Chevron Form Quantum Charts

New graphical representation of quantum orbitals

Jean-Yves Boulay

Abstract. It is proposed here to represent the quantum distribution of atomic orbitals in an unprecedented table where the quantum shells and subshells are drawn in the form of chevrons whose vertices are occupied by orbitals with the magnetic quantum number m = 0. This new representation visually shows, much better than a classic linear chart, the relationship between the number of quantum shells and the number of orbitals . Also, this new visual model can be easily used in the individual quantum depiction of the atoms represented alone or into molecules and can find its place in illustration of some two-dimensional space-time quantum theories. Finally, this graphic representation allows to introduce the hypothesis of the existence of stealth orbitals, quantum gates opening towards singularities.

1. Introduction

In the scientific quantum literature, many tables already exist describing the quantum structure of matter. Very often, these tables are represented in the same general linear form to describe the distribution of orbitals and electrons on the different quantum shells of chemical elements. The quantum study of the genetic code [1] has was an opportunity to propose a new type of table describing the quantum organization of atoms. We will demonstrate here, after having compared it to a classical illustration, that this new concept of chart, using an innovative representation of quantum shells arranged in the form of chevrons is more explicit in the study of chemical elements and molecular chemical structures.

2. Linear chart versus chevron form quantum chart

2.1 Classical linear quantum chart

In Figure 1 is illustrated a classical quantum table of linear form of the first three shells and the first six quantum subshells. This type of table is conventionally used in quantum scientific literature.

shells and subshells		orbitals and electrons by shells		orbitals and electrons by subshells						
1(K) n=1	*1s l=0*	1	2	1	2	•• *m=0*				
2(L) n=2	*2s l=0*	4	8	1	2	•• *m=0*				
	2p l=1			3	6	•• *m=-1*	•• *m=0*	•• *m=+1*		
3(M) n=3	*3s l=0*	9	18	1	2	•• *m=0*				
	3p l=1			3	6	•• *m=-1*	•• *m=0*	•• *m=+1*		
	3d l=2			5	10	•• *m=-2*	•• *m=-1*	•• *m=0*	•• *m=+1*	•• *m=+2*

Fig.1 Classical linear quantum chart of the first three shells and the first six subshells. See Fig.2 to comparison.

In this linear form chart, the relationship between the shell number and the orbital amount is not clear. Visually, by shell, we need to add each orbital line to understand that their sum is equal to the square power of the shell number.

- 1st shell → 1 orbital = 1^2 = 1 orbital,
- 2nd shell → 1 + 3 orbitals = 2^2 = 4 orbitals,
- 3rd shell → 1 + 3 + 5 orbitals = 3^2 = 9 orbitals.

Note: Here it is the quantum number *mℓ* which is the subject of study. For graphic simplification this value is simply noted *m* in the demonstrations.

2.2 New chevron form quantum charts

In figure 2 is illustrated the new concept of quantum chart in chevron form. Inside this table, the different quantum shells and subshells are so presented in the form of chevrons.

At the top end of each rafter are indicated the names of the different shells and subsells; at the left end of these chevrons, the numbers of orbitals and electrons of these different shells and quantum subshells are indicated. At each chevron vertex is the orbital where the quantum number $m = 0$. The orbitals with positive quantum number m are progressively positioned towards the top of these chevron vertices and the orbitals with negative quantum number m are progressively positioned towards the outside left of these chevron vertices.

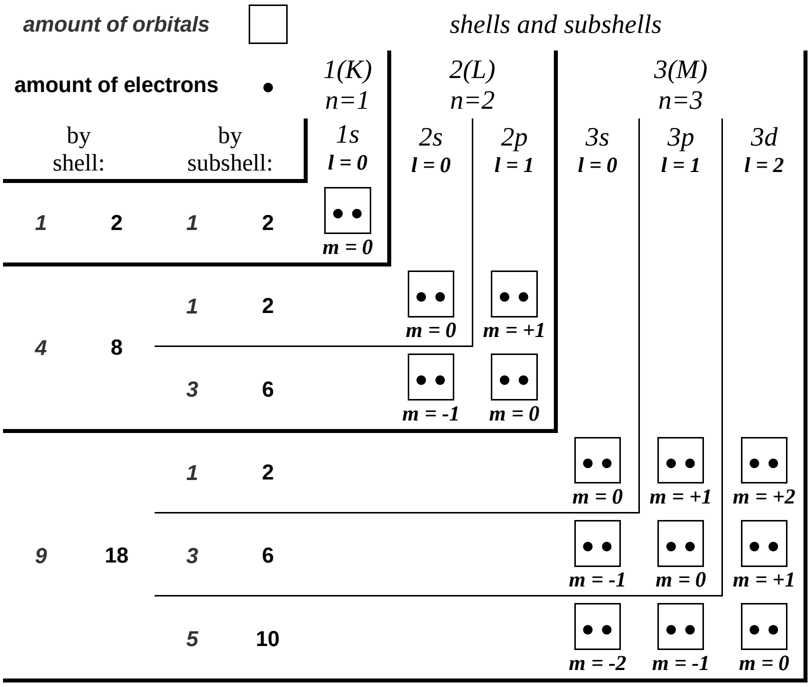


Fig. 2 New chevron form quantum chart: quantum distribution of orbitals and electrons in the first three shells and the first six subshells. See Fig.1 to comparison.

This new graphic design is more explicit in describing the quantum structure of chemical elements than any other usual linear chart. Very visually, as illustrated Figure 3, this chevron configuration clearly highlights the arithmetic progression of the orbital numbers of the different quantum shells in square powers of the level of these electronic shells.

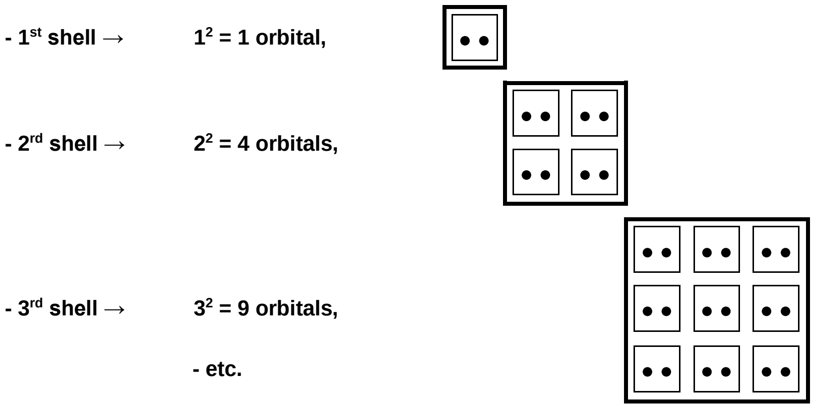


Fig. 3 Square geometric correspondences between shell quantum number and number of orbitals.

2.3 Classical versus chevron form quantum chart

Figure 4 can would be without from comment. Compared to the classic version, the chevron form version of the quantum chart brings a vision as in relief of quantum shells (See Chapter 3.1). In this new version, for each quantum shell, the orbitals appear as a compact square block whose dimension is directly proportional to the shell number (square power). Also, orbitals with the same magnetic quantum number (m) are arranged on the same diagonals. All of this is instantly visible in this chevron-shaped version, unlike the linear classic version.

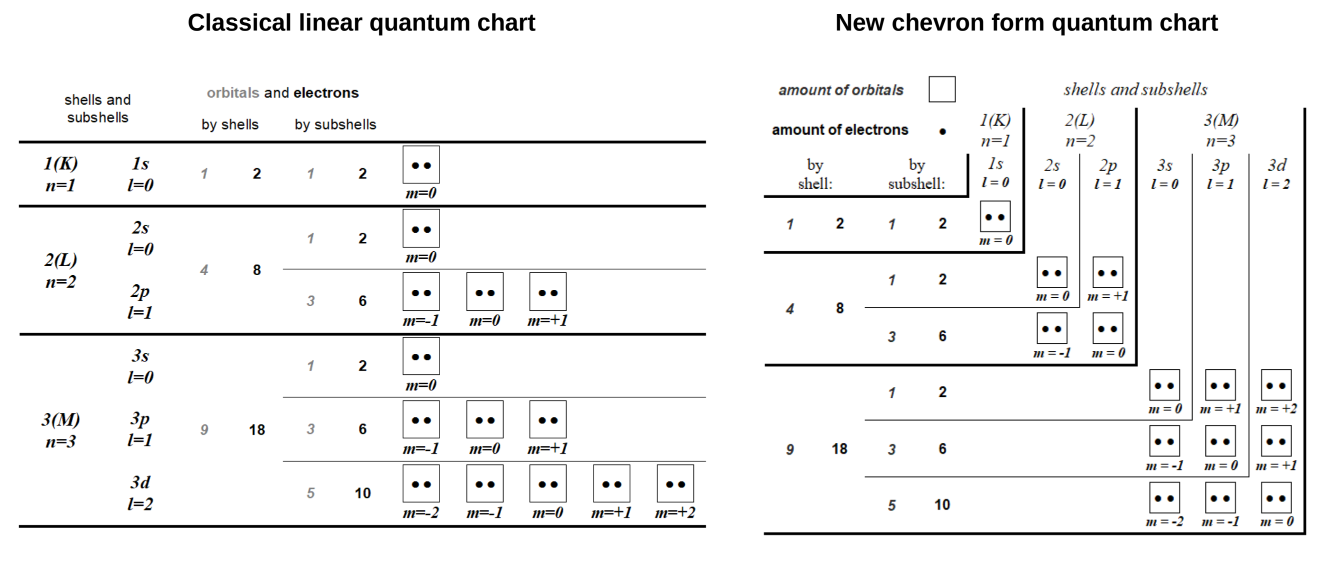


Fig. 4 Classical chart versus chevron form quantum chart.

3 General chevron form quantum chart

Figure 5 shows the chevron form quantum table of the first 15 electronic shells. This graphic concept is extensive development of that introduced in Chapter 2.1 and illustrated in Figure 2. We suggest that this new graphic type be favoured for the description of the quantum organization of the different chemical elements.

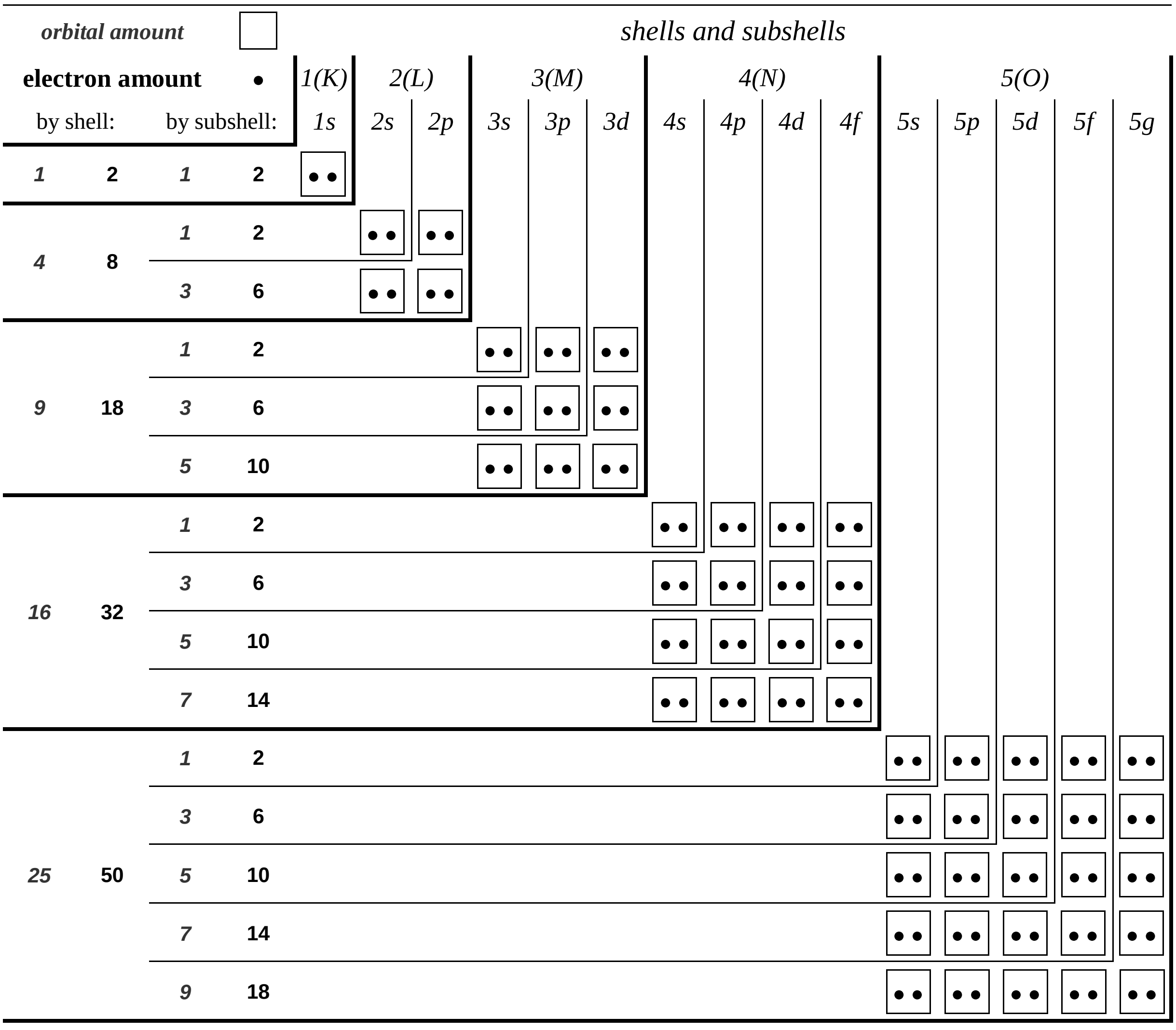


Fig. 5 General chevron form quantum chart representing the first 5 shells and first 15 quantum subshells of the chemical elements. Distribution of orbitals and electrons in these shells and subshells.

3.1 Chevron form quantum chart appellation

Although it is two-dimensional, this new type of graphics gives a three-dimensional aspect of the quantum structure of the elements. It is for this reason that the term "form" is preferred to that of "shape" in the name of this new chart concept. Nevertheless, this chevron form chart representation can find its place in illustration of some two-dimensional space-time quantum theories.

3.2 Chevron form quantum chart why electron spin

In this introduction to the new graph concept, the spin of the electron has not been detailed in order to lighten the presentation. But of course, this new chevron form quantum chart can also be represented by indicating the values of the spins as illustrated Figure 6.

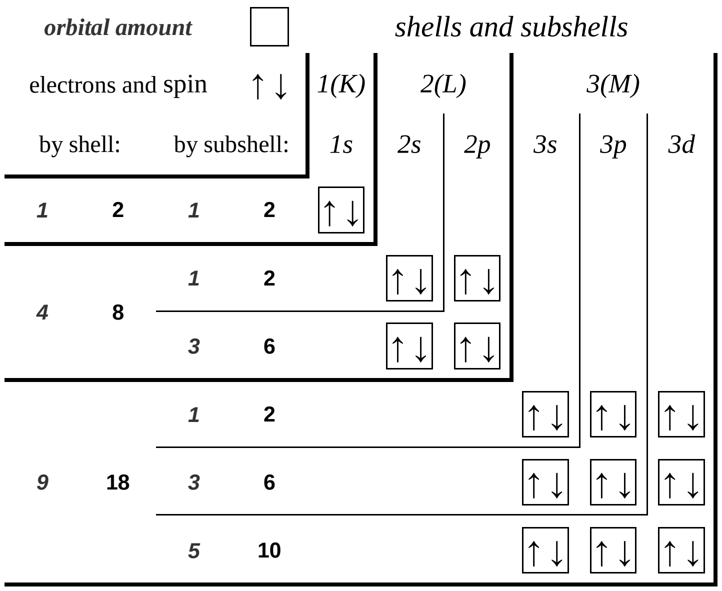


Fig. 6 New chevron form quantum chart why detail of electron spin.

The non-value presentation of spins is privileged in the following demonstrations, allowing the distinction of the own electrons from those guest in the quantum description of atoms and molecules.

4. Atoms quantum charts

In this new quantum chart concept, and more generally in the *quantum study of the chemical elements* [1], the electronic spin is so not detailed (by ascending or descending arrows). In return, it is the migratory or non-migratory nature of the electrons which is highlighted. Thus, for example, representation of the nitrogen atom and sulphur atom such as that illustrated below (Figure 7) is favoured.

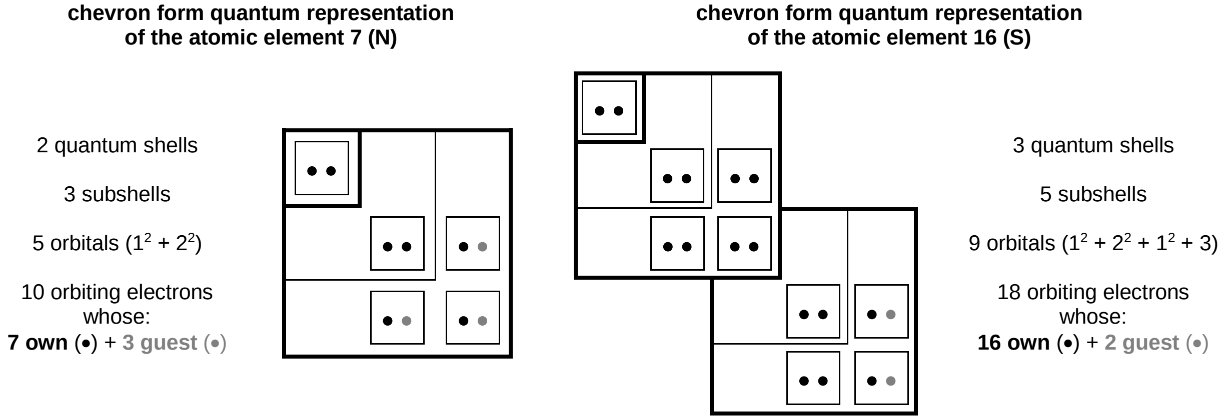


Fig. 7 Graphical quantum representation of Nitrogen and Sulphur in chevron form design (in their saturated state). See also Fig. 2 and Fig. 5.

With this new quantum chart design, the relative dimension of quantum shells and subshells is also more explicitly perceptible than in a line graph (such as the one presented in Figure 1).

In Figure 8 is illustrated, in the new chevron form chart concept, the quantum structure of the first ten chemical elements. This type of table gives simultaneously, visually, a lot of quantum but also physical information, in particular a good idea of the electronic wingspan of the different chemical elements represented.

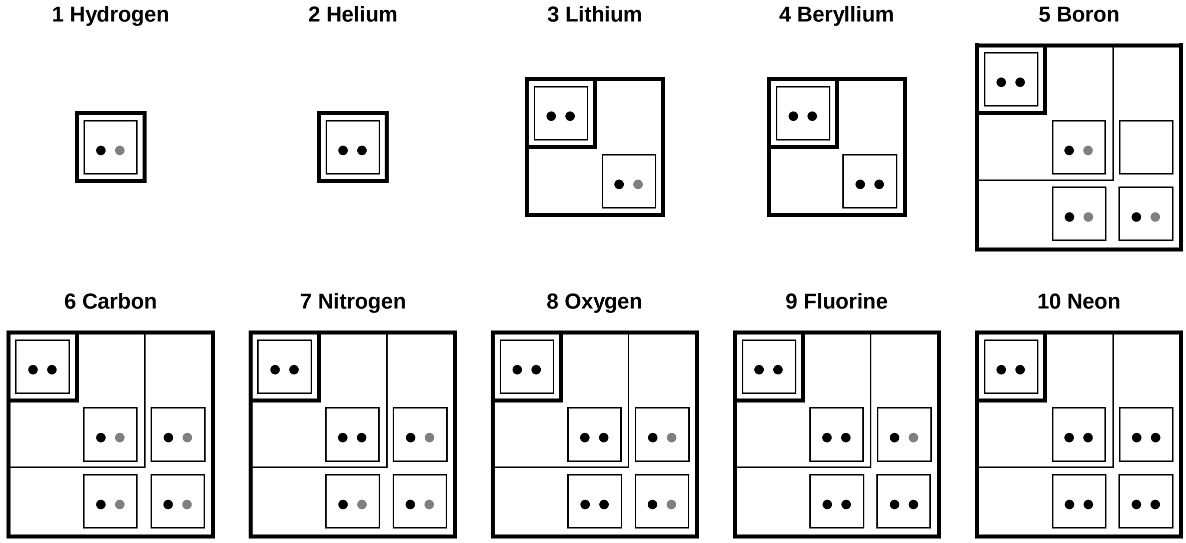


Fig. 8 Graphical quantum representation of the first ten atomic elements in chevron form design (in their saturated state). See also Fig. 2 and Fig. 5.

In this table, with this kind of graphic representation, we can clearly see the differences in electronic organization of the three groups of chemical elements isolated according to their number of quantum subshells (here 1, 2 or 3 subshells).

4.1 Atoms quantum scripting

From the concept of representation of atoms in chevron form quantum chart, we now propose a quantum writing of the chemical elements.

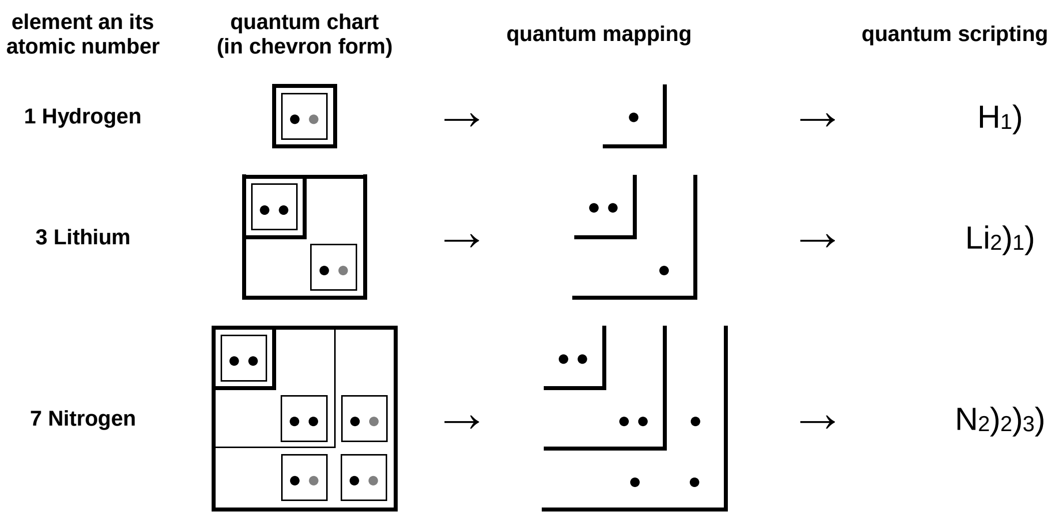


Fig. 9 Graphical scripting of chemical elements from chevron form quantum charts.

Thus, as illustrated in Figure 9, we propose for example a quantum scripting of the element nitrogen under the form:

$$\mathbf{N_{2})_{2})_{3})}$$

This type of quantum writing quickly but clearly describes the electronic structure of the element considered with the graphics parentheses separating the different subshells. This quantum scripting is more easily readable that, for example for Nitrogen, this fastidious classical script:

$$1s^2\ 2s^2\ 2p^3$$

Also, a variant of this quantum writing can be envisaged with two different sizes of parentheses distinguishing the boundaries of shells and of subshells:

$$\mathbf{N_2\Big)_2)_3\Big)}$$

In addition, it is possible to consider a simplified variant of this quantum writing of the elements by distinguishing only the shells alone (without showing the subshells):

$$\mathbf{N_2\Big)_5\Big)}$$

However, in order to clearly introduce this new concept of quantum scripting, we favour the use of the first formula with, for example, scripting $N_2)_2)_3)$ to chemical element Nitrogen.

5. Molecules quantum charts

From the atoms quantum charts in chevron form (see Figures 7 and 8), then we propose a representation of molecules under the aspect of that presented in Figure 10.

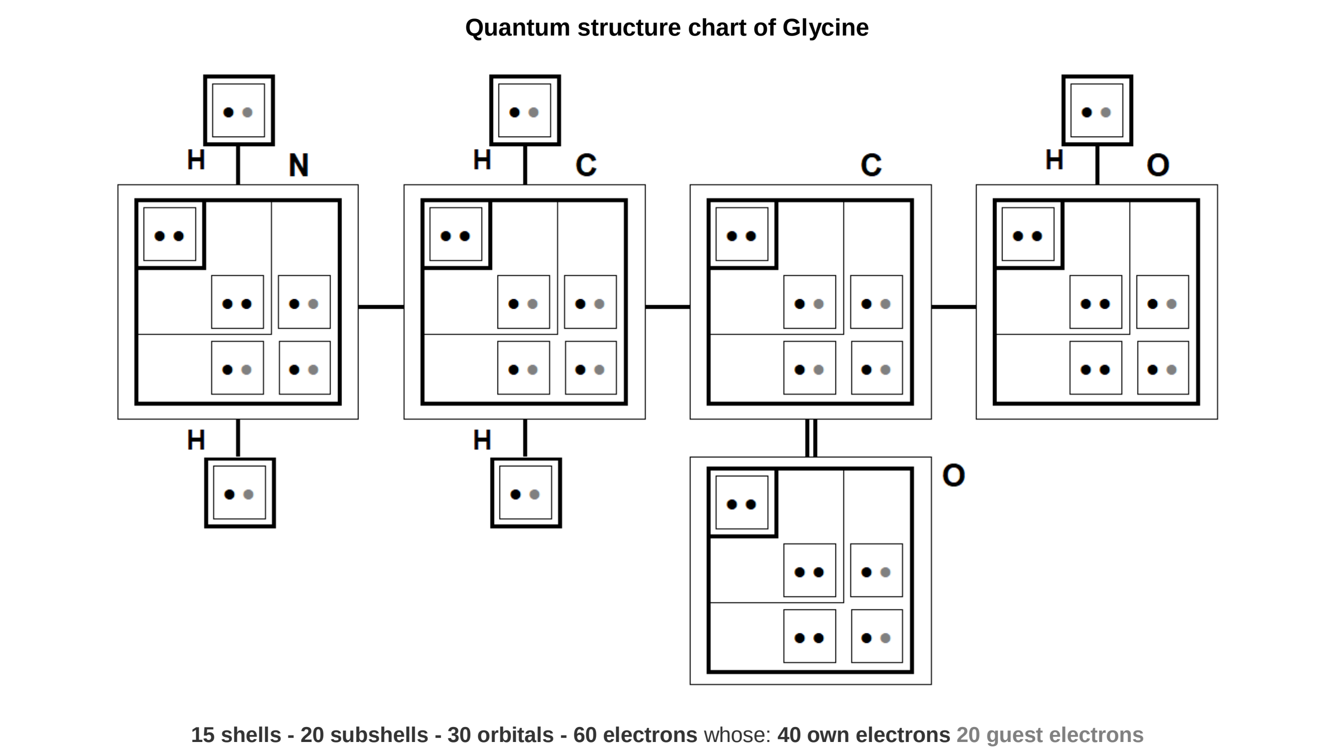


Fig. 10 Quantum structure of Glycine in a chevron form quantum chart. Own electrons (•) and guest electrons (•). See Fig. 8.

This does not represent molecular orbitals but describes the source orbitals of each atom. Again, the chevron-shaped representation of quantum shells, subshells, orbitals and electrons distributed over them appears clearer than a linear or circular representation of atoms.

6 Stealthy orbitals hypothesis

6.1 Stealthy orbitals concept introduction

This new graphic chevron-shaped representation of the quantum organization of electronic shells is the opportunity to propose the hypothesis of the existence of stealthy orbitals. We therefore propose the existence of two additional stealth orbitals on each end of the quantum subshells, this excepted for the very first subshell *1s*. Figure 11 illustrates this concept for chemical elements Nitrogen and Sulphur as example.

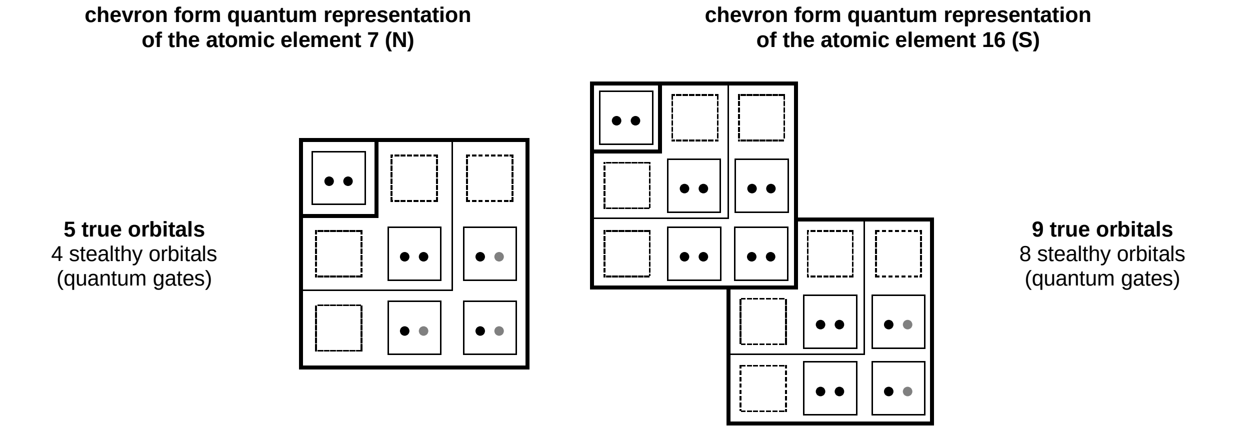


Fig. 11 Graphical quantum representation of Nitrogen and Sulphur in chevron form design (in their saturated state) with highlights of stealthy orbitals. Own electrons (•) and guest electrons (•). See Fig. 2 and Fig. 5 also.

These stealthy orbitals can be considered as quantum gates where pass electrons changing orbital and subshell, especially in their interatomic migrations.

Although these "quantum gates" graphically (in square shaped) fill the chevrons so as to close the quantum shells, they are not affected by the different quantum numbers applied to the electrons. Any of these gates can be therefore taken by any single electron within a shell.

Beyond and through these quantum gates, the electrons pass through a singularity without classical spacetime and are therefore projected instantly from an orbital to another (outside or inside atoms).

6.2 Stealthy orbitals concept depiction

Into Figure 12 amino acid Glycine is depicted in its zwitterionic state. This doubly ionized state is a good way to illustrate the different possible configurations of stealth orbitals supposed to operate in the quantum subshells of atoms.

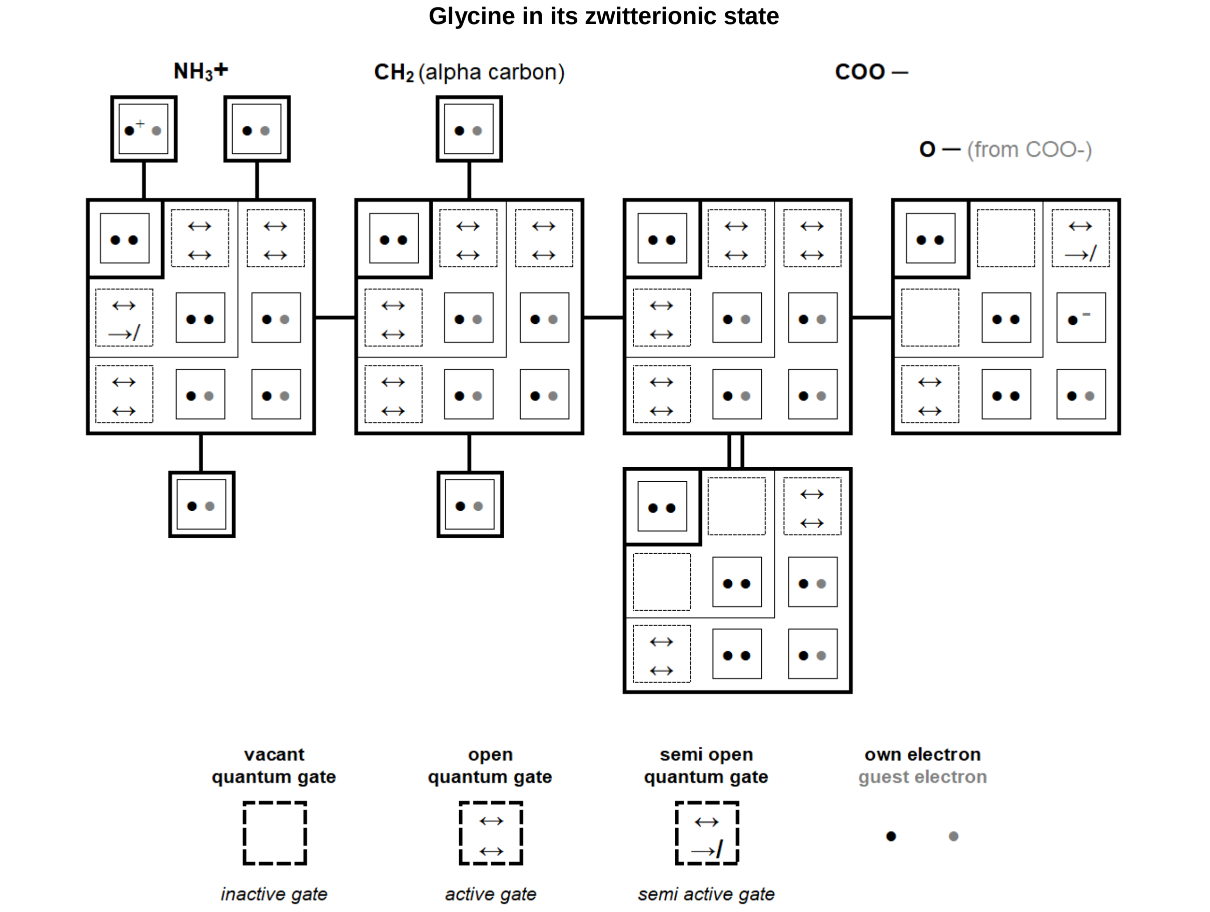
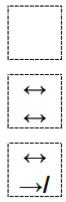


Fig. 12 Graphical quantum representation of chemical groups NH_3+, CH_2 (alpha carbon) and O- (from COO-) of amino acid Glycine in its zwitterionic state. Own electrons (•) and guest electrons (•). See Fig. 10 also.

Thus, quantum gates can be into three possible states:

conventional proposed representation

- inactive gate → vacant quantum gate
- active gate → open quantum gate
- semi active gate → semi open quantum gate



6.3 Stealthy orbitals and singularity

The stealth orbital hypothesis also requires us to propose the existence of singularities where electrons temporarily transit. The latter term is actually not really appropriate since we suggest that in these singularities there is neither time nor space. We therefore call them "singularities without spacetime". These singularities are therefore a virtual place (without space) where electrons pass when they operate in covalent bond. Figures 13 and 14 will now illustrate the quantum mechanism of these virtual entities.

6.3.1 Classical functioning of singularities

When two orbitals are in possible interaction, so stealthy orbitals activate and a singularity appears. In this new stealthy orbitals hypothesis, we suggest that the first orbital *1s* is simultaneously also as a quantum gate (stealth orbital) but only when this orbital does is by only one electron, so in fact only for the hydrogen atom.

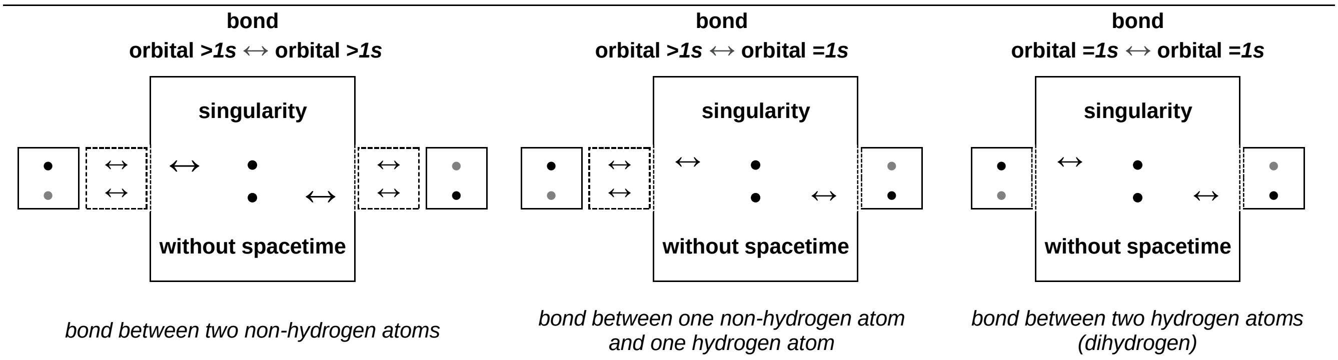


Fig. 13 Graphical quantum depiction of three classical covalent bonds using gates and quantum singularity. Own electrons (•) and guest electrons (•). See Fig. 12 also.

6.3.2 Functioning of singularities in ionised configurations

Figure 14 illustrates the interactions between orbitals of the Hydrogen in excess and of Nitrogen in the positively ionized NH3+ group and what happens to the celibate orbital of Oxygen in the negatively ionized COO- group of the zwitterionic Glycine introduced in Figure 12 and used as an example.

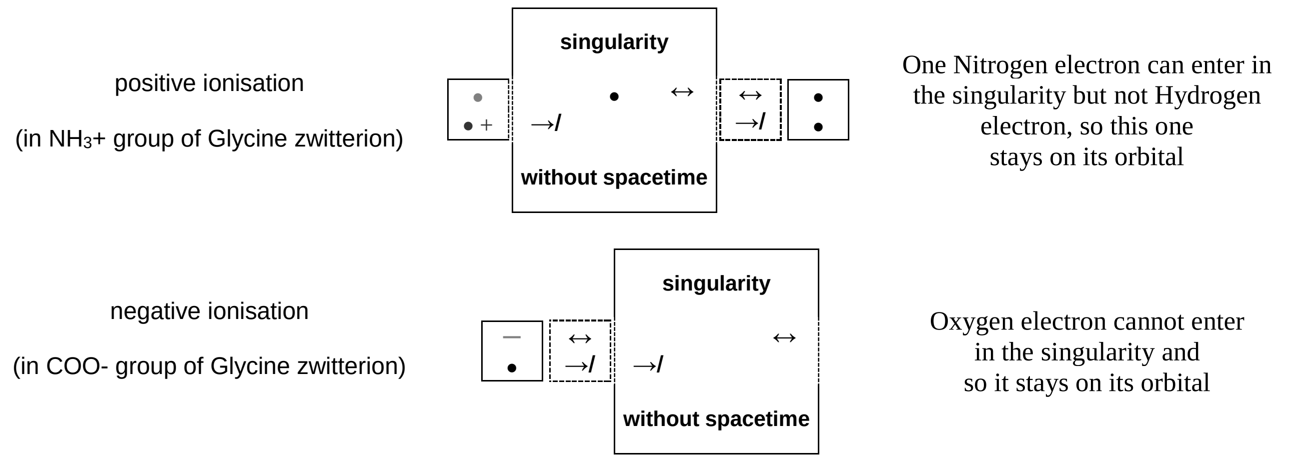


Fig. 14 Graphical quantum depiction of two ionised configurations using gates and quantum singularity in NH_3+ group and COO- group of zwitterionic Glycine. See Fig. 12 also. Own electrons (•) and guest electrons (•).

In positive ionisation, an electron (•+) from Hydrogen atom (thus orbiting on a gate-orbital*) can generate a singularity towards a quantum gate (of a non-hydrogen atom, in the example: Nitrogen). But this one, not being connected to any orbital, stays on its orbital. Nevertheless, a non-binding bond is possible between the two atoms because an electron of Nitrogen atom (from a full orbital) can cross the singularity to join and share the celibate orbital of Hydrogen atom.

In negative ionisation, a celibate electron (•-) from the third Oxygen subshell activates a gate and a singularity. But this gate remains semi closed (so, as far as, semi open) and the electron cannot penetrate or cross the singularity because there is not another activated gate (stealth orbital) due to the absence of a Hydrogen atom where it can migrate. So this electron stays on its orbital and none bond is created. However, the non-filling of the orbital in Oxygen, leave open a passage in the singularity and in the quantum gate which therefore remains semi open.

*Recall: it is agreed that, in Hydrogen atom, the first orbital *1s* is simultaneously also as a quantum gate (stealth orbital).

6.4 Functioning of singularities

Some way, one can say that various configurations illustrated in Figures 13 and 14 are as molecular orbitals. So, from the stealth orbitals hypothesis, a molecular orbital is structured like this:

orbital ↔ quantum gate ↔ singularity ↔ quantum gate ↔ orbital

As the light wave is an emanation of the photon, the singularity is an emanation of the celibate electron. Also It is the singularity, emanation of a electron, that activates the gates between celibate electrons. but these quantum gates are not emanations of electrons, they are in a vacuity state.

7 Stealthy orbitals and chevron form quantum chart

The hypothesis of stealth orbitals allows us to offer a more quantum chart trimmed and still in chevron form.

7.1 Chevron form quantum chart including stealth orbital

Figure 15 represents a chevron form quantum chart similar to that previously introduced in Figure 5 Chapter 3. However, this one is enriched with stealthy orbitals (so quantum gates) proposed in hypothesis Chapter 6.

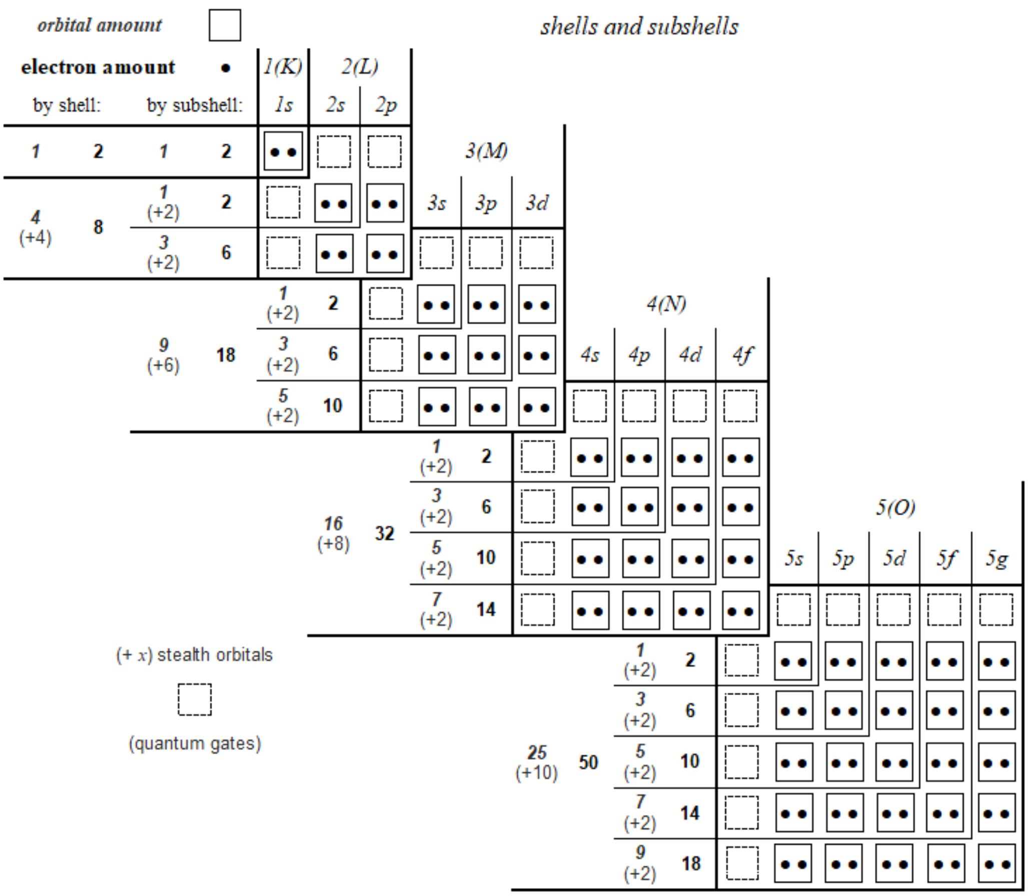


Fig. 15 Full general chevron form quantum chart representing the first 5 shells and first 15 quantum subshells of the chemical elements. Distribution of orbitals, stealthy orbitals (quantum gates) and electrons in these shells and subshells.

In this table, all the different quantum shells and subshells are graphically closed in square shaped polygons. This can approach the real physico-quantum configuration of the electronic clouds surrounding atomic nuclei and this, although we perceive them in three dimensions.

7.2 Figurative chevron form quantum chart

In a graphic optimization of the new concept of a quantum chart in chevron form, a concept integrating the hypothesis of the existence of stealth orbitals, we finally propose a figurative representation of the physico-quantum organization of the electronic shells of the different chemical elements.

Figurative chevron form quantum chart

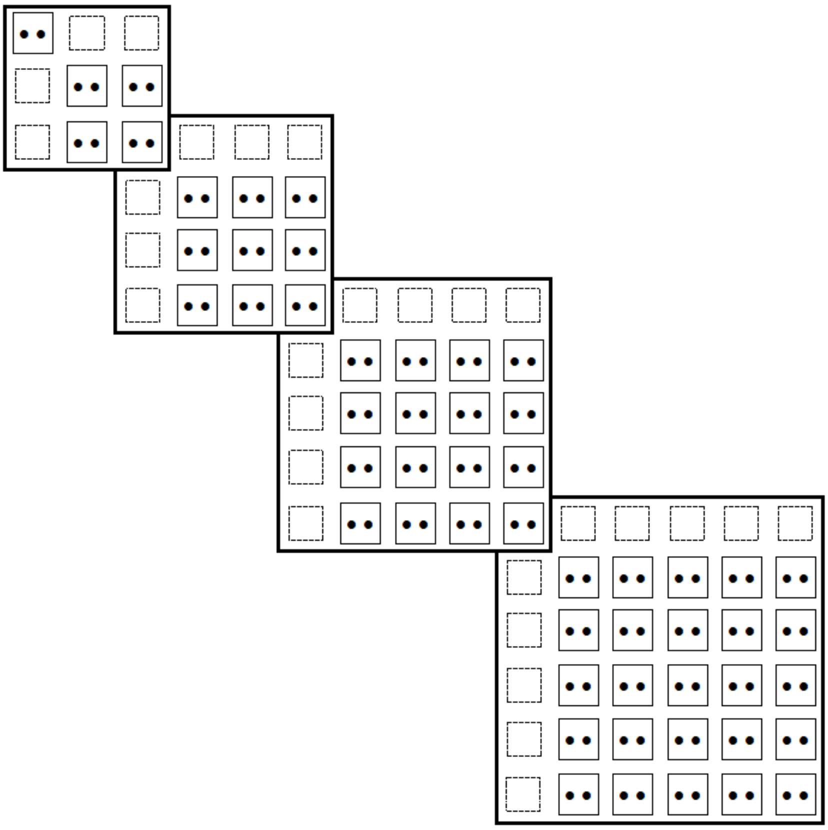


Fig. 16 In a figurative shape, general chevron form quantum chart representing the first 5 shells and first 15 quantum subshells of the chemical elements. This, as an abstract of chart in Fig.15.

This intuitive figuration illustrated in Figure 16 opens the debate of new quantum theories towards an idea of a two-dimensional structure of the clouds of electrons surrounding the atomic nuclei. However, in order not to confuse the so already complex notions introduced here, this will not be developed in this paper.

8 Orbitals, stealthy orbitals, genetic code and the 3/2 ratio

The stealth orbital hypothesis is reinforced by the permanence of an arithmetic phenomenon previously revealed in the article "Genetic code, quantum physics and the 3/2 ratio" [1]. In this paper, we have shown that the chemical elements entering into the composition of the different components of the genetic code (amino acids, DNA) are opposed in various ratios of value 3/2 according to multiple criteria.

In overlay of this, the distribution of stealth orbital these genetic components also organizes in various arithmetical ratios of 3/2 value.

8.1 The five chemicals elements of the genetic code

Only five atoms make up the twenty genetically encoded amino acids. These five different atoms distribute their electrons over one, two and three quantum shells. According to these physico-chemical criteria, chart Figure 17, these five atoms are opposed in two groups in a duality of three versus two atoms: Carbon, Nitrogen and Oxygen are with even number of quantum shells; Hydrogen and Sulphur have an odd number of quantum shells. Still in a 3/2 ratio duality, the three atoms with an even number of electron shells total six shells (2 + 2 + 2 = 6 shells) versus four (1 + 3 = 4 shells) for the two atoms with odd number of quantum shells.

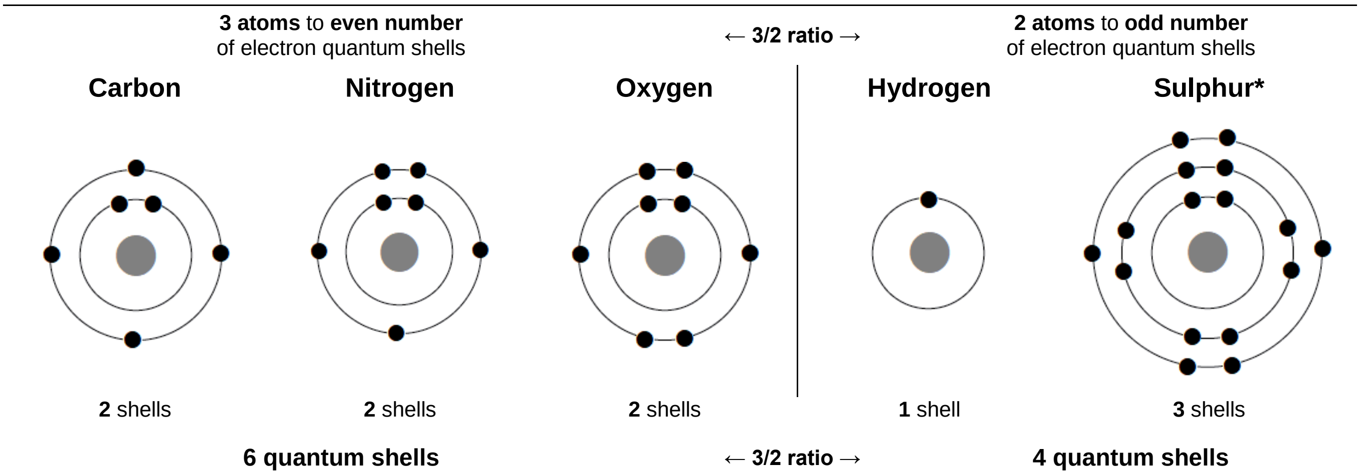


Fig. 17 Differentiation of the 5 atoms constituting 20 amino acids into 2 groups of 3 and 2 atoms according to the parity of their number of electron quantum shells. * In DNA, Phosphorus replaces Sulphur.

DNA is also made up of the same five different qualities of atoms except that Phosphorus replaces Sulphur. However, these last two atoms have the same number of electron shells and the same electronic structure in their saturated state (inside molecules) with the same maximum number of electrons that can orbit their nucleus. So Phosphorus and Sulphur having the same saturated quantum configuration, these two elements can be confused in following demonstrations.

Figure 18 illustrates the quantum structure of the five atoms working in the genetic code. Thus it appears that, both "true" orbitals and "stealth" orbitals (quantum gates) are organized in ratios of 3/2 value in the opposition of the three chemical elements with an even number of quantum shells (C, N and O) to the other two with an odd number of shells (H and S or P for DNA).

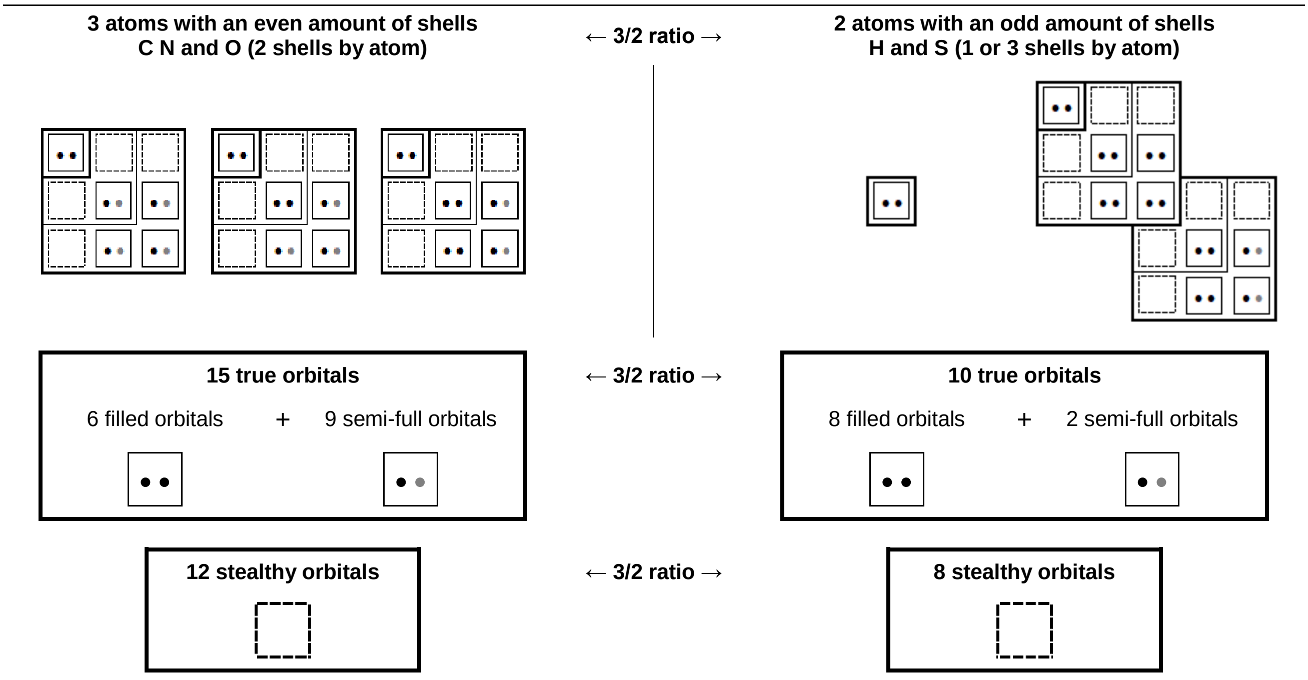


Fig. 18 Quantum structure depiction of the five chemical elements constituting 20 amino acids of genetic code. Arithmetical opposition in 3/2 ratio of true orbitals and stealth orbitals according to the parity of number of electron quantum shells of these elements (In DNA, Phosphorus replaces Sulphur).

8.2 Glycine and Methionine quantum structure

Into amino acid Glycine, the smallest proteinogenic peptide and into Methionine, the amino acid initiator of peptide chains, true and stealth orbitals (quantum gates) are distributed in singular arithmetic arrangements. These physico-quantum configurations reinforce the likelihood of the existence of these stealth orbitals. Next depictions of these two amino acid will made in isolated molecular state.

8.2.1 Glycine quantum structure

Among the twenty amino acids, Glycine is distinguished by its absence of radical. Its radical is reduced to a simple hydrogen atom which in a way simply closes the base structure common to each amino acid. So Glycine can be considered as a base, more precisely as glycined base. Quantum study of it reveals singular arithmetic arrangements of its true and stealth orbitals (quantum gates).

Complet quantum structure chart of Glycine

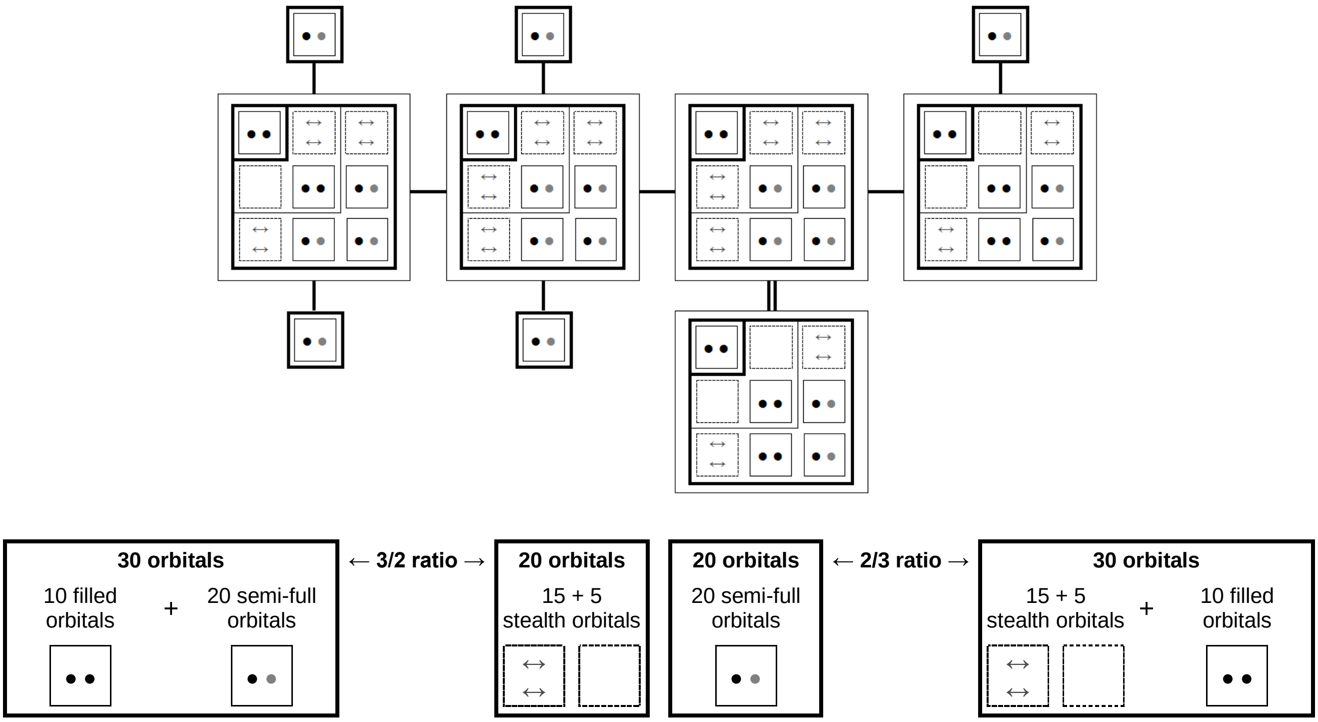


Fig. 19 Quantum structure of Glycine in a chevron form quantum chart: 30 true orbitals whose 10 filled orbitals and 20 semi-full orbitals, 20 stealthy orbitals. 40 own electrons (•) and 20 guest electrons (•). See Fig. 7 and 8.

The illustration of the detailed quantum structure of Glycine (in isolated molecular state) therefore reveals that number of true orbitals and that of stealthy orbitals are in a ratio of value 3/2. In transcendence to this, another arithmetic phenomenon is revealed. It is also that the total number of stealth orbitals and filled orbitals is equal to 3/2 that of semi-full orbitals (those of covalence).

8.2.2 Methionine quantum structure

It turns out that Methionine, the amino acid initiator of all peptide chains working in living matter, has exactly double the number of entities as Glycine, previously studied.

Figure 20, the illustration of the detailed quantum structure of Methionine (in isolated molecular state) therefore reveals that number of true orbitals and that of stealthy orbitals are, as in glycined base, in a ratio of value 3/2. Again, in transcendence to this, another arithmetic phenomenon is revealed. It is also that the total number of stealth orbitals and filled orbitals is equal to 3/2 that of semi-full orbitals (those of covalence).

Unlike Glycine, Methionine has a larger atom: Sulphur. The detailed quantum configuration of this element (showing both true and stealth orbitals, see Figure 11) differs somewhat from C, N and O. However the overall arrangement of Methionine presents the same arithmetic arrangements opposing the different types of orbitals in 3/2 value ratios as in Glycine, the other fundamental amino acid used in the genetic code.

Complet quantum structure chart of Methionine

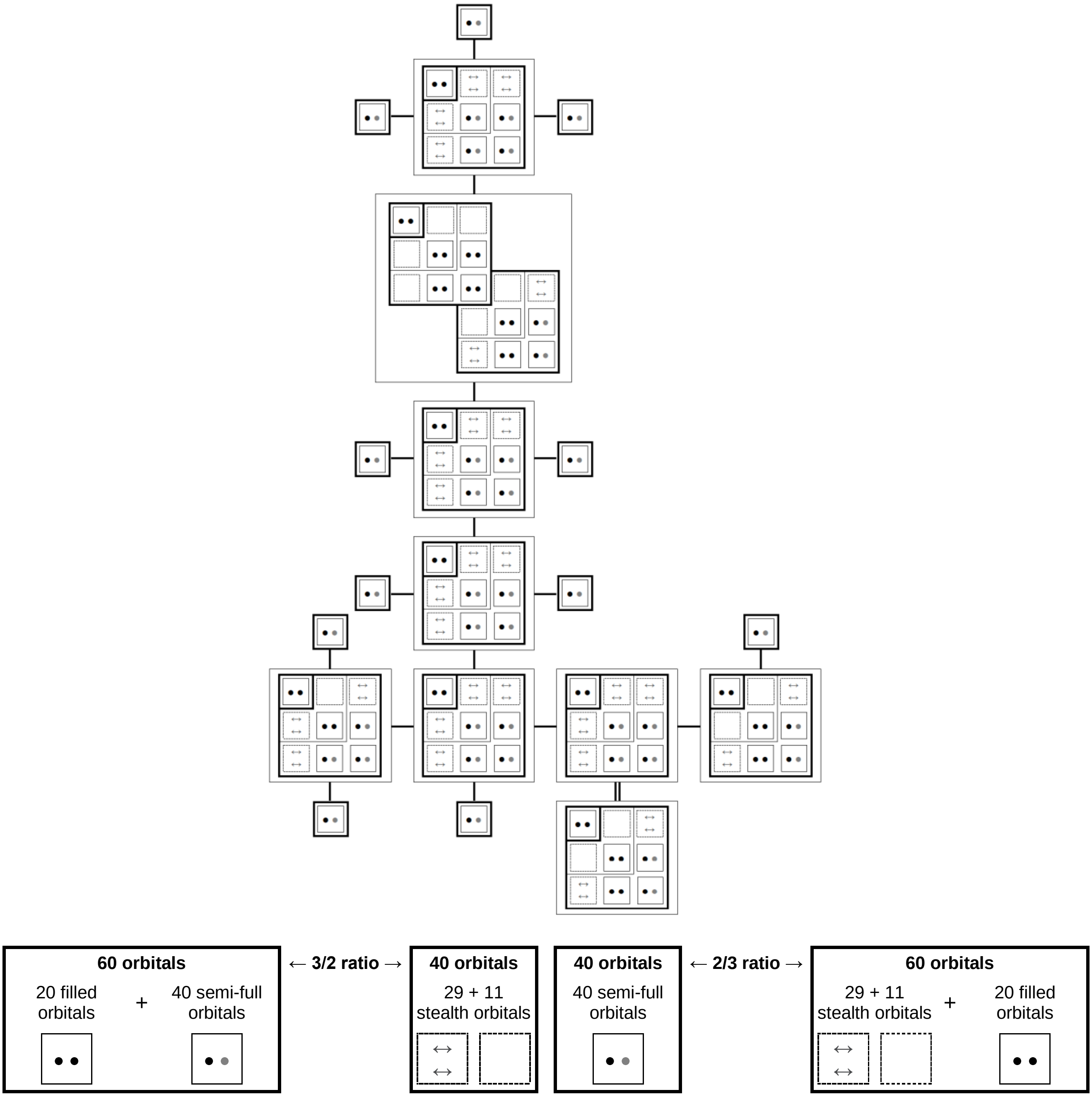


Fig. 20 Quantum structure of Methionine in a chevron form quantum chart: 60 orbitals whose 20 filled orbitals and 40 semi-full orbitals, 40 stealthy orbitals. 80 own electrons (•) and 40 guest electrons (•).See Fig. 7 and 8.

9. Synthesis of graphic and quantum proposals

Before the conclusion of this article, a synthesis of the proposals made as much on their graphic representation as on their existence is essential about true and furtive orbitals and the quantum shells where they evolve.

Figure 21 summarizes the proposals made in this paper about the graphical and quantum representations of electronic shells of chemical elements. Here are illustrated the first three shells, but of course the same representation remains valid beyond.

We therefore proposed the representation of these quantum shells in bi-dimensional spaces square shape and we intuitively filled empty proposing the existence of stealth orbits which can be also called "quantum gates." Finally, we propose that these quantum gates allow electrons to move instantly from orbitals to orbitals (and from atom to atom) by crossing singularities without space-time.

We have thus determined three possible quantum states in which these stealth orbitals can be found depending on the electronic environment that surrounds them but also generates them. Finally we were able to make several demonstrations of the functioning of all this electronic quantum structure in particular into the atomic and molecular components of the genetic code. The fact that arithmetic arrangements of the same nature are observed (in the form of a 3/2 ratio) as those previously introduced in the study [1] of the primordial constituents of the genetic code in the distribution of these real and stealthy orbitals reinforces the assumptions of existence of these last.

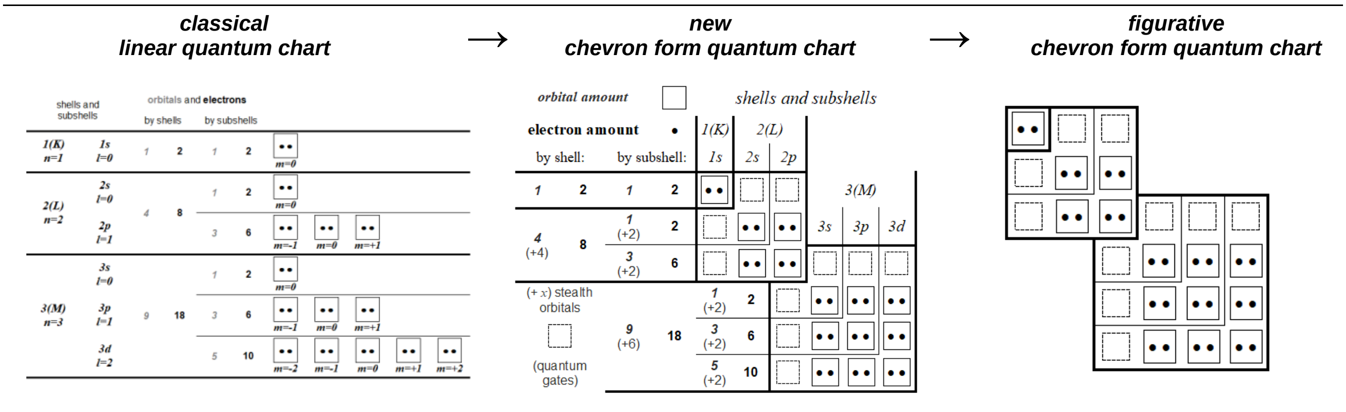


Fig. 21 Electronic quantum chart depiction of chemical elements from classical linear quantum chart to detailed chevron form quantum chart then figurative chevron form quantum chart. See Fig. 1, 2 , 15 and 16.

Conclusion

To illustrate the quantum composition of the various chemical elements, it is possible to represent, in a non-linear form, the distribution of the various electronic shells and subshells as well as the distribution of the orbitals which they contain.

It turns out that a graphic illustration of quantum shells representing them in the form of chevrons allows an instant viewing of the arithmetic connection operating between the number of these shells and the number of orbitals they can host.

In such representation, the groups of orbitals indeed appear in the form of a square structure whose size of the sides is directly proportional to the number of the shells, i.e. to the principal quantum number *n*.

Also, this new chart design is more explicit in describing the quantum structure of chemical elements and molecules they can form than any other usual linear depiction.

For these reasons, we suggest that this graphics be privileged in the study and quantum descriptions of chemical elements (atoms) and molecules. Also, we propose the name of "chevron form quantum charts" to name this new physical graphic concept.

Intuitively, we think that this type of representation can reflect a true two-dimensional and quantum organization of the electronic clouds orbiting around atomic nuclei. Also, to fill the void of square-shaped quantum charts, we propose the existence of stealthy orbitals functioning as quantum gates and which allow the transit of electrons from orbitals to orbitals.

The fact that, in the components of the genetic code, orbitals and these quantum gates are in 3/2 arithmetic proportion reinforces our beliefs that the graphical quantum description of matter that is proposed in this article approaches physical reality.

References

1. Jean-Yves Boulay. Genetic code, quantum physics and the 3/2 ratio. 2020. ⟨hal-02902700⟩

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