

# Could Mars have intra-planetary life?

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## Abstract

A popular article in National Geographic tells about unexpected findings made by the first robotic geophysicist, the Insight lander revealed in the European Planetary Science Congress and in the American Astronomical Society. There are odd magnetic pulsations with frequency around 10 mHz occurring at Martian night-time: for Earth these pulsations occur in frequency range 1 mHz to 1 Hz. Mars has much stronger magnetic field as expected. The magnetic field was detected at heights 96-400 km.

Besides this there is evidence for the existence for a global electrically conductive layer about 6 km below the surface, which suggest an underground reservoir of water. This has enormous implications for potential existence of life in Mars. There is also earlier evidence for the existence of salty, liquid water measuring about 19 km across.

In this article I discuss the findings from TGD point of view.

## 1 Introduction

A popular article in National Geographic (see <http://tinyurl.com/y5unt6y7>) tells about unexpected findings made by the first robotic geophysicist, the Insight lander revealed in the European Planetary Science Congress and in the American Astronomical Society. There are odd magnetic pulsations with frequency around 10 mHz [E1] (see <http://tinyurl.com/y3118kcg>) occurring at Martian night-time: for Earth these pulsations occur in frequency range 1 mHz to 1 Hz. Mars has much stronger magnetic field as expected: the strength is rather near to that of Earth at Earth radius if it extends so far. The magnetic field was detected at heights 96-400 km.

Besides this there is evidence for the existence for a global electrically conductive layer about 6 km below the surface, which suggest an underground reservoir of water. This has enormous implications for potential existence of life in Mars. There is also earlier evidence for the existence of salty, liquid water measuring about 19 km across (see <http://tinyurl.com/ycjaky5g>).

In the sequel I will discuss the findings from TGD point of view. For years ago I developed what I called expanding Earth model [L5, L4] with motivation coming from the finding that if the radius of Earth is 1/2 of its recent value, continents fit nicely together. This strengthens Wegener's finding. In TGD smooth cosmic expansion is replaced with a sequence of rapid steps, and the proposal was that the rapid expansion increasing the radius by factor 2 could explain the sudden emergence of highly developed life forms in Cambrian explosion. They would have bursted from underground ocean as the crust of Earth broke to continents and led to the formation of oceans.

The model solves several problems related to the evolution and allows also new view about the evolution of climate replacing the snowball Earth model. The new findings allow to develop the model further.

1. Also Mars would have magnetic field but it would contain only the part for which flux tubes carry monopole flux so that no currents would be required to maintain it. Also Earth would have monopole part of field besides ordinary part requiring currents to maintain it. The monopole part would correspond to what I have called endogenous magnetic field with strength 2/5 of the magnetic field of Earth [L2].

Van Allen belts would be present but carry dark matter in TGD sense and would bring ions of the solar wind to the interior of Earth - in particular to the ocean below martial surface. The ionosphere in the oceans below crust would not be lost to the outer space so that the oceans would serve as a womb for the prebiotic evolution. The model explains why the magnetic field has not been detected but explains the mysterious finding that auroras requiring the presence of magnetic field appear also in Mars.

2. The standard model assumes that the outer core of Mars somehow disappeared and that this led to the collapse of the magnetic field. TGD model suggests the opposite. Mars has never had separate inner and outer cores. In the case of Earth the expansion doubled the radius of the core and it split to inner and outer core and outer core gave rise to the ordinary magnetic field.
3. The prebiotic evolution in the interiors of Earth and Mars has been discussed already earlier [L3] [K1, K2]. The recent findings lead to a more detailed picture. Solar radiation propagating as dark photon along monopole flux tubes to the underground oceans and transforming to ordinary photons (bio-photons) would make possible photosynthesis in the underground ocean producing also oxygen. This would allow oxygen based metabolism. The underground water containing the life forms would burst to the surface in the expansion. The emergence of the convective inner core would create ordinary magnetic field preventing the leakage of the atmosphere and life would continue to evolve in the oceans.

## 2 TGD based model for the findings and for intra-martial life

The strange findings about Mars [E1] can be understood in the framework provided by TGD based model for expanding Earth providing also explanation for the mysterious Cambrian explosion assuming that the life developed in Earth's interior, TGD based notion of magnetic field, and dark matter identified as phases with nonstandard value  $h_{eff} = nh_0$  of Planck constant.

### 2.1 Connection with the TGD inspired model of Expanding Earth

The findings bring in mind TGD based model for expanding Earth [L5, L4, ?] (see <http://tinyurl.com/yc4rgkco>, <http://tinyurl.com/yb68uo3y>, and <http://tinyurl.com/ya68nggs>).

1. The observation is that if Earth has radius one half of its recent radius the continents fit nicely together to cover entire surface of Earth. This led to the proposal that during Cambrian explosion in which highly developed life formed mysteriously emerged, the Earth radius grew by factor 2 in a relatively short time. The life would have evolved in Mother Gaia's womb, underground oceans perhaps between crust and asthenosphere at depth not larger than 80 km, shielded from cosmic rays and meteoric bombardment.
2. The sudden expansion can be modelled in TGD inspired new physics as a phase transition increasing the p-adic length scale of Earth and reducing the scale dependent cosmological constant assignable to Earth by factor 1/4: these kind of phase transitions replace smooth cosmological expansion in TGD inspired cosmology.

This led to the splitting of the continuous crust to continents and oceans emerged as the water from underground oceans containing the highly developed life forms burst to the surface.

3. The intriguing coincidence is that Mars has radius which is 1/2 of Earth's recent radius. Could also Mars have underground ocean with rather developed life forms waiting for the moment of birth? Magnetic field is necessary in TGD based model of life and the article tells that Mars has unexpectedly strong magnetic field. It also tells about underground ocean at depth about 100 km! The boundary between Earth's core and asthenosphere, where the ancient oceans might have been is at depth of about 80 km.

## 2.2 There is something weird in the magnetic field of Mars

The assumption that magnetic field of Mars can be approximated as a dipole field leads to a paradoxical situation in Maxwellian framework.

1. Wikipedia article about Earth's magnetosphere (see <http://tinyurl.com/y3t78oka>) gives a criterion for the height below which magnetic field can survive under the pressure caused by solar wind. The criterion reads

$$\frac{R_{CF}}{R_P} = \left( \frac{B^2}{\rho_{sw} v_{sw}^2} \right)^{1/6} .$$

Here  $R_P$  is planet radius,  $B$  is the strength of the magnetic field at its surface, and  $\rho_{sw}$  and  $v_{sw}$  are the mass density and velocity of solar wind. The ratio  $R_{CF}/R_P$  is essentially the ratio of the density of magnetic energy and density of kinetic energy. This implies that the strength of  $B$  is about 10 times higher than the strength of the Earth's magnetic field at surface about .5 Gauss. The recent findings should increase the earlier estimate  $R_{CF}/R_P \sim 1$  given in Wikipedia. For Earth the thickness of magnetosphere is about 10 times Earth radius giving  $R_{CF}/R_P \sim 11$ .

2. The strength of magnetic field behaves like  $1/r^3$  in dipole approximation and scaling  $R_P$  by factor 2 would reduce magnetic field strength at surface down by factor 1/8, which is near to value of the Earth's magnetic field strength  $B_E$ . Could one think that also Earth had similar magnetic field before the expansion and that the expansion of Earth radius by factor 2 gave rise to the recent magnetic field?  $B_{Mars} \sim 10B_E$  however suggests that the magnetic field of Mars in dipole approximation should actually extend equally far as the Earth's magnetic field! This does not seem to make sense.

Could one think that the matter at the flux tubes of Martian magnetic field is dark matter as  $h_{eff} = nh_0$  phases and is not visible in the ordinary sense. For instance, cyclotron energies proportional to  $h_{eff} eB/m$  would be much higher than expected. Another option is that the magnetic field corresponds carries monopole fluxes at its flux tubes carrying dark particles.

What looks mysterious is that if Martian magnetic field is dipole field in reasonable approximation, it should be more or less like Earth's magnetic field! One would expect cyclotron radiation and van Allen belts. Why they are not seen? The answer could be simple.

1. Also Earth's magnetic field would decompose to stable part for which flux tubes carry quantized monopole flux and ordinary part. Monopole part does not need current to sustain it and this has been used to explain why Earth's magnetic field has not disappeared long time ago. The varying part of the Earth's magnetic field would be created by convection currents in the solar. Since Mars does not have outer core, it would not have this part of magnetic field. I have proposed this model for the maintenance of Earth's magnetic field at [L2] (see <http://tinyurl.com/y5anawyk>).
2. I have assumed that dark matter as  $h_{eff} = nh_0$  phases of ordinary matter essential for life resides at the flux tubes of this field having strength which is 2/5 of the Earth's ordinary magnetic field. I have called this field endogenous magnetic field and its existence and existence of  $h_{eff}$  hierarchy was deduced from the explanation of quantal effects of ELF em fields on vertebrate brain. If Mars has only dark magnetic field, the magnetic field of Mars could be invisible! The ordinary part of this magnetic field should appear in the analog of Cambrian explosion as the radius of Mars increases to that of Earth and core radius increase by factor 2 and the core becomes unstable against division to two layers.
3. It has been thought that Martian magnetic field is so weak because the outer core of Mars has been seized up in distant past leading to a collapse of the magnetic field. Could one think that the reverse of this process took place for Earth in the expansion and created the outer core, perhaps by splitting of the core to outer and inner core? This picture would fit nicely with the p-adic length scale hypothesis suggesting layered structures with thickness of layer coming as some power of 2: the thickness of core would have double and core would

have divided to two layers. If the strength of the Earth's magnetic field has been stronger by factor 8 before Cambrian explosion, this should be seen in magnetic records.

The rotation of the outer core would create ordinary magnetic field after the expansion. Before that various ions from solar wind would have entered to the dark flux tubes and entered to the interior of Mars. Same would have happened also in Earth and would explain how oxygen atmosphere emerged in Cambrian explosion and life could burst safely to the surface of Mars.

4. Intriguingly, Mars has its own version of Northern lights (see <http://tinyurl.com/y5z7j1kb>). Without magnetic field auroras should not exist! Could it be that they are dark auroras associated with dark magnetic field of Mars. In reconnections of the magnetic field of Martian magnetic field and those associated with solar wind dark ions would transform to ordinary ones and create Northern and Southern lights. Van Allen belts are in the height range .6-58 Mm (Earth radius is 6,4 Mm). Mars should have dark van Allen belts along which ions of solar wind would end down to the interior of Mars.
5. What about the pulsed oscillations of Martian magnetic field at frequency around 10 ms, which corresponds to a period of 3.33... minutes detected at the night-side of Mars?

The pulsations could correspond to a biorhythm. Also Earth's magnetic field has pulsations with frequencies varying between 1 mHz and 1 Hz. 1 mHz corresponds to 3/3.6 minutes and 1 Hz to average DNA cyclotron frequency in endogenous magnetic field  $B_{end} = .2$  Gauss identifiable as dark magnetic field.

Could these pulsations correspond to a heartbeat or breathing of Martian magnetic Mother Gaia - rather concrete pulsation of its magnetic body made from flux tubes and/or sheets? Why the pulsations appear only at the dark side? Could the pressure of the solar wind prevent the pulsations at the day-side?

One can wonder what the measured magnetic field is. Is it the sum of dark and ordinary part or only ordinary part. If test particles touch all space-time sheets involved, they experience the sum of the magnetic fields so that the usual measurements should give the sum. If it is only the ordinary part, one would still have the problem why the field having strength near to Earth's magnetic field is not visible as van Allen belts for instance. The QFT limit of TGD indeed corresponds to the replacement of space-times sheets with single region of Minkowski space and the identification of fields as the sums of the induced fields from various space-time sheets.

## 2.3 Intraplanetary life

The new observations allow to make the existing model for intra-planetary life much more details. The following applies to both Earth and Mars.

1. At Earth the multicellular life forms would have emerged in Cambrian explosion suddenly from the Earth interior as its size increased by factor 2. The expansion would be one stepwise cosmic expansion and associated with the decrease of length scale dependent cosmological constant associated with Earth. Same should happen in Mars sooner or later. So that there is no reason to worry. If we destroy our species and many other at the same time, intelligent life forms will develop in Mars.
2. If the multicellular life forms represented intra-terrestrial life, photosynthesis and even oxygen based life should have evolved in underground ocean. The breathing animals would be like fishes using the oxygen in water.
3. The dark magnetic flux tubes of planet would served as channels for solar photons propagating as dark photons to the ocean in the interior of the planet. Dark photons would have transformed to ordinary photons (that is bio-photons) and used in photosynthesis making possible chemical energy storage. Photosynthesis would have produced oxygen  $O_2$ , which would not have been lost to outer space now: a good reason for intra-planetary life when oxygen atmosphere is missing.

Thus breathing animals would have become possible besides plants like organisms performing the photosynthesis. Also animal-plants doing photosynthesis themselves can be considered. Even we could use the metabolic energy stored chemically in manner analogous to photosynthesis. The machinery is very similar and there is evidence that even humans can use sunlight as metabolic energy. Pollack effect [L1] would be key element here. Pollack effect generates charge separation and thus voltage and this gives rise to a battery.

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