right product.)

What is depending on what? In this model magnetic vector fields are seen as a force in its own right, the complementary pole to electric fields, and belonging to and a manifestation of this "Vacant space" in relation to Mass as the complementary pole.

Referring to the earlier remarks above about the eventual role of "vacant space" as surrounding, we could ask if the "dependence": spin - magnetic moment isn't mutual?

Parallel and orthogonal spin axes:

In spite of spin not being a real rotation, some illustrations cannot avoid the similarity. They seem to indicate that the spin axis of the graviton is parallel (or antiparallel) to the path line, while that of the photon is perpendicular to the path line.

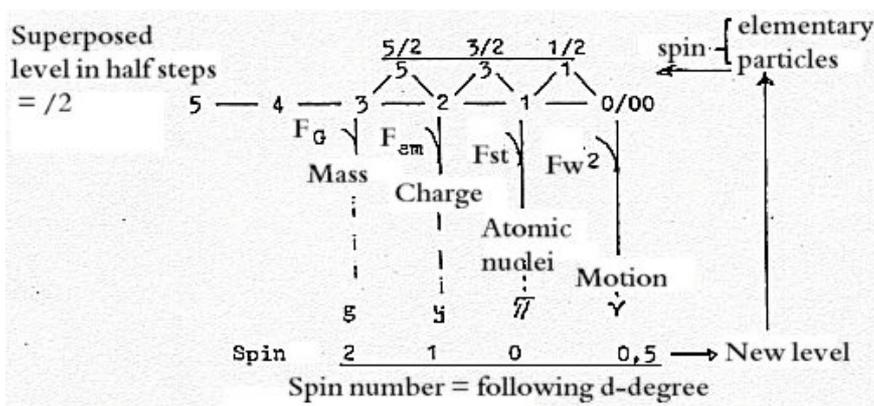
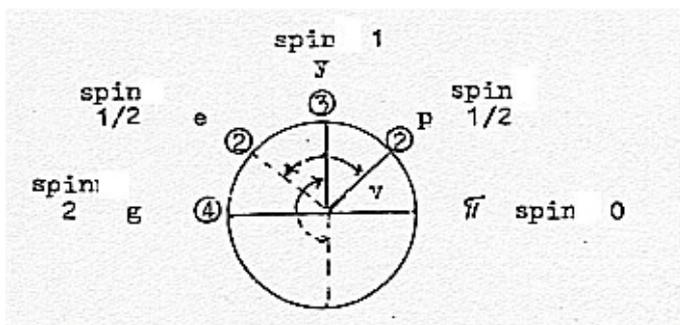
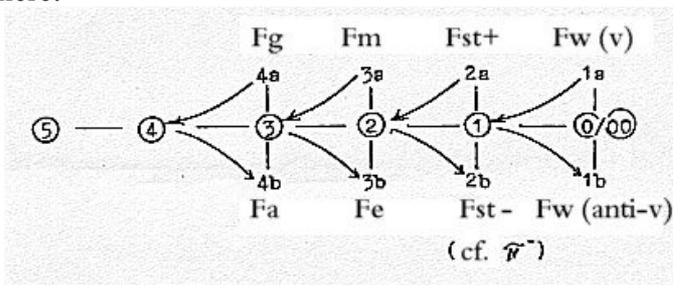


In that case it would agree with the hypothesis about gravitation as a force in d-degree 4, related to the angle 180° , and the electro-magnetic force arising out of d-degree 3, related to the angle 90° .

It should also correspond with the difference between longitudinal waves (hypothetically gravitation waves are of that character) and on the other hand transversal waves (the electromagnetic ones).

Three figures from the original texts,

the right interpretation of spin 1/2 according to Hawking not included, nor the suggestions above or on page Charge. Still giving something of an outline of the views here:



(Spin 0 for the π -meson implies that it looks the same in all directions (Hawking), which seems to be a result of two opposite spins that cancel each other. Cf. perhaps that d-degree 4 in this model corresponds to "all directions" and both inwards and outwards.)

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