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The core-planets' tilt and spin rate can be explained by the Solar Protuberance Hypothesis and Gyro-Gravitation.

by using the Solar Protuberance Hypothesis and the Maxwell Analogy for Gravitation.

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Summary

Several of my former papers showed that a huge solar protuberance created the gas planets of our solar system. A c*uriosum* is the changed sequence order of the actual gas planets compared with their sequence order when the solar protuberance has occurred.
In my paper *"Is the Earth a Former Solar Sunspot?"*, strong evidence was given that the core planets as well were created by the same solar explosion : the impulse of the protons related to the exploded gas-planets out of the sun, corresponded perfectly with the impulse of the equivalent number of electrons that were related to the explosion of the core-planets, at the same instant.
In the present paper, I come to the second *curiosum*, that the proto-planets Mercury and Venus have been ejected in a retrograde orbit, and the proto-planets Earth and Mars have been ejected in a prograde orbit.
We show why Mercury and Venus came back in a prograde orbit and why both planets have a very slow spin rate, while the Earth and Mars have almost the same spin rate.
Finally, we find that the ejection of the four planets corresponds with the remarkable Titius-Bode law as well.

Key words - solar sunspot, core planets, solar protuberance, retrograde orbit.
Method - Analytical.
Notation - Decimals with comma.

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1. The solar protuberance. - *pro memore*

The gas-part and the core-part – Basic concept

As explained in my former papers, the protuberance was a solar eruption in which all types of the planet's atoms were already present. It caused the ejection of matter, about 0,15 % of the sun's total mass, at a speed of about 10^5 *m/s* .
The hypothesis of a solar protuberance implies that the planets were created from one eruption only, but consisted of two (successive or simultaneous) eruption shocks: a first eruption shock of mainly hydrogen and some helium at one side of the protuberance (proto-Uranus, -Neptune, -Saturn, -Jupiter), followed by an implosion-explosion shock due to the hydrogen shock wave hitting a solar spot at the other side of the electromagnetic force line of that protuberance (proto-Mercury, -Venus, -Earth, -Mars).

The electromagnetic properties of a solar protuberance – A screwing hot cloud

When the protuberance or eruption is formed, and taking in account the second shock, hitting the solar spot, the serie of proto-planets has the following shape. When mass ejections occur, at very high temperature, the ionised hydrogen and the electrons follow a magnetic path which quit one sunspot pole and go to the other pole, creating so a magnetic buckle outside the sun's surface (fig.1.1).

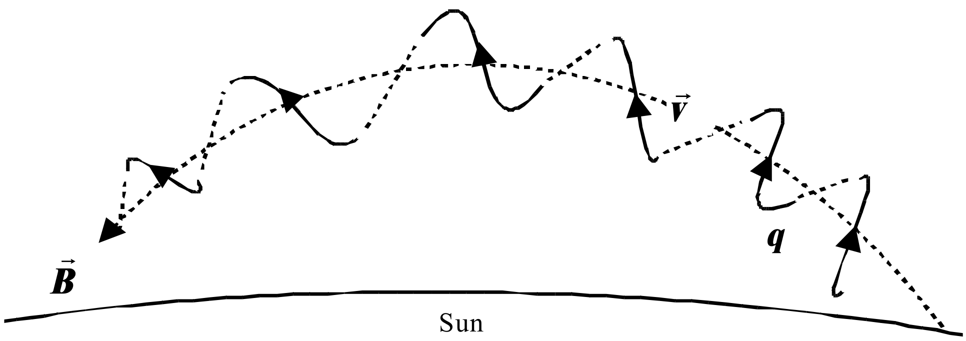

Fig.1.1*: protuberance hypothesis: ions, protons spiralling about a magnetic path.*

In fig.1.1 , **B** is the magnetic field, **q** the electric charge and **v** the screwing speed of the hot cloud. Remark that the dynamics of the cloud are almost solely defined by the positive hydrogen ions. The electrons will screw very tightly about the electromagnetic force line, in the inverted screwing direction of the hydrogen- and helium ions.

Disruption into proto-planets – Basic equations

How did the protuberance exactly split-up into proto-planets? Therefore we have to look at fig.1.2.

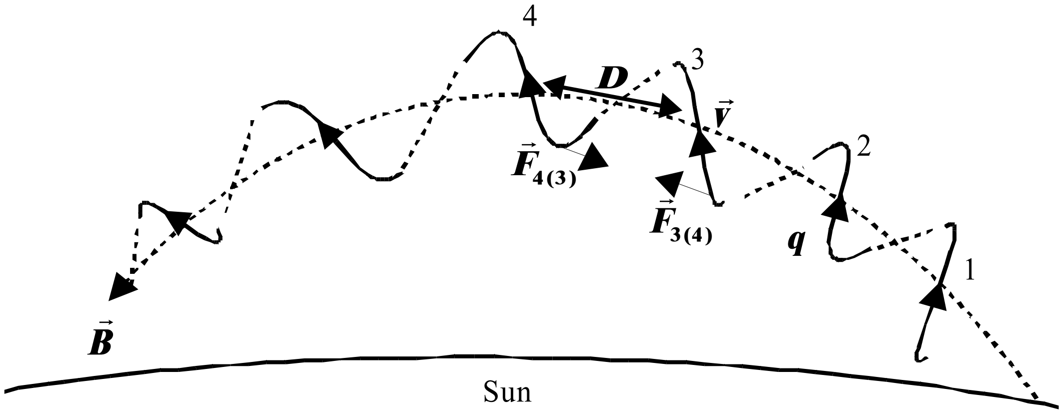

Fig.1.2*: Lorentz and Coulomb forces in the solar protuberance.*

Since there are four core planets known, I will restrict the number of parts to four, assuming that the gas planets don't influence the core planets formation.
Each part of the screwing hot cloud will undergo a force from the other parts. So, it follows that the cloud will expand in length, allowing the final separation of the parts into proto-planets. The distance D between the parts is assumed to be the same for the whole protuberance.
In the drawing, I have shown two examples of forces: $F_{4(3)}$ and $F_{3(4)}$ which mean respectively the force on part 4 due to part 3, and the force on part 3 by the part 4.
For simplicity, I consider the X-axis positive to the right side, and I disregard the bending of the magnetic force line. This is allowed because, at the end, all the planets move in elliptic orbits, and the starting direction of the proto-planets at this stage of the study is then of little importance.

The forces can then be written as follows.

For part 1 (the first proto-core-planet):

$$F_{1(2)} = \frac{q_1 q_2}{4\pi\varepsilon_0 D^2} \qquad F_{1(3)} = \frac{q_1 q_3}{4\pi\varepsilon_0 (2D)^2} \qquad F_{1(4)} = \frac{q_1 q_4}{4\pi\varepsilon_0 (3D)^2}$$

Hence :

$$F_1 = \sum_{i=2}^{4} F_{1(i)} = \frac{q_1 (36q_2 + 9q_3 + 4q_4)}{144\pi\varepsilon_0 D^2} \qquad (1.1)$$

and the acceleration a_1 of the part 1 with mass m_1 is : $$a_1 = \frac{F_1}{m_1} \qquad (1.2)$$

For the acceleration of the other parts of course, a similar equation as (2.2) exists.

For part 2 :

$$F_{2(1)} = \frac{-q_2 q_1}{4\pi\varepsilon_0 D^2} \qquad F_{2(3)} = \frac{q_2 q_3}{4\pi\varepsilon_0 D^2} \qquad F_{2(4)} = \frac{q_2 q_4}{4\pi\varepsilon_0 (2D)^2}$$

Hence :

$$F_2 = \sum_{i=1,3,4} F_{2(i)} = \frac{q_2(-4q_1 + 4q_3 + q_4)}{16\pi\varepsilon_0 D^2} \qquad (1.3)$$

For part 3 :

$$F_{3(1)} = \frac{-q_3 q_1}{4\pi\varepsilon_0 (2D)^2} \qquad F_{3(2)} = \frac{-q_3 q_2}{4\pi\varepsilon_0 D^2} \qquad F_{3(4)} = \frac{q_3 q_4}{4\pi\varepsilon_0 D^2}$$

Hence :

$$F_3 = \sum_{i=1,2,4} F_{3(i)} = \frac{q_3(-q_1 - 4q_2 + 4q_4)}{16\pi\varepsilon_0 D^2} \qquad (1.4)$$

For part 4 :

$$F_{4(1)} = \frac{-q_4 q_1}{4\pi\varepsilon_0 (3D)^2} \qquad F_{4(2)} = \frac{-q_4 q_2}{4\pi\varepsilon_0 (2D)^2} \qquad F_{4(3)} = \frac{-q_4 q_3}{4\pi\varepsilon_0 D^2}$$

Hence :

$$F_4 = \sum_{i=1}^{3} F_{4(i)} = \frac{-q_4\,(4q_1 + 9q_2 + 36q_3)}{144\,\pi\,\varepsilon_0\,D^2} \qquad (1.5)$$

The order of the proto-planets however is not known, and we have to find this out by reasoning or by trying out all the possibilities.

2. Evaluating the core planets' order.

The core planets' order based on the actual physical data – *A normal sequence order.*

In the table 2.1 we see that the core planets' order seems to be quite normal compared with the sequence order of the gas planets, which at their creation (proto-planets) were having the sequence order proto-Uranus, -Saturn, -Jupiter, -Neptune.
The core-planets show first a small planet and ends-up with a small planet as well, just as the shape of a usual solar protuberance.

With (1.2), the acceleration of the parts of the protuberance can be calculated, taking in account the electrical charges, which are directly proportional with the known planetary masses. In fact, unlike the gas-planets, where the main element is hydrogen, with an electrical charge of 1 versus the atomic mass, the core-planets will have an electrical charge of ½ versus the atomic mass of the elements, because the neutrons are equally present as the protons.

		SUN	MERCURY	VENUS	EARTH	MARS	JUPITER	SATURN	URANUS	NEPTUNE	PLUTO
Mass	(10^{24}kg)	*1989000*	*0,33*	*4,87*	*5,97*	*0,642*	*1899*	*568*	*86,8*	*102*	*0,0125*
Diameter	(10^3 m)	*1390000*	*4879*	*12104*	*12756*	*6794*	*142984*	*120536*	*51118*	*49528*	*2390*
Density	(kg/m^3)		*5427*	*5243*	*5515*	*3933*	*1326*	*687*	*1270*	*1638*	*1750*
Rotation Period	(hours)		*1407,6*	*-5832,5*	*23,9*	*24,6*	*9,9*	*10,7*	*-17,2*	*16,1*	*-153,3*
Distance from Sun	(10^9 m)		*57,9*	*108,2*	*149,6*	*227,9*	*778,6*	*1433,5*	*2872,5*	*4495,1*	*5870*
Orbital Period	(days)		*88*	*224,7*	*365,2*	*687*	*4331*	*10747*	*30589*	*59800*	*90588*
Orbital Inclination	(degrees)		*7*	*3,4*	*0*	*1,9*	*1,3*	*2,5*	*0,8*	*1,8*	*17,2*
Orbital Eccentricity	Eccentricity		*0,205*	*0,007*	*0,017*	*0,094*	*0,049*	*0,057*	*0,046*	*0,011*	*0,244*
Axial Tilt	(degrees)		*0,01*	*177,4*	*23,5*	*25,2*	*3,1*	*26,7*	*97,8*	*28,3*	*122,5*

table 2.1[16]

Now, let us look at the chemical composition of the core planets and try to deduce the proto-planet sequence order that possibly is the most appropriate choice.

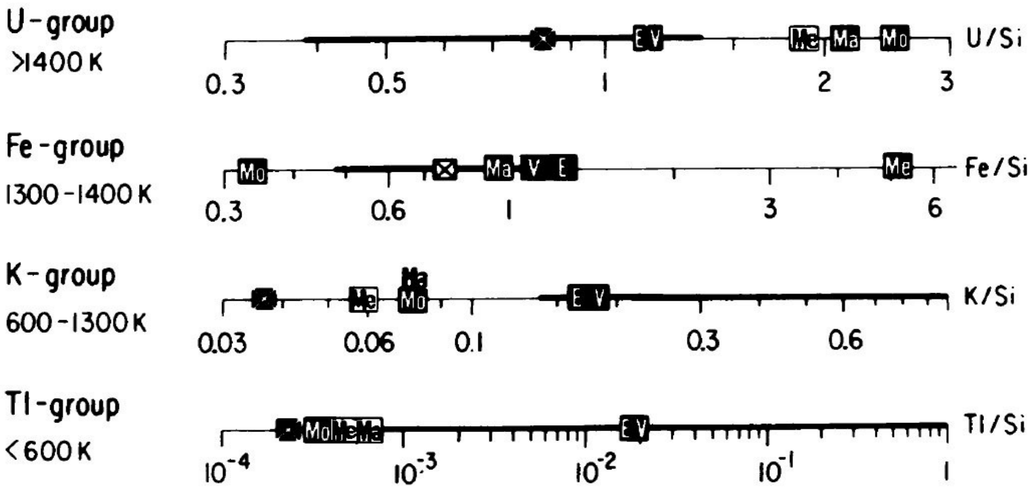

Fig. 2.1[17]: *Chemical composition of the core planets and the Moon.*

In fig.2.1, we show the relative compositions of the planets Mercury (Me), Venus (Ve), Earth (E), Mars (Ma) and the Moon (Mo). Since our hypothesis is that the core-planets are originated from a solar sunspot, we will especially look at the iron composition, because the distribution of other elements in solar sunspots are not known.

In the whole fig.2.1 , we find Venus and Earth close together. For Mars, we also get figures that are relatively close to Venus and Earth, especially for the content of iron. Only Mercury shows a higher relative content of iron, compared with the other core planets.

Based on this table, we can only conclude that the Earth and Venus were probably grouped as proto-planets. Mercury has a stronger iron content, and Mars and Mercury got a composition that is very close to that of the Earth and Venus.

Comparing the actual planets and the proto-planets' sequence order. *– the basic order is incorrect.*

When the equations (1.1) to (1.5) are used for the four core-planets, we can find 4! = 24 solutions for the original proto-planets' sequence order. Since the order 1,2,3,4 is fully symmetrical to the order 4,3,2,1 , we will only get 4!/2 significant sequence order possibilities of the proto-planets. Hopefully, only one solution of them will give a good correlation between the actual orbit positions of the planets, compared with the original order sequence that is tested.

	Proto planets	M [kg] (xE24)	q [C] Comparative figures.	F (N)	a [m/s²]	r (xE9) orbit
1	**Mercury**	0,33	0,33	0,53	1,61	57,9
2	**Venus**	4,87	4,87	7,06	1,45	108,2
3	**Earth**	5,97	5,97	-6,43	-1,08	149,6
4	**Mars**	0,64	0,64	-1,16	-1,81	227,9

Table 2.2 : *test for a proto-planets' sequence order. We chose the same order of the proto-planets as their actual sequence order.*

In the table 2.2 , the equations (2.1) to (2.5) are applied on the supposition that the core planets' positions in the large sun's protuberance were originally the same as the actual ones.

It is clear that the values of the Coulomb force F are tangential to the Sun, but radial forces to the proto-planets. The values of F and a are only mutually comparative and not absolute values. We multiply F with an unknown factor because the value of the distances D between the protuberances' parts are not known. The results for the initial acceleration a of the proto-planets' are multiplied with an unknown constant factor p as well.

I connect the condition for the direct proportionality of the accelerations with the orbit radii to the following: the physical-geometrical law (for low velocities, where v is the tangential velocity to the orbit)

$$v^2 = GM / r \qquad (2.1)$$

must have been able to catch the planets into orbits, while they decelerated due to the increasing distance to the sun, and thanks to the bending path of the ejected proto-planets, caused by the sun's gravitation.

The more the proto-planets become distant to the Sun, the more the they also become distant to each other and the more their velocities loose their radial orientation towards the Sun and instead become tangential velocities by respect to the Sun. This means that a and r are directly proportional : $a \sim r$.

For the easy use of the calculations, I have put the figures of the electric charges of the proto-planets equal to the actual masses' data of the planets, multiplied with a constant factor $k = q_e /(m_p + m_n) \approx q_e /(2\ m_p)$.
The reasons are that it is probable that the hot cloud was almost totally ionised.

Interpretation of the acceleration's sign – *Retrograde orbits become prograde orbits.*

Indeed, the sign of the acceleration can initiate an prograde or a retrograde orbit about the sun. A negative (positive) sign for the acceleration will cause a prograde (retrograde) orbit, -or inversely-.
Even when the orbits initiate in retrograde way, these orbits will turn back into prograde orbits, as explained in *"A coherent dual vector field theory for gravitation"*. This *angular orbit-swivelling* is generated by any body, moving in the spinning gravitation field of the sun, and the conclusion was that the prograde-wise spinning sun will automatically generate prograde orbits of the planets. During this angular orbit-swivelling, the orbit's diameter remains unchanged, and the retrograde orbit turns towards a prograde orbit, more or less about a virtual axis, laying in the sun's equator plane.

The loss of angular momentum when a retrograde orbit swivels into a prograde one.

If a full prograde orbit is at 0° and consequently at the Sun's equator level, a retrograde orbit can be defined as an orbit between -90° and +90°. The full retrograde orbit is at 180° and this orbit will need the most energy to swivel into a full prograde orbit.
The energy for swivelling is provided by the Sun's gyrotation field, and there is no reason for an energy loss.

Definition of a statistical gauge for evaluating possible order sequences.

Table 2.2 is not resulting in accelerations that are directly proportional with the distances of the actual orbits of the planets. According table 2.2, the final order-sequence would then have become : Earth, Venus, Mercury, Mars, which is not correct.

When applying the statistically based equation

$$\sqrt{\sum_{i=1}^{4}\left(\boldsymbol{a}_i/\boldsymbol{r}_i\right)^2}\Big/\sum_{i=1}^{4}\left|\boldsymbol{a}_i/\boldsymbol{r}_i\right| \qquad (2.1)$$

we can compare the proto-planets' accelerations and the today's orbital radii. The results we can find using (2.1) will be situated between 0,5 (perfect fit) and 1 (worst fit). The statistical value of (2.1) is not defined here and we consider it only as an indicator and a standardisation method for the results.

If we want to transform the gradation from 0 (or 0% , worst fit) to 1 (or 100% , perfect fit) we need to use (2.2).

$$\boldsymbol{X} = \mathbf{2}\left(\mathbf{1} - \sqrt{\sum_{i=1}^{4}\left(\boldsymbol{a}_i/\boldsymbol{r}_i\right)^2}\Big/\sum_{i=1}^{4}\left|\boldsymbol{a}_i/\boldsymbol{r}_i\right|\right) \qquad (2.2)$$

In the case of table 2.2 we got a result of X = 0,91 or a 91% fit, which is reasonably good but not good enough to be a proof. Ideally, in order to get a real fit, we need to reach at least a fit of 97% , provided that there is only one solution between 97% ± 3%. In other words, we only can be sure of a final result if it is clearly superior to the rest of the group of possible solutions.

Since the hypothesis of table 2.2 wasn't correct, other alternatives should be tested.

Testing other sequence orders – *There is no best fit.*

There are two sequence orders that have results for X that are 0,96 or 0,97. These are the ones where the Earth and Venus are grouped together at the beginning or the end of the protuberance.

Indeed, the two mirror-solutions come to the same result. But that means that we didn't find any perfectly fit for the protuberance's sequence order of the core planets.

One could say that one of the reasons of that failure can be that the distance D is not a constant for the core planets. So, we could try all the combinations including many variations of the distance D. But will that augment the reliability of the result?

We will look at this phenomenon in the next chapter and analyse it.

3. The interpretation of the results.

Hypothesis: the distance D wasn't a constant – Proto-Venus and -Earth were closer.

This hypothesis is at least suspicious. Don't we risk to just try to find a solution by finding a value for D that fits without any physical ground? Moreover, if we would find a better result, would it be reliable when based on some iterating manipulation of figures? The answer is that we have no certitude anyway, even if we find a good fit.
I tried a number of possibilities where I made variate D between 0.8 D and 1.1 D but that mostly gave worse results. We got only one good fit : when the distance between the middle two proto-planets is reduced from D to 0,86 D , for the sequence order Mercury, Mars, Venus, Earth, we get a fit of X = 0,988 which is excellent.

	Proto planets	M [kg] (xE24)	q [C]	F (N)	a [m/s²]	r (xE9)	a/r
			mutually comparative figures only				
1	**Earth**	5,97	5,97	7,61	1,27	149,6	117,43
2	**Venus**	4,87	4,87	-6,1	-1,25	108,2	-86,45
3	**Mars**	0,64	0,64	-1,28	-2	227,9	-114,23
4	**Mercury**	0,33	0,33	-0,23	-0,69	57,9	-83,32
						***X* =**	**0,988**

Table 3.1: *result for the proto-core-planets with a distance between the middle two proto-planets that is reduced from* D *to 0,86* D *. Proto-Mercury and -Venus have very similar values of* a/r *and Mars and the Earth as well.*

Remark that the mass of the Earth almost equals the sum of the three other planets. This is an interesting complement of evidence for the choice of the proto-planets' sequence order. From that point of view, the group of Venus + Mars + Mercury is balanced with the Earth. Moreover, Venus and the Earth are almost twins by size and by composition. Therefore, the proposed proto- sequence order seems to be the only reasonable one. Finally, the correct chemical composition of Mars is not well know, and most of the publications have extrapolated them according the actual sequence order [18].

The proto-planets Mercury, Venus and Mars have been projected in retrograde direction and the orbits have been swivelling towards prograde orbits in time. The Earth was projected in prograde direction. We analyse this case in more detail in the next chapter.

The exploded sunspot turned itself into a sequence of proto-planets – It exploded like an onion.

As we saw in my former paper "*Is the Earth a Former Solar Sunspot?*", I show that the sum of the gas planets' impulsion, seen as protons, have projected the same quantity of electrons into a sunspot which generated an equivalent quantity of core planets' impulsion. Both the gas planets and the core planets are strictly bound as two groups of four planets. The group of gas planets as generated by very hot protons and the group of core planets as generated by much colder electrons.

When looking from Mercury to the other planets, the proto-planets' sequence order begins with the most iron-contenting planets and ends with the planet having the most diversified number of atomic elements, the Earth. It probably exploded like an onion : in the middle, Mercury; around it, the first layer, Mars; then the second layer Venus and finally the last layer: the Earth.

The mystery of the sequence proto-planets, their spin rate and their tilt two by two.

In the table 3.1 , the proto-planets Mars and Earth show almost identical figures for a/r . The same is true for the proto-planets Mercury and Venus. What did they make grouping? No one can tell this for sure and we can only emit hypotheses.
Remarkable is also that two planet-groups have the same spin rates and tilts (the inverted tilt of Venus is considered equivalent because the spin is nearly zero).
Can all this be accidental, or is this mutually related? The probability for an accidental fit is 4!/(2!2!) or 16,7 %. I believe we should look at the more probable 83,3 %.

The global tilt of four of the eight planets is around 26°. The other planets are tilted near zero or a multiple of 90°. And the rotation time of two of the core planets is about 24 hours, whereas that of the gas planets is about 10 to 17 days.

One of the possible reasons of the very slow spin of Mercury and Venus could be that both proto-planets started to leave the solar protuberance under an angle with the magnetic path of that protuberance or under an angle with another magnetic path. This would result in an interaction between the ionized proto-planets and the magnetic path by a Lorentz force.
The Lorentz force, acting upon the circling ionized ring could have flipped the ring when it slid perpendicularly through the magnetic path. When the spinning ring has flipped by force, it has transformed its spin direction into the inverted direction. But by doing this, its original angular momentum has been totally consumed. The spin value is reduced to almost zero.

4. Discussion and conclusion.

One could be impressed by the excellent fit of the proto-planets sequence Earth, Venus, Mars, Mercury. However, when we look at the chemical content, the correspondence is logical. No other order sequence would better fit with the figures. It is very probable that the four core planets came out of a protuberance that was originated by the electrons. These electrons correspond to the mass of the core planets just as correspond the same quantity of protons with the mass of the gas planets.
The vanishing of the spin of Mercury and Venus could perfectly happen by the swivelling of the proto-planets when they slid over a solar magnetic path, with the result of a spin flip and a consumption of the spin. Mercury could have been re-flipped afterwards by a magnetic solar field, due to its high content of iron.
Based on the analysis of this paper, it seems obvious that the core planets are born out of a sunspot and its area, while the gas planets are created by an electromagnetic explosion out of the solar surface.

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