On the inadequacy of linear partial differential equations to describe the evolution of vibrating topological composite systems that rotate.

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A loss of information about the fermionic antisymmetric moment of the atomic system would occur in the Schrodinger complex partial differential equation, causing the misleading notion of two separate kind of nuclear spaces that only can be probabilistically described. The interpolation of partial complex conjugate derivatives would be necessary for a complete description of the evolution of the topological nucleus.

Keywords: Sobolev interpolations, Sobolev inequality, Sobolev embedding, Schrodinger equation, loss of information, linear and nonlinear partial differential equations, integer and noninteger derivatives, Lorentz force, electromagnetic waves, mirror symmetric bosons, mirror antisymmetric fermions, supersymmetry, dual atomic model, 2x2 complex matrix, complex conjugate operation, actual transposition, -1/2 derivative, +1/2 antiderivative, noninteger spin, topological transformations, function spaces, discrete Fourier, inverse Fourier, Fourier series.

A complex differential equation of second order that doesn't use all the partial complex conjugate derivatives will loss half of the information of the system - the antisymmetric one - when it comes to describing the evolution of a composite topological system that rotates.

What I meant by "partial complex conjugate derivatives" can be clearly understood in the context of a complex 2x2 matrix whose elements are 4 rotational vectors.

When performing the complex conjugate operation on the initial matrix A, although the 4 vectors rotate, only half of the vectors will change their sign, completing an actual transposition; we can say then that the complex conjugate system A* has -1/2 spin (with respect to the initial state of A where all vectors were positive). This complex conjugation is a -1/2 partial complex conjugate derivative.

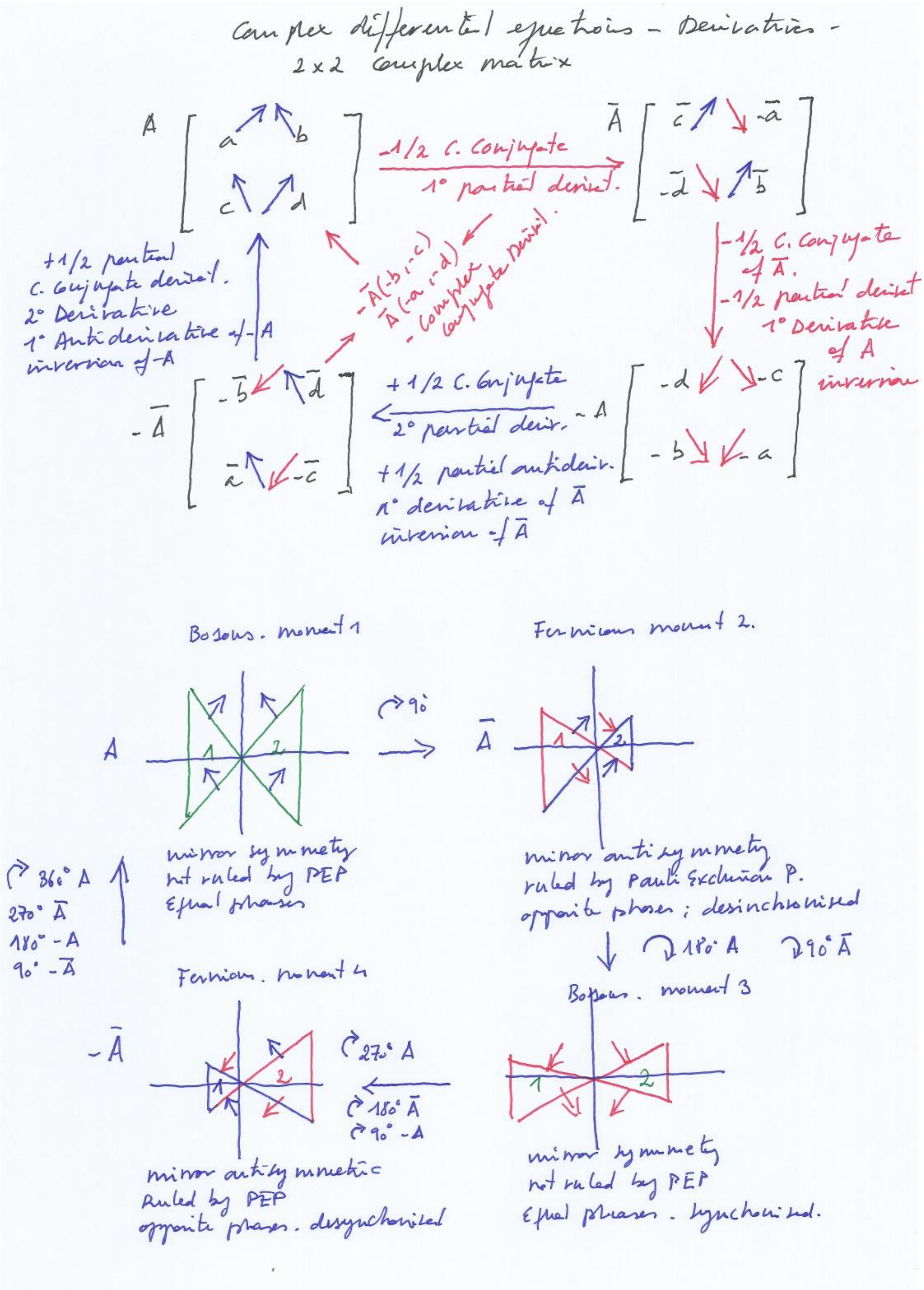
A new rotation will change the sign of the two still positive vectors, and so the whole system will have negative spin on the -A matrix. -A is the -1/2 partial complex conjugate derivative of A*, and the integer - derivative of +A.

After a new rotation, two negative vectors will become positive on -A*. -A* will represent the +1/2 partial complex conjugate antiderivative of -A, the +1/2 partial complex conjugate derivative of A, and the integer derivative of A*
A last rotation will change the sign of the two still negative vectors, arriving to the whole positive vectors of A. A is, then, the antiderivative of -A, and the +1/2 partial complex conjugate derivative of -A*.

The Schrodinger equation is a partial complex differential equation of second degree. The ordinary equation describes the mirror symmetric bosons with integer spin; and it also provides an alternative complex conjugate solution that describes the mirror antisymmetric fermions with 1/2 spin.

But, if the atomic nucleus is a complex composite rotational system, the complex conjugate equation is not just an alternative solution, it is an essential part of the evolution of the system; we cannot arrive to the derivative -A without passing through the partial complex derivative A*.

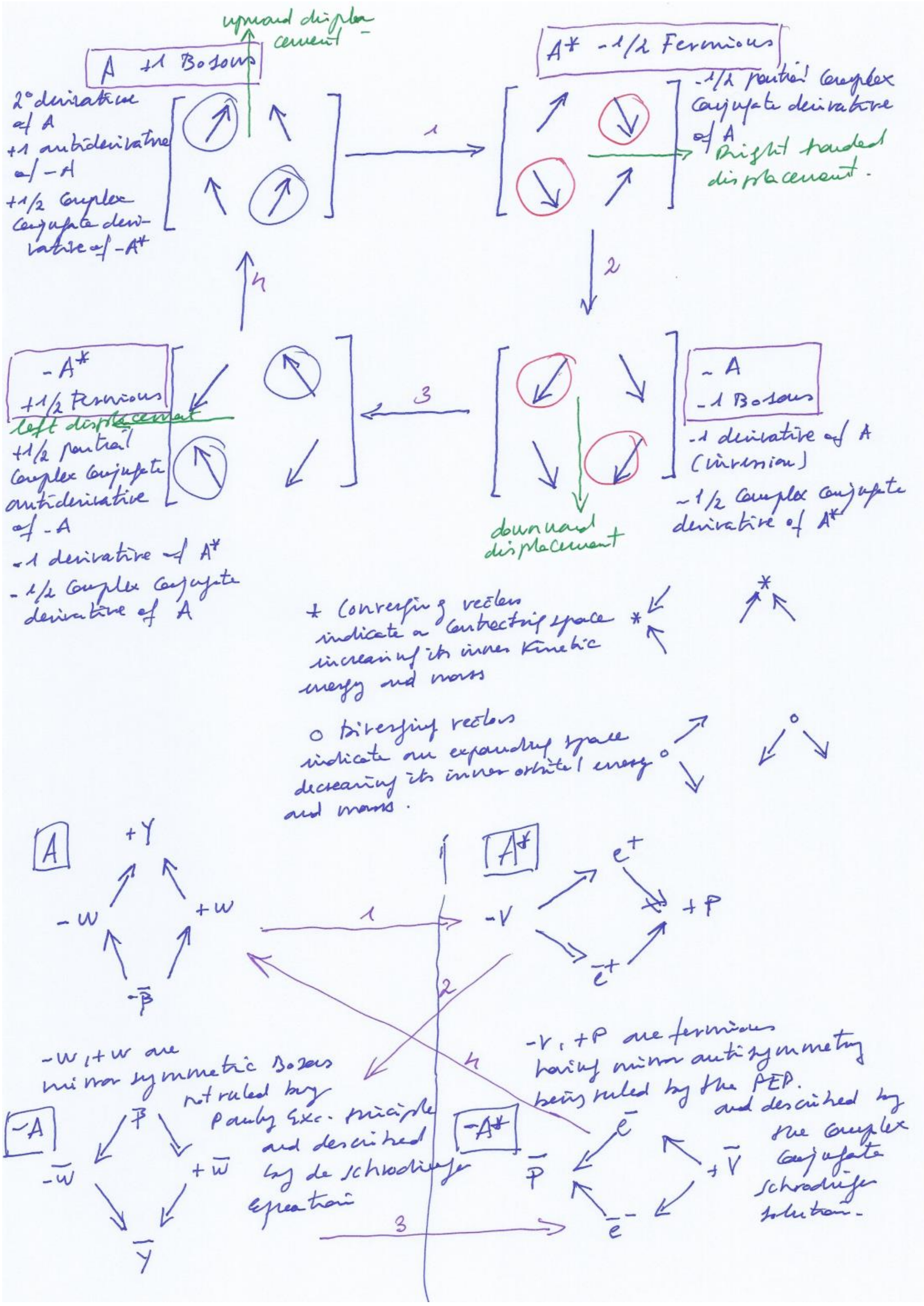
Leaving out of the equation the complex partial conjugate derivatives, the dynamic system only could be described in a statistical way, its evolution will appear to be discontinuous, and we logically think that the system is formed by two separate type of particles that maybe can be super symmetrically linked by some additional that we would be looking for in ever larger particle colliders.



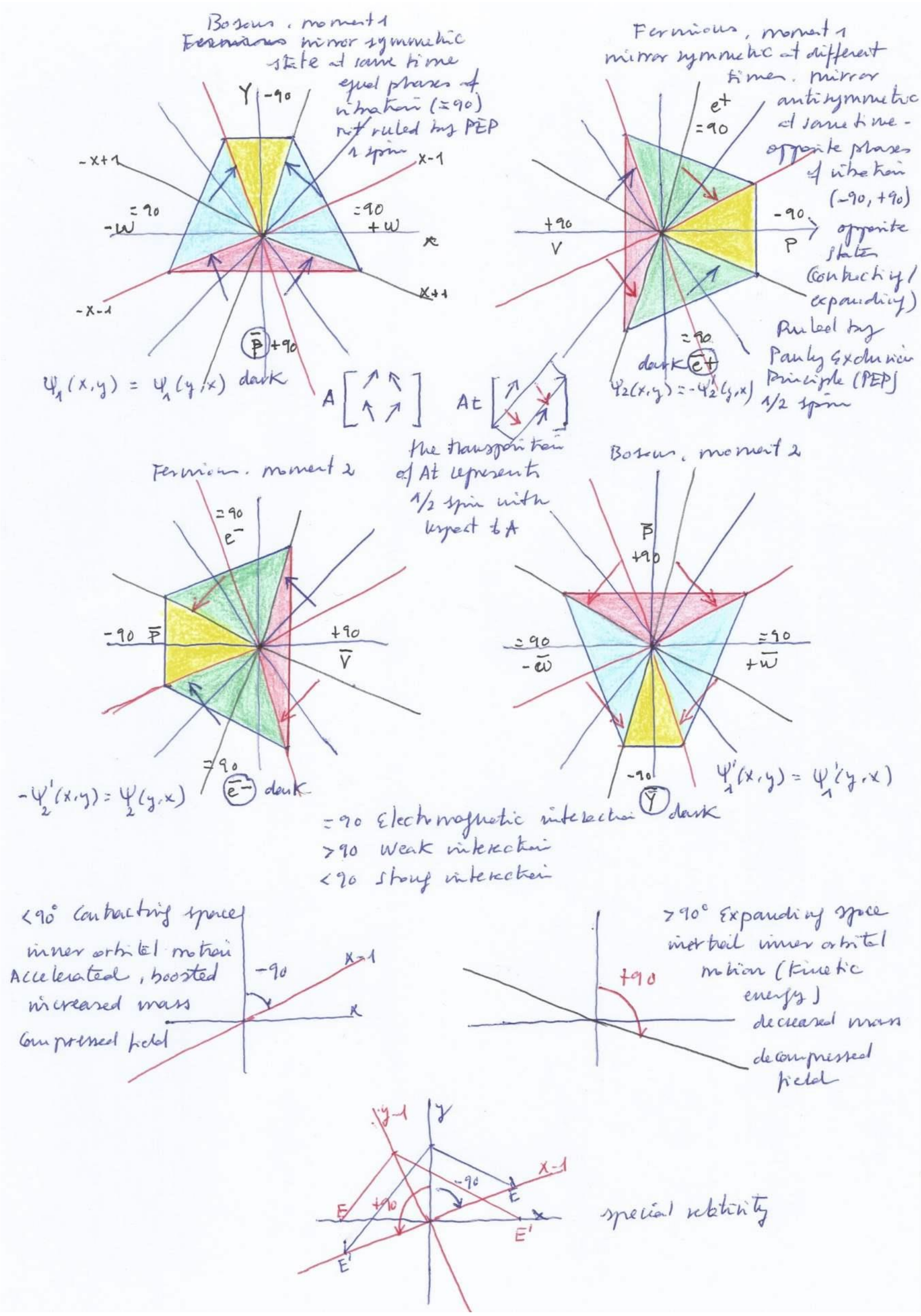
Without intercalating the antisymmetric A* and -A* on the symmetric function of A and -A, the problem of quantum discontinuity arises.

The differential equation should be (-1/2 A*) + (-A) + (+1/2 -A*) + A = 0

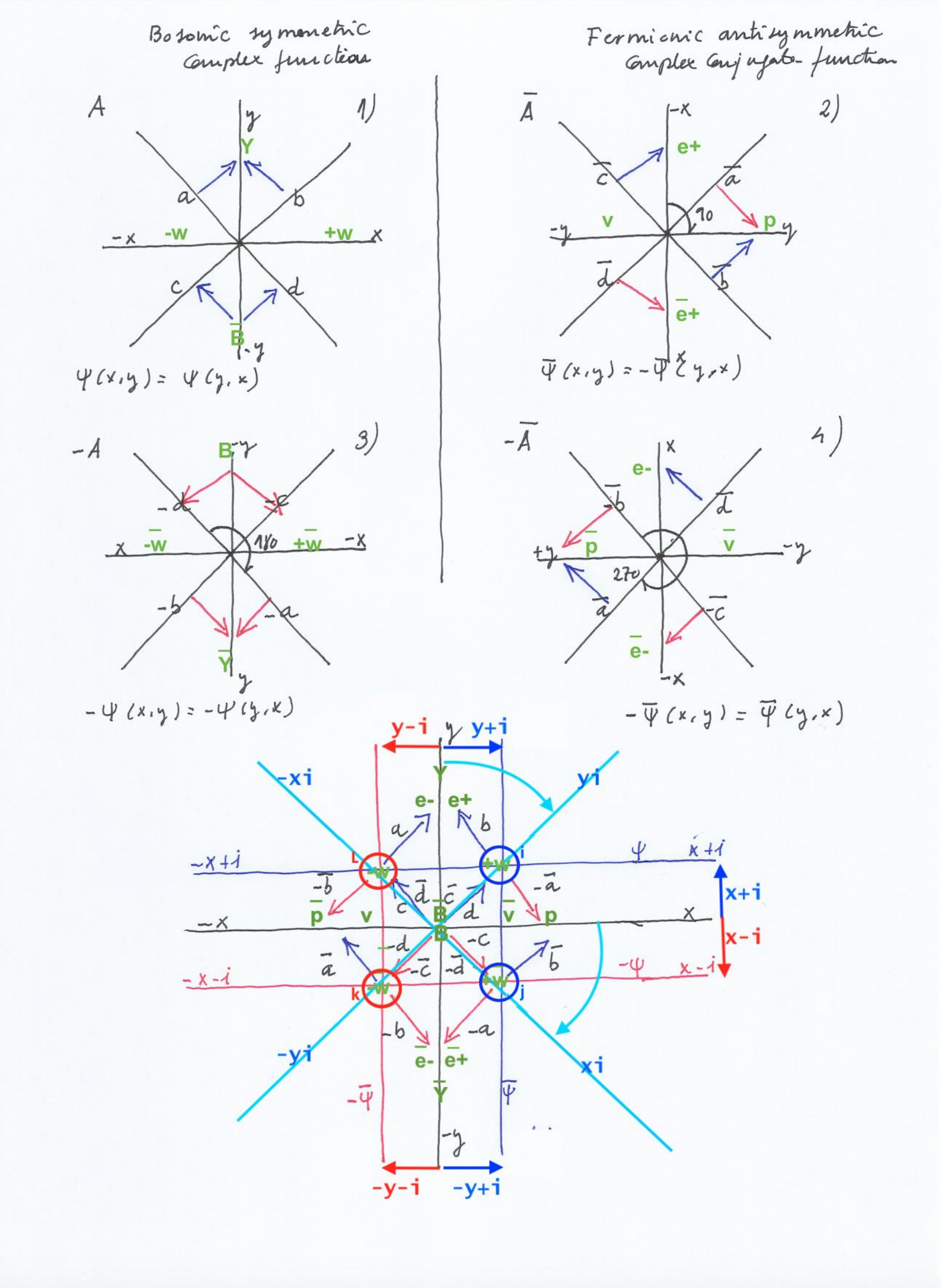
The ordinary equation A + (-A) = 0, and the complex conjugate solution A* + (-A*) = 0, lose half of the information and do not allow us to be aware of the topological transformations of the spaces of the system.



The rotational nucleus could be represented in this way. Two converging vectors indicate a space that contracts (increasing its inner orbital motion and its mass in the higher interaction), and two diverging vectors represent a space that expands (losing its inner kinetic energy and decreasing its mass in the weaker interaction):



If we simultaneously set on a same space all the moments of the evolution of the system, we would say that it's perfectly symmetric. Fermions would be placed on the real axes and bosons on the imaginary points. (Although considering the system from the point of view of the rotated coordinates as our spatial reference, bosons would be on our real axis and fermions on the imaginary points).



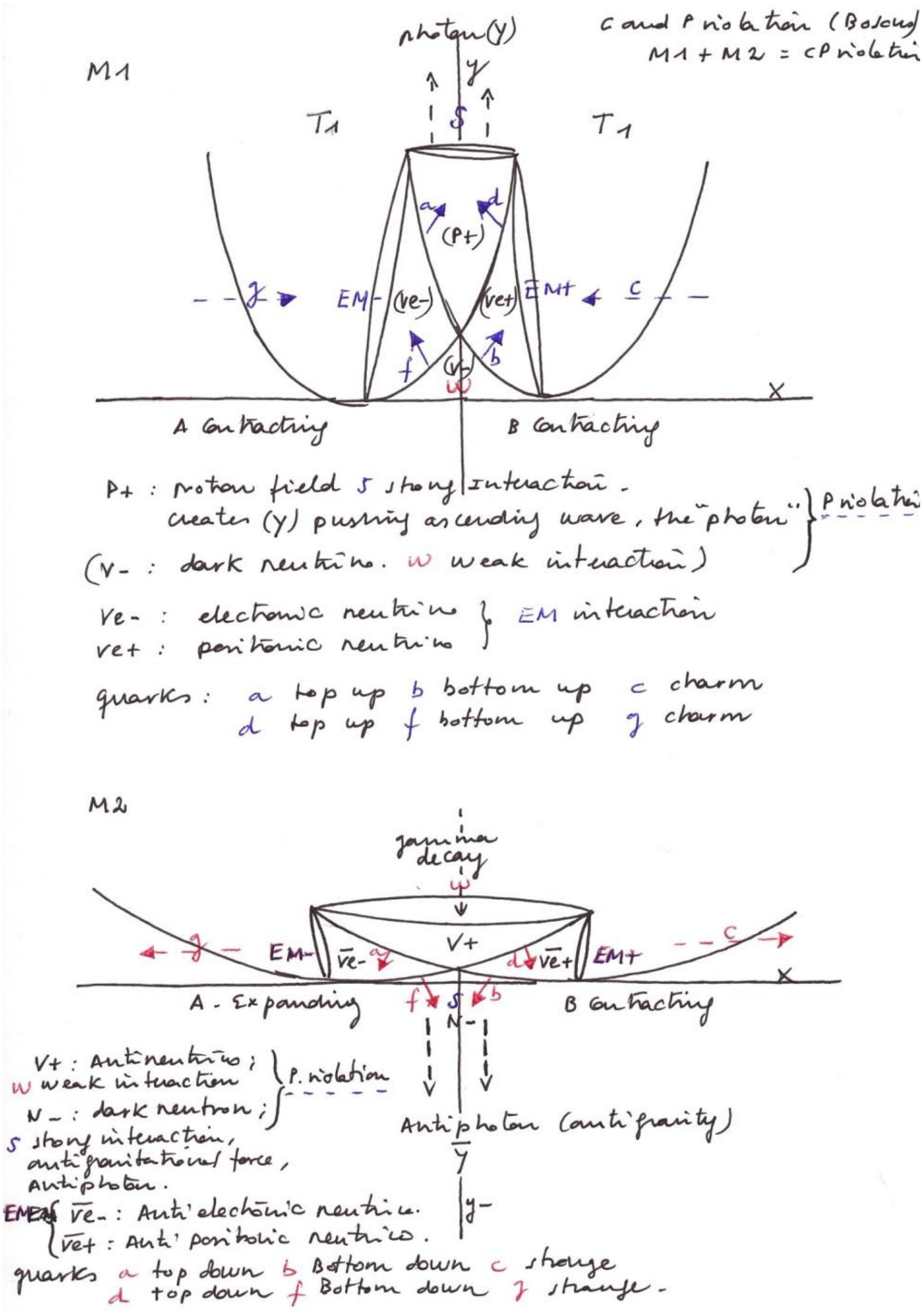
By doing this symbolic representation we can appreciate that it's necessary to extend our real coordinates XY to the imaginary points X+i, X-i, y+i, Y-i , to make room for the bosonic orthogonal (upward and downward) displacements and the fermionic horizontal (left to right and right to left) displacements, what can be interpret as an expansion or contraction of the complex composite space.

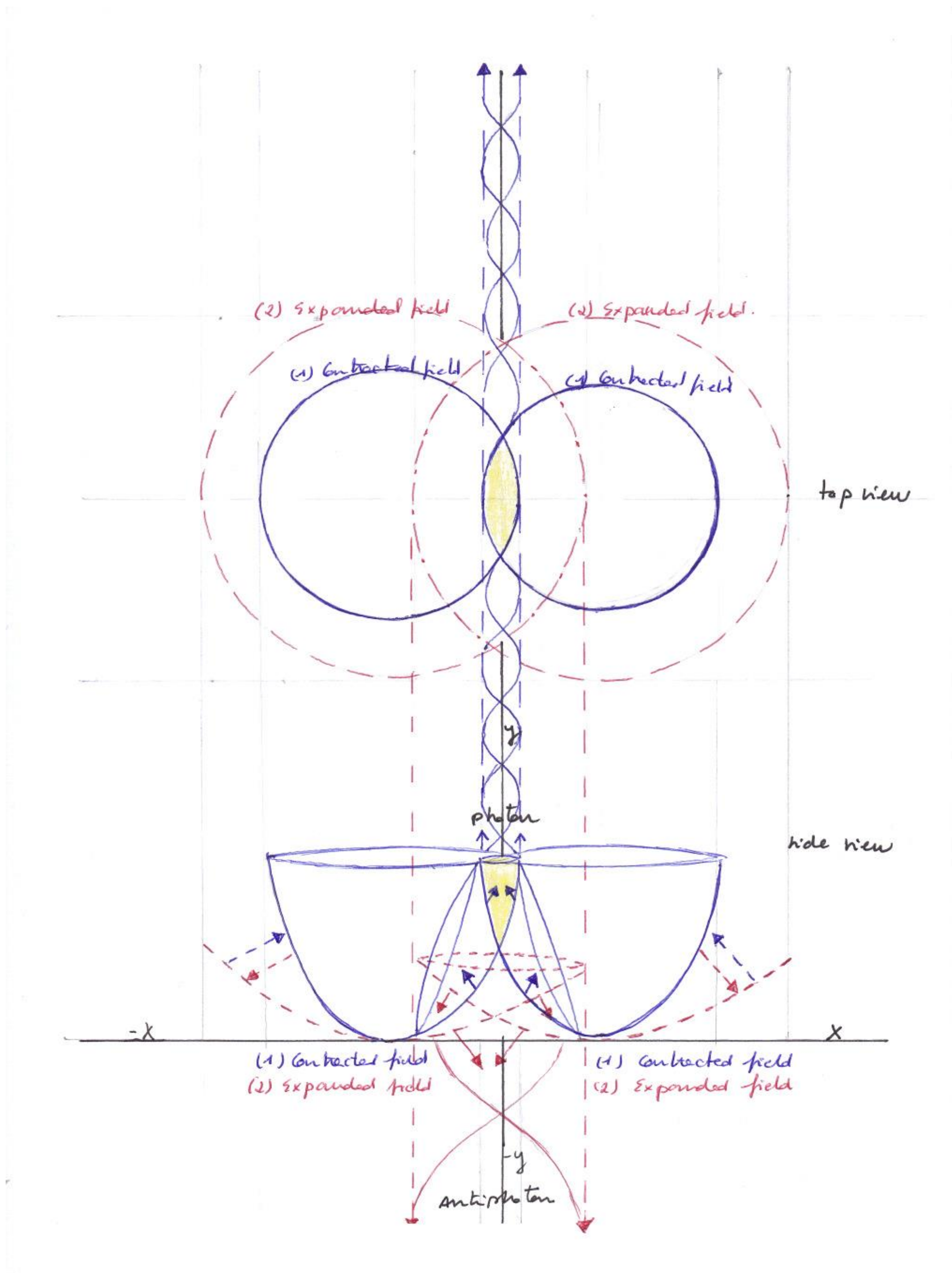
The rotational matrix model would be part of a broader atomic model of two intersecting spaces that vibrate with equal or opposite phases synchronizing and desynchronizing periodically.

When the phases of vibration of the two intersecting spaces are equal and they both simultaneously contract, the left and right transversal bosonic subspaces will expand and the top orthogonal fermionic subspace will contract while moving upward.

And when both intersecting spaces simultaneously expand, the left and right transversal bosonic subspaces will contract and the top orthogonal fermionic subspace will expand moving downward.

Mirror symmetric bosons:



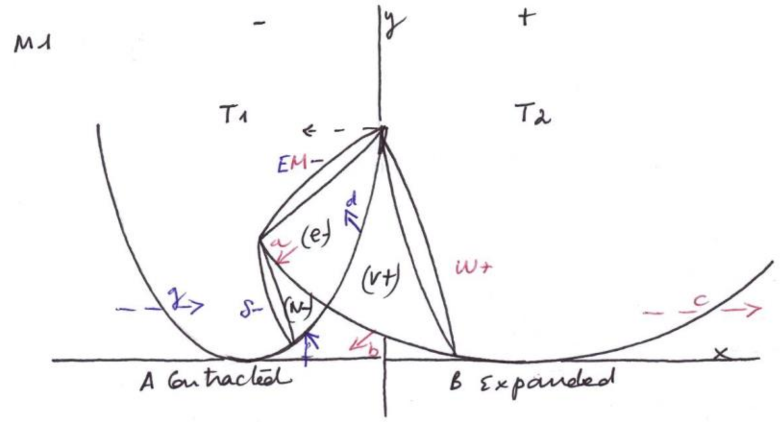


When the phases of vibration of the left and right intersecting spaces are opposite, the transversal subspaces will follow the phase of the space which they are inside of. So, if the left intersecting space contracts and the right one expands the left transversal fermionic subspace will contract and the right one will expand, and vice versa. The orthogonal subspaces will move towards the side of the intersecting space that contracts.

Mirror antisymmetric fermions:

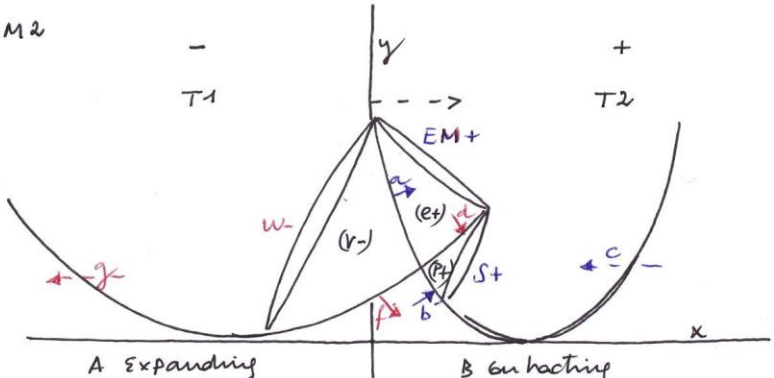
C and P violations – (Fermions).

M1



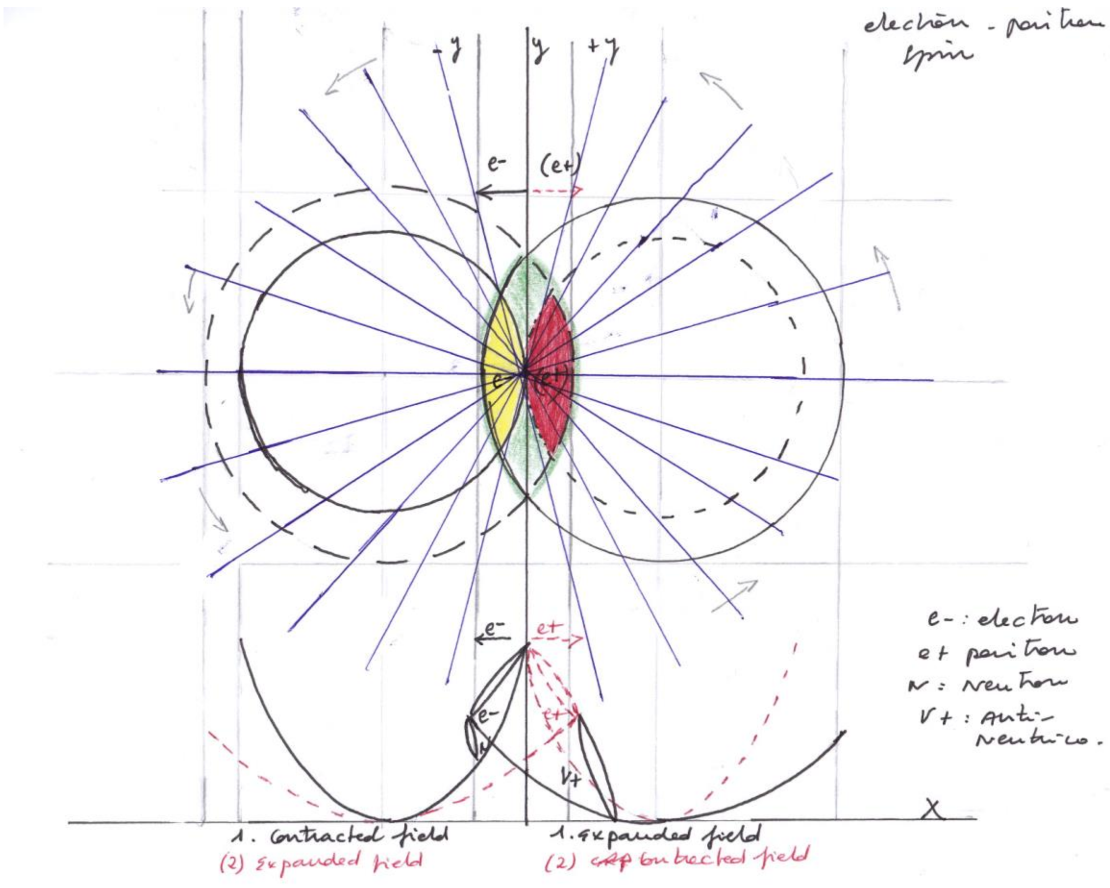
N– : Neutron field; S : strong interaction } N and V+ P. violation
V+ : Anti Neutrino field; W : weak interaction
e– : electron field; EM : electro magnetic interaction
quarks : a top down b bottom down c strange } C violation g and c
d top up f bottom up g charm –

M2



P+ : Proton field; S : strong interaction } P. violation, P+ and V–
V– : Neutrino W : weak interaction
e+ : positron EM : electromagnetic interaction
quarks ; a top up b bottom up c charm } C violation
d top down f bottom down g strange } g and c

M1 + M2 restore order



The dual composite system would have then a shared nucleus of two orthogonal and two transversal subspaces that will be mirror symmetric or antisymmetric, depending on their equal or opposite phases of vibration that will follow the opposite or same phase than the intersecting spaces.

When both intersecting spaces simultaneously contract or expand the transversal subspaces will be mirror symmetric bosons not ruled by the Pauli exclusion principle; when both spaces contract the orthogonal subspace will experience and upward displacement creating an ascending pushing force that will cause a photonic radiation, and when both expand the orthogonal subspace will experience a downward displacement and a decay of its inner kinetic energy.

With opposite phases, when the right intersecting space contracts while the left one expand, the left transversal subspace will expand acting as a neutrino, the right transversal subspace will contract acting as a proton, and the orthogonal subspace will move right acting as a positron; a moment later, when the left intersecting space contracts while the right one expands, the left transversal subspace will contract acting as an antiproton, the right transversal subspace will expand acting as an antineutrino, and the orthogonal subspace will move towards left acting as an electron.

Electron and positron, being the same space moving left or right, will be Majorana antiparticles. Proton and antiproton, or antineutrino and neutrino, will be Dirac antiparticles at different moments. The left and right transversal subspaces, having antisymmetric phases, will be fermions ruled by the Pauly exclusion principle.

In this context, the Pauli exclusion principle is an indication of the symmetry or antisymmetry of the phases of vibration of the mirror subspaces. It must be understood in terms of mirror symmetry or mirror antisymmetry.

Fermionic and bosonic would be then different quantum states (the state of being contracting or expanding and the physical consequences of it in terms of mass, energy and forces) of a sane topological space that evolves through time when its phases of vibration synchronize or desynchronize.

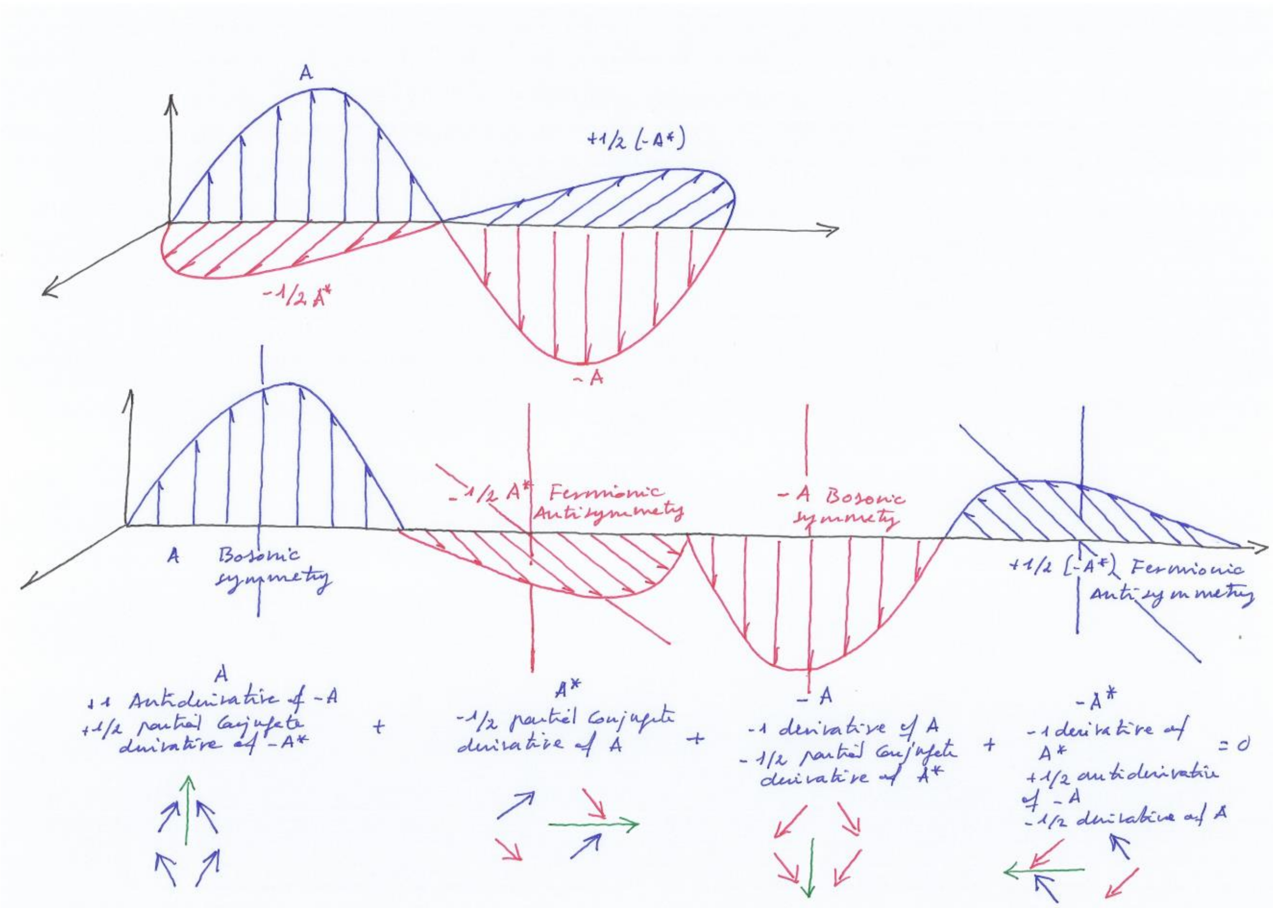
The vector rotational matrix suggests that fermions are the -1/2 or +1/2 partial complex conjugate derivative of the +1 or -1 bosons, and that their topological transformation periodically occurs with the nuclear rotation.

The partial complex conjugate derivatives could also be thought in terms of Fourier transforms: A* would be a discrete Fourier transform, and -A* would be the inverse Fourier (that will require 3 consecutive partial complex conjugate operations, A*, -A, -A*, or in other terms, two consecutive -½ partial complex conjugate derivatives and one +½ partial complex conjugate antiderivative that will be as well a –1 integer complex conjugate derivative.)

The addition of all the partial complex conjugate derivatives that are A*, -A, -A*, +A, would be the Fourier series.

Since the XIX century, electromagnetic waves have been thought caused by the combination of an electric and a magnetic field that vibrate or periodically fluctuate in the orthogonal and the horizontal axes. Here we propose a model of electromagnetic waves created by two intersecting fields that vibrate with same or opposite phases. The orthogonal waves - created by the electrical field in the classical model - will be created when both intersecting fields contract; The horizontal waves - created by the magnetic field in the classical view - will be caused when an intersecting field contracts while the other expands. The positively or negatively charged subspace will move toward the side of the intersecting field that contracts.

It's known that Heaviside reformulated the Maxwell's equations using partial derivatives instead of total derivatives and that implied the loss of the description of the Lorentz force. The Lorentz force is the force that the magnetic field causes on a charged particle. In the context of an orthogonal subspace moving left or right, it will not be a force but the geometric consequence of the variation of the curvature of the field that contracts when its intersecting counterpart expands; the charge of the orthogonal subspace will be the pushing force that it will cause when moving left or right towards the contracting "magnetic" space it's "attracted" to.



The loss of information about the antisymmetric moment of the "magnetic" system represented by the missing Lorentz force that happened with the Maxwell equations when the partial derivatives where used, will be the same loss of information about the fermionic antisymmetric moments that the Schrodinger partial differential equation would be causing in the description of the evolution of the atomic nucleus.

In this sense, the classical graphic of the electromagnetic waves as coexisting fluctuations on the orthogonal and horizontal planes, would be incorrect. The intersecting electromagnetic spaces will simultaneously vibrate with the same or opposite phases, synchronizing and desynchronizing periodically, but their orthogonal and horizontal radiations will be emitted in different moments, the "electrical" symmetric moment (at the orthogonal axis) and the "magnetic" antisymmetric moment (at the horizontal axis), if you will, and they could be expressed in terms of partial conjugate derivates.

If the electromagnetic [i]wave rotates, the same apparent discontinuity that was found at the atomic level should also be met here because the radiations of the system would follow the sequence given by the equation -1/2 A* + (-1/2 -A) + 1/2 (-A*) + 1/2 A = 0

The classical representation of the EM waves would imply exactly the same vectorial dynamics mentioned above for the atomic nucleus, although they are shown in a time overlapping way, and that would imply a same topological system of vibrating spaces and nuclear subspaces whose phases synchronize and desynchronize while rotating as the above figure shows.

It's known (1) that "*in mathematical analysis, an interpolation space is a space which lies in between two other Banach spaces. The main applications (of the interpolation spaces) are in Sobolev spaces, where spaces of functions that have a noninteger number of derivatives are interpolated from the spaces of functions with integer number of derivatives".*

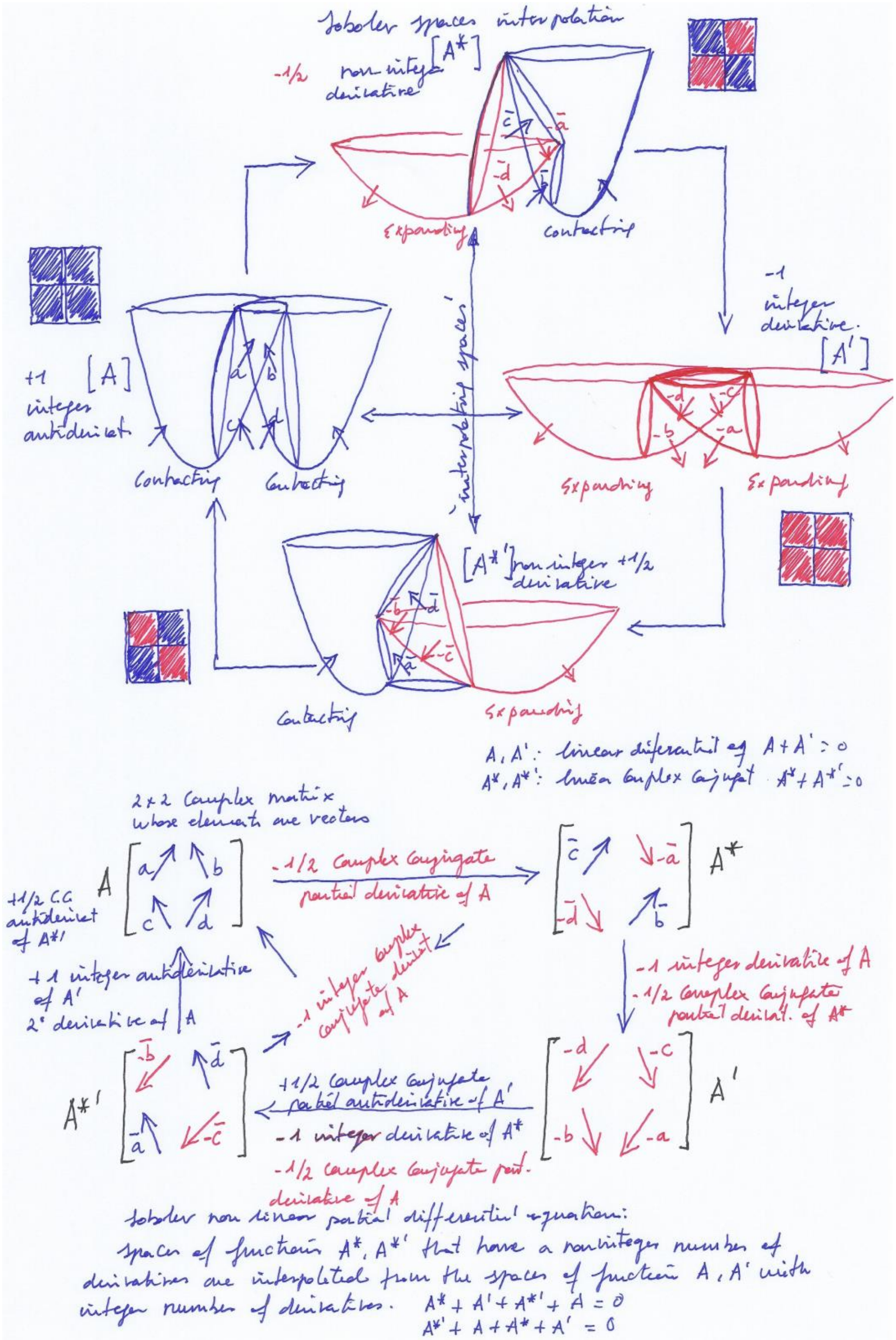
In the context of the 2x2 complex matrix, each permutation can be thought as a derivative of the previous state, causing an exponential increment or decrement. So, starting from A, and performing the complex conjugate operation, as only two vectors change their sign becoming negative in what implies an actual transposition, the operation will imply a –½ partial complex conjugate derivative represented by A*.

Performing a new complex conjugate operation on A*, two new vectors will become negative, and the whole system will have negative vectors on –A. We could also represent –A as A' to indicate that A' is the whole derivative of A.

So, what we are representing with the partial complex conjugate derivatives by means of the rotational matrix, seems to be related to the mathematical development known as "Sobolev" spaces. The non-integer number of derivatives would be the case of –½ A* and +½ -A*, while the whole integer derivatives would be the case of –A and A.

To be able to describe the evolution of the nuclear spaces, and avoid the loss of information, the equation that describes them should consider the atomic nucleus as a case of Sobolev spaces, intercalating A* and -A* in between of A and –A.

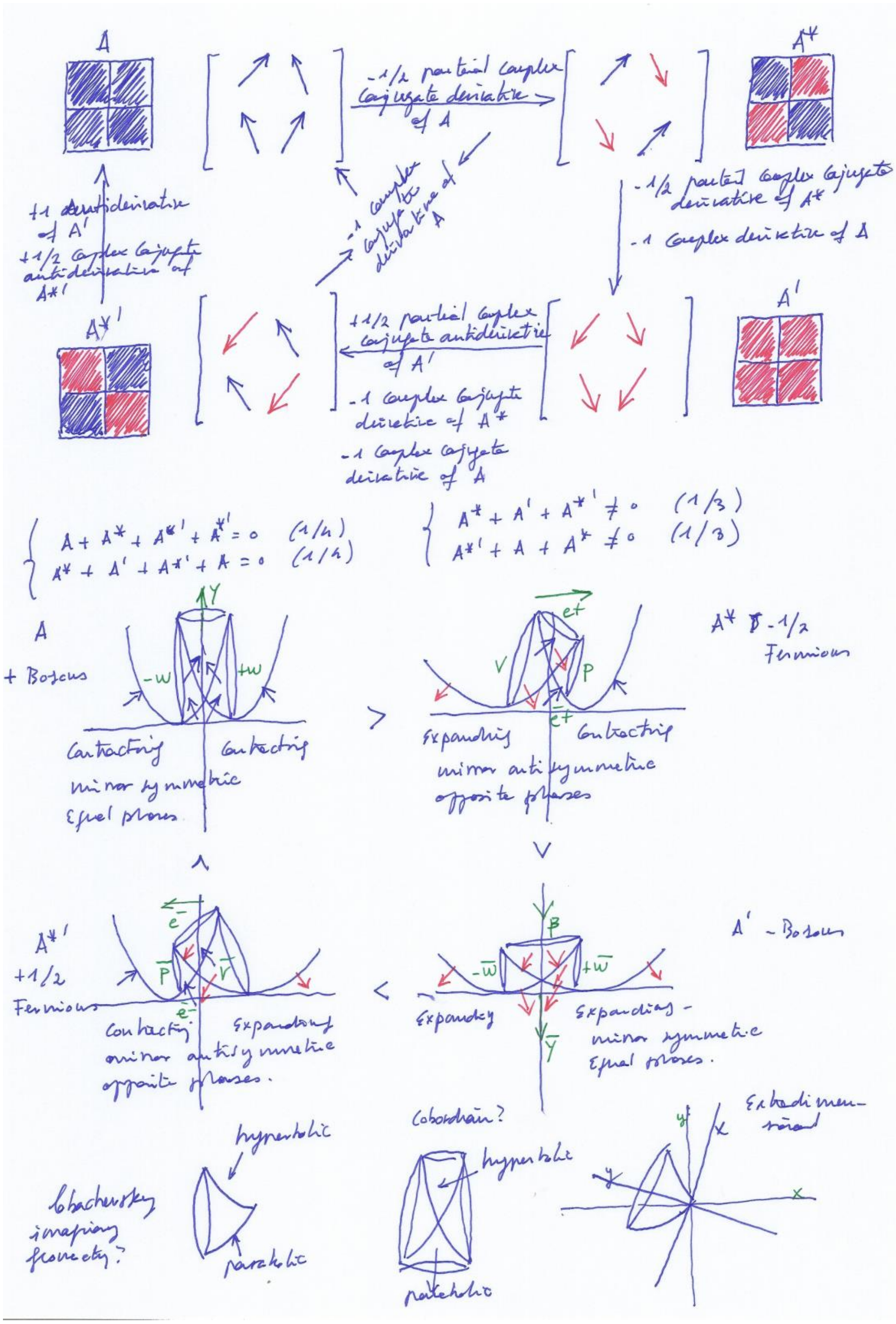
The subspaces formed by the intersecting spaces, could be considered as function spaces.



In this complex rotational context, where the fractional, or noninteger derivatives A* and –A*' must be interpolated in between the whole or integer derivatives AA' and A'A to follow the correct continuous and sequential transformational flux.

Sobolev inequality would be given by the antisymmetry between the mirror antisymmetric transversal subspaces described by the function spaces related to the complex conjugate –½ A* and +½ A*' derivatives.

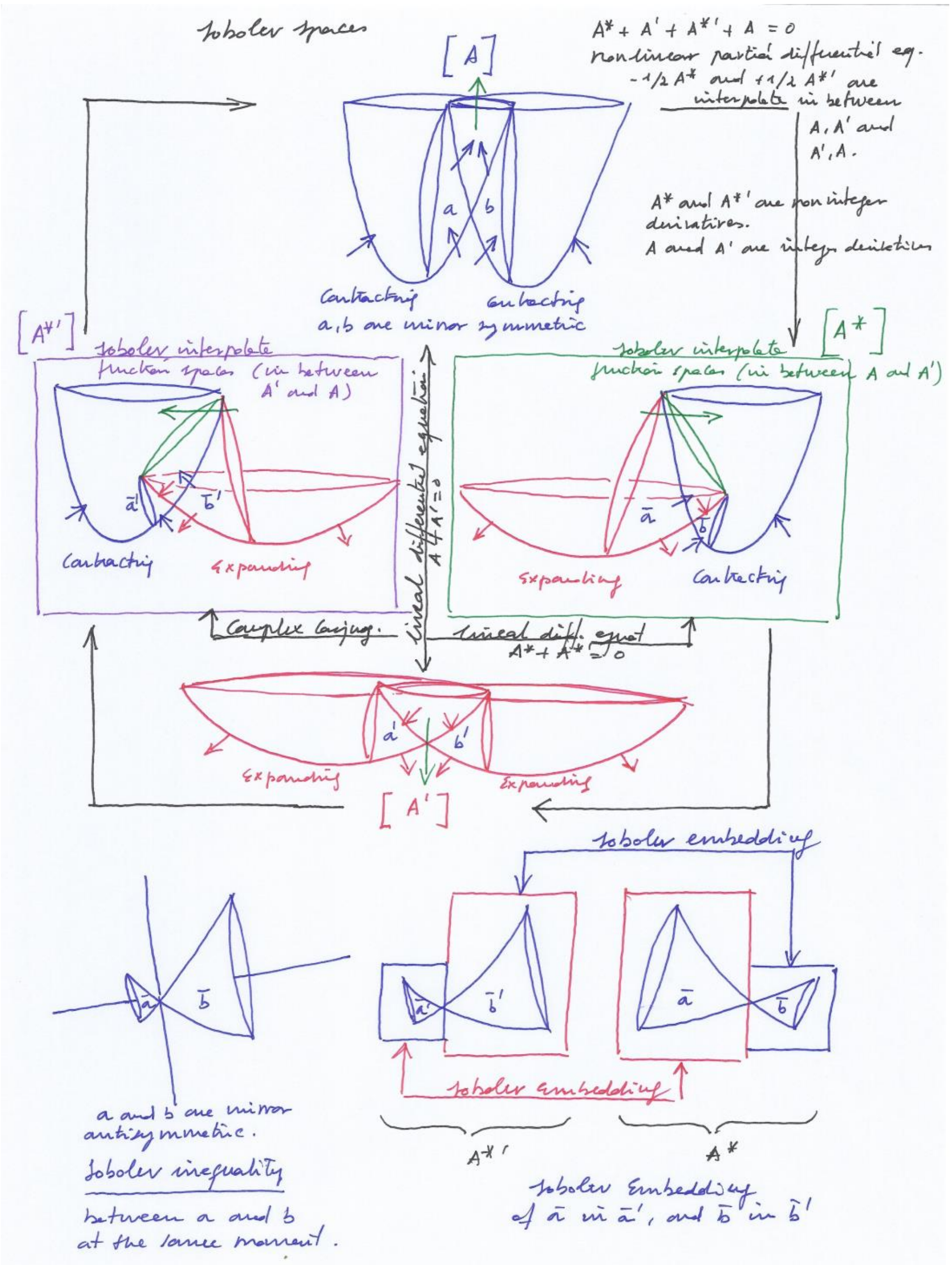
Sobolev embedding of the A* in -A* and vice versa would take place through time being mediated by the necessary interpolations of A and A'.



In that sense, the Sobolev inequality would be given by the antisymmetric moment of the topological transformation of the nucleus, when the left and right transversal spaces are mirror antisymmetric subspaces vibrating with an opposite phase at A* and, later, at A*'.

So, when it comes to the state of the A* moment, the right transversal space will reach its highest degree of contraction while the left transversal space will reach its highest degree of expansion (and the orthogonal spaces will move towards right). At the A*' moment, the right transversal space will reach its highest degree of expansion while the left transversal space will reach its highest degree of contraction (and the orthogonal spaces will move towards left).

Sobolev embedding would fix the antisymmetric inequality between A* and A* in the sense that the right-handed contracting transversal space of A* would be embedded in the right-handed expanding transversal space of A*', and the left-handed transversal contracting space of A*' would be embedded in the left-handed transversal expanding space of A*.



In that sense, the Sobolev embedding would occur through time and it will require the mediation of the topological transformations that occur at A' and A. By means of that embedding, we get the symmetry of the antisymmetric system through time.

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References:

interpolation: https://en.wikipedia.org/wiki/Interpolation_space

Function space: https://en.wikipedia.org/wiki/Function_space

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[i] Classical EM graphic: wikipedia