

Hypothetical Superluminal Trek and Spin-2 Boson

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Abstract - With subluminal speeds, the trek to a (hypothetical) new ‘habitable planet’ may take a lot of time and impose medical and technical conditions out of actual technology. Superluminal speeds may drastically shorten this time and then make possible such treks. New inertial motors based on the equivalence between the Levitron top toy and the matter structure may be used to achieve such superluminal speeds. The paper presents the theory of such motor and also an extension to a new inertial motor based on acoustic and ultra-acoustic waves. Some tips are presented to extend the speed of a vehicle equipped with such motors to superluminal speed values. It may also be remarked that the 3D electromagnetic waves generated by a Levitron top are equivalent to a spin-2 boson and then to the hypothetical graviton.

Associated with a new convenient technology, this may make possible star trek to very long distances by keeping eventually a contact with the earth using gravitational waves and/or, may be the teleportation methods if the equivalent technology holds for these situations.

I. INTRODUCTION

The complex analytic exponential functions are the successfully main tool to model the 1D and 2D signals. These functions are ‘angle functions of time’, periodic, normalized but also degenerated elliptical functions. Extension to 3D lead naturally to the complex elliptic ‘3D born functions’ Jacobi and Weierstrass. These 3D functions and their eventual extensions to more dimensions, the complex ultra-elliptic functions, are ‘complex angle functions of time’, periodic and normalized. In mechanics, such functions successfully model as example the pendulum and/or the gyroscope. [1], [4]. A special gyroscope, the Levitron top toy [2], has an added magnet and can fly due to the magnetic repulsion of a magnetic base. It is known that a gyroscope (and/or a top) needs to spin and also have external ‘bending torques’ to operate. As any gyroscope, the Levitron top toy tries to maintain the direction of its spin axis in space but due to the interaction between its own magnet and the magnets on the base, external torques are also applied. These bending torques are compensated by the inertial restoring impulses generated by the gyroscope and the sum of the restoring impulses over a precession period

represents a ‘lifting force’. Then, in some well chosen conditions, the Levitron top may fly at a higher attitude than that corresponding to the balance between the magnetic repulsion forces of the base and Levitron magnet. For an ordinary top, the Euler equations on a mobile system o, x', y', z' may be written [3], [4], [5], [6] as:

$$\left\{ \begin{array}{l} \omega_x = \frac{\partial \theta}{\partial t} = \dot{\theta}; \Rightarrow \dot{\omega}_x = \ddot{\theta}; \\ \omega_y = \frac{\partial \psi}{\partial t} . \text{Sin}(\theta) = \dot{\psi} . \text{Sin}(\theta); \Rightarrow \dot{\omega}_y = \ddot{\psi} . \text{Sin}(\theta) + \dot{\psi} . \text{Cos}(\theta) . \omega_x; \\ \omega_z = \frac{\partial \psi}{\partial t} . \text{Cos}(\theta) = \dot{\psi} . \text{Cos}(\theta); \Rightarrow \dot{\omega}_z = \ddot{\psi} . \text{Cos}(\theta) - \dot{\psi} . \text{Sin}(\theta) . \omega_x; \\ \begin{cases} I_{xx} . \dot{\omega}_x - I_{xx} . \omega_y \omega_z + S . I_{zz} . \omega_y = L_x; \\ I_{xx} . \dot{\omega}_y + I_{xx} . \omega_x \omega_z - S . I_{zz} . \omega_x = 0; \\ I_{zz} . \dot{S} = 0; \end{cases} \end{array} \right. \quad (1)$$

where L_x is the mechanical torque applied on the ox' axis, I_{xx}, I_{yy}, I_{zz} are the moments of inertia, $\omega_x, \omega_y, \omega_z$ are the angular speeds around the axis x', y', z' , $\omega_z + s = S$ where s is the spin of the gyroscope and due to the symmetry, $I_{xx} \equiv I_{yy}$.

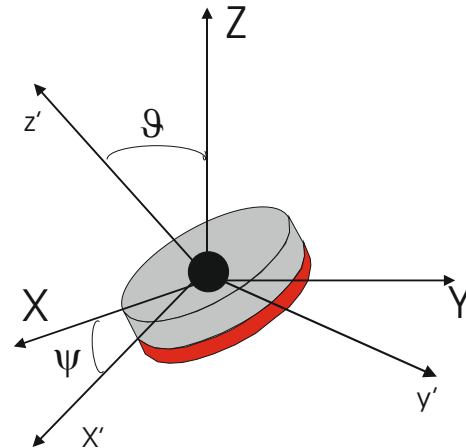


Fig. 1: Levitron top with an added magnet (in red) and absolute and mobile Cartesian coordinates.

One observes that the angle θ is connected with the nutation movement, the angle ψ with the precession movement and only on the OX' axis is applied an external torques due to the earth gravity. Figure 1 shows a Levitron top with an added magnet (in red) with absolute O, X, Y Z and mobile O', X', Y', Z' Cartesian coordinates.

Due to the influence of the added magnet, we have to add some new terms in the Euler equation (1) and it results:

$$\left\{ \begin{aligned} (I_{xx} + \frac{\partial B_g}{\partial \theta}) \cdot \dot{\omega}_x - (I_{xx} + (\frac{\partial B_g}{\partial \psi})^2 \cdot \frac{1}{\sin(\theta) \cos(\theta)}) \cdot \omega_y \cdot \omega_z + \\ I_{zz} \cdot S \cdot \omega_y + (\frac{\partial B_g}{\partial \psi})^2 \cdot \frac{\omega_y \cdot \omega_z}{\sin(\theta) \cos(\theta)} + \frac{\partial B_g}{\partial \psi} \cdot \frac{s \cdot \omega_y}{\sin(\theta)} = L_x; \quad (3) \\ (I_{xx} + \frac{\partial B_g}{\partial \psi} \cdot \frac{1}{\sin(\theta)}) \cdot \dot{\omega}_y + (I_{xx} + 2 \cdot \frac{\partial^2 \bar{B}_g}{\partial \theta \partial \psi} \cdot \frac{1_x}{\cos(\theta)}) \cdot \omega_x \cdot \omega_z - \\ (I_{zz} \cdot S \cdot \omega_x + 2 \cdot (\frac{\partial^2 \bar{B}_g}{\partial \theta \partial t} \cdot \frac{\omega_x \cdot \omega_z}{\cos(\theta)} + \frac{\partial B_g}{\partial \psi} \cdot \frac{s \cdot \omega_x}{\sin(\theta)})) = L_y; \\ (I_{zz} + \frac{\partial \bar{B}_g}{\partial \psi} \cdot \frac{1}{\cos(\theta)}) \cdot \dot{S}_z = L_z; \end{aligned} \right.$$

where L_x, L_y, L_z are the (equivalent mechanical) torques applied on the OX', OY', OZ' axes and we had consider that the magnetic field \bar{B}_g is function of the mechanical angles θ, ψ but also on the time t :

$$\bar{B}_g = \bar{B}_g(\theta, \psi, t) \quad (4)$$

In the relation (3), the terms $\frac{\partial B_g}{\partial (\cdot)}$ and $\frac{\partial^2 B_g}{\partial (\cdot, \cdot)}$ represents the first and second order 'sensitivities' of the time-variations of the magnetic field \bar{B}_g due to the time-variation of the angles θ, ψ and one consider that s is nearly constant. As the magnetic field \bar{B}_g is included in the equations of a top, it results that its equivalent 'energy' is included too. This leads to the possibility to transfer energy by electromagnetic field and then ensure the possibility to realize the necessary bending torques without the necessity of a 'strong point' in a free space. Then, the position and the speed of such a Levitron type top in space may be controlled by using two external oscillators, one synchronized on the spin movement to pump energy to its spin and the other synchronized on the nutation movement to control the position and speed of the Levitron top in space [6], [7], [8], [9]. It can be observed that the oscillator synchronized on the nutation movement of the top must be also modulated in function of the new desired speed and position of the top. It may be also observed that the spectral bandwidth for the spin movement is different from the spectral bandwidth for the nutation movement and that these oscillators may be installed on the board of a vehicle that has a kind of Levitron top as motor. In this manner, such a vehicle may fly anywhere in space [7], [9].

The mathematical model for a top is connected with the Weierstrass $\wp[u, \{g_2, g_3\}]$ elliptic function that may be also represented by Jacobi $SN[u, m_1], CN[u, m_1], DN[u, m_1]$ elliptic functions as in the relations:

$$\left\{ \begin{aligned} \sqrt[2]{\wp[u, \{g_2, g_3\}] - e_1} &= \frac{CN[u, m_1]}{SN[u, m_1]}; \\ \sqrt[2]{\wp[u, \{g_2, g_3\}] - e_2} &= \frac{DN[u, m_1]}{SN[u, m_1]}; \\ \sqrt[2]{\wp[u, \{g_2, g_3\}] - e_3} &= \frac{1}{SN[u, m_1]}; \end{aligned} \right. \quad (5)$$

where g_2, g_3 are some parameters of the Weierstrass $\wp(\cdot)$ function, e_1, e_2, e_3 are the roots of its definition polynomial, m_1 a parameter of Jacobi functions and :

$$\left\{ \begin{aligned} g_2 &= -4 \cdot (e_1 \cdot e_2 + e_1 \cdot e_3 + e_2 \cdot e_3); \\ g_3 &= 4 \cdot e_1 \cdot e_2 \cdot e_3; \\ e_1 + e_2 + e_3 &= 0; \\ m_1 &= \frac{e_2 - e_3}{e_1 - e_3}; \end{aligned} \right. \quad (6)$$

Similarly to the trigonometric functions, the Jacobi elliptic functions are interconnected by:

$$\left\{ \begin{aligned} SN^2[u, m_1] + CN^2[u, m_1] &= 1; \\ DN^2[u, m_1] + m \cdot SN^2[u, m_1] &= 1; \end{aligned} \right. \quad (7)$$

A simple analogy may be considered between a Levitron top and an atomic particle like electron, positron, proton, neutron, etc., as these particles have spin and magnetic moment. Then in theory, a given mass may be equivalent to a lot of Levitron tops that have a given statistical distribution of their spin. By analogy with the free electrons into a solid mass where the (statistical) laws of the resulting electrical current are generally different from the laws concerning a single electron, we may suppose that the (statistical) laws of these assemblies of Levitron tops are also different from the laws concerning a single atomic particle and then a Levitron top.

On the other side, it is known that heat and inertia are kinds of 'dynamic polarization of a mass'. In fact, the volume of a mass increase with its temperature but also the diameter of a body in rotation increases with its angular speed. The fact that the energy of inertia and/or heat can be transferred between two masses by a physical contact leads to the idea that this kind of dynamic polarization is kept by acoustical and/or ultra acoustical waves into the matter. One observe also that heat may be transferred between a cold mass and a warm mass using acoustical and/or ultra acoustical waves [11] and a trailer is generally connected with the tow car by using a spring and a damper that diminish the amplitude of the oscillations during the transfer of the inertia energy to the trailer.

Simplest physical systems that generate waves are the coil-condenser (LC) in electricity and its equivalent in mechanics, the mass-spring (MK). One observes that an electrical long line implies distributed coil-condenser systems and a cylindrical wave guide may be equivalent to a long line that rotate around its axis of symmetry. For the simple case of a hydrogen molecule, we may (approximately) consider that all the mass of this system is concentrated on the two atomic nucleus and the atomic and molecular forces are like a spring. A (simple) mathematical model equivalent to a molecule of hydrogen as shown in the figure 2 is presented in the differential equation (8):

$$(ma + mb) \cdot \frac{d^2 x(t)}{dt^2} + k \cdot x(t) = F(t); \quad (8)$$

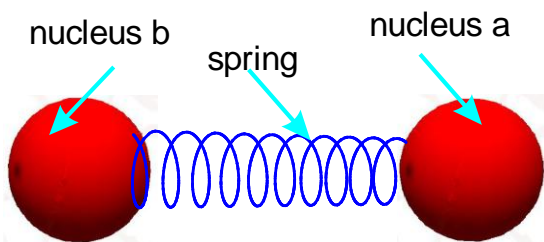


Fig. 2: Symmetric mass-spring system.

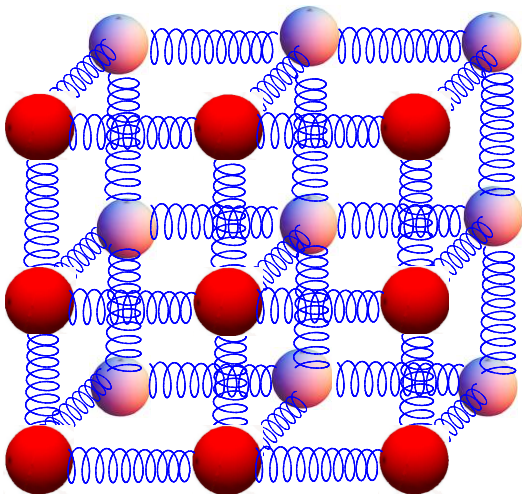


Fig. 3: 3-D lattice of symmetric mass-spring systems.

where ma, mb are the masses of the nucleus a and b, k is the elasticity coefficient of the (equivalent) spring of the atomic and molecular forces, $x(t)$ is the equivalent elongation in time and $F(t)$ an external applied mechanical impulse force. The solutions of the equation (8) are:

$$x(t) = \frac{F(t)}{k} + C_1 \cdot \text{Cos}\left[2\sqrt{\frac{k}{ma + mb}} \cdot t\right] + \quad (9)$$

$$C_2 \cdot \text{Sin}\left[2\sqrt{\frac{k}{ma + mb}} \cdot t\right];$$

where C_1, C_2 are constant. From (8) and (9) it results that an equivalent hydrogen molecule on which a

mechanical impulse force is applied will follow the trajectory of the applied impulse but also will ‘vibrate (ultra-acoustical)’ with a pulsation $\omega = 2\sqrt{\frac{k}{ma + mb}}$. As

following Newton, $F(t) = m_t \cdot a$ where m_t is the total mass of the considered system and a is the induced acceleration it results

$$\frac{F(t)}{k} = \frac{m_t \cdot a}{k} = \frac{(ma + mb) \cdot a}{k} = \frac{a}{\omega^2}. \quad \text{This relation}$$

represent (a kind of) equivalence between the linear (instantaneous) acceleration a and the mean value pulsation ω . But the hydrogen nucleus is ‘polarons’ [12] and then by analogy between a Levitron top and a proton, an equivalent gravitational (electromagnetic) associated wave will result due to these ‘vibrations’. This wave will interact with the gravitational environment field and will assure the trajectory of this molecule. Then, a volume of hydrogen may have as equivalent model the 3D structure shown in figure 3. We remember that such (equivalent) structure has been also proposed for the interactions between light and ultra-acoustical waves in the matter. Because the hydrogen nucleus are like Levitron tops placed inside molecular and atomic fields and that generally a mass polarization leads to deformations and/or rotations of molecules, atoms and/or atomic particles, crudely we may consider that the mass polarization due to the inertia change the mean direction of the spin of its atomic particles slightly in the direction of the external applied force to obtain, like for the Levitron top, an equivalent ‘lifting force’ in this direction. One may observe than the statistic (thermal) speed direction of the free electrons in a solid matter is also changed in a nearly similar way by an electric polarization due to an external applied electric voltage. This may represent a kind of equivalence between the inertial forces produced by the hydrogen nucleus (as equivalent to the Levitron top) and the inertial forces produced by the (corresponding) acoustic and/or ultra-acoustic waves.

Let now consider a mass where the (mean) temperature of this mass is very different from the local temperature of a given very hot point of it, heated by an external source. It will take time and energy to raise the temperature of the whole mass to the temperature of this local point. Similarly, any given mechanical motor needs time to transfer its energy to the inertia of its vehicle. Only if the whole needed inertia energy to move the vehicle is transferred, this vehicle will start to move. We remember also that the Gulf Stream is a (thermal) inertial current of the Atlantic Ocean pumped by the temperature distribution of the ocean water.

II SUPERLUMINAL SPEEDS.

Let now consider a mobile equipped with a motor like a Levitron top. It is known [4], [5] that when the charge of the top increase, the elliptic module m_1 increase too.

The charge applied to such an equivalent motor is proportional to the energy E_m that the motor must deliver to this mobile considered in translation and then, it depends on the speed v of the mobile because:

$$E_m = \frac{M.v^2}{2}; \tag{10}$$

where M is the whole mass of the mobile. As results, the elliptic module m_1 will increase if the speed of the mobile increase. The variation of the periods of the elliptic functions depends also on the elliptic module m_1 and this variation is shown in the figure 4 and 5.

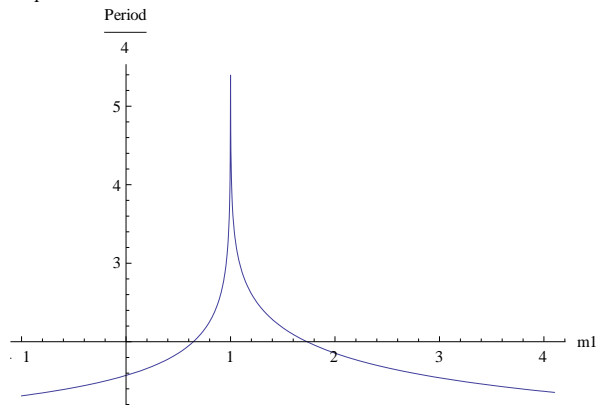


Fig. 4: Absolute value of the elliptic function $EllipticK[m_1]$.

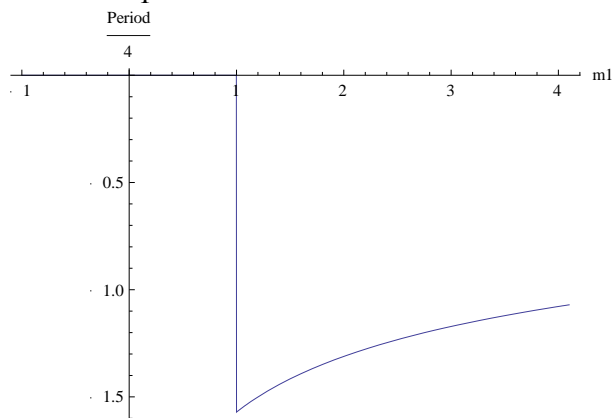


Fig. 5: Imaginary value of the elliptic function $EllipticK[m_1]$.

From [7] and the figures 4 and 5 it results that $m_1 = 1$ is a ‘mathematical pole’ where the period of the elliptic function tends quickly to infinite and then practically cannot be attained. By analogy with the complex exponential functions, for $m_1 > 1$ the system become also ‘dissipative’ as the function $EllipticK[m_1]$ become complex. It can be observed that, for $m_1 > 1$ these functions have a shape more elliptic as in figure 8. On these bases, one may consider that $m_1 = 1$ correspond to a ‘speed barrier’ equivalent to the ‘sound and/or light barrier’. For $m_1 < 1$, by analogy with the

complex exponential functions, the space coordinates X, Y, Z may be represented by:

$$\begin{cases} X \rightarrow \text{Re}[CN[u, m_1]]; \\ Y \rightarrow \text{Re}[SN[u, m_1]]; \\ Z \rightarrow \text{Re}[\Delta DN[u, m_1]]; \end{cases} \tag{11}$$

but for $m > 1$ we have to ‘switch’ the even function $CN[u, m_1]$ to $DN[u, m_1]$. Observing that:

$$\begin{cases} \int DN[u, m_1].du = \Delta DN[u, m_1]; \\ \int CN[u, m_1].du = \frac{\text{Arc}[\text{Cos}[DN[u, m_1]]].SN[u, m_1]}{\sqrt{1 - DN^2[u, m_1]}}; \end{cases} \tag{12}$$

and that this last function is ‘periodic’ as in figure 10, we may consider it as equivalent to a ‘phase function’ and following the quantizing theorem [13] it results:

$$\begin{cases} X \rightarrow \text{Re}[DN[u, m_1]]; \\ Y \rightarrow \text{Re}[SN[u, m_1]]; \\ Z \rightarrow \text{Re}[a.u]; \end{cases} \tag{13}$$

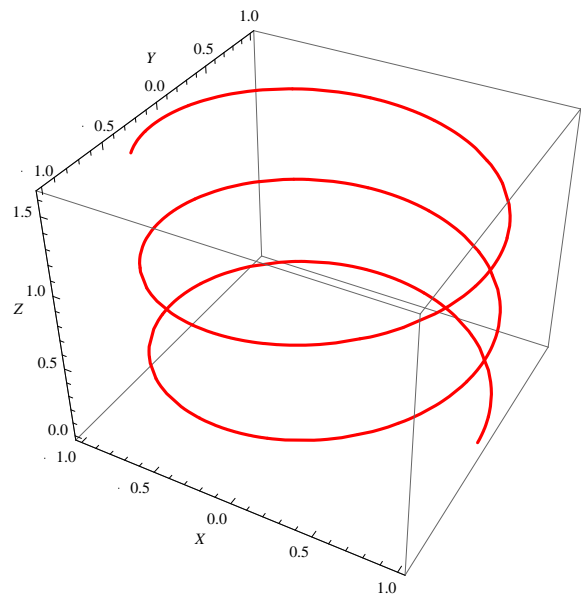


Fig. 6: 3D parametric plot following (11).

Excepting for the difference in the ‘elliptic shape’, the figures 6 and 7 shows that (about) the same movement may be realized even for superluminal speeds. Figure 8 shows the superposition between the parametric plot of real part of the functions $CN[u, 0.8], SN[u, 0.8]$ and $DN[u, 2.8], SN[u, 2.8]$ where it can be observed that for $m_1 > 1$ the circle becomes ellipse and figure 9 shows the parametric plot of imaginary part of the functions $DN[u, 2.8], SN[u, 2.8]$ where it may be observed that the amplitudes of these functions follow the figure 5.

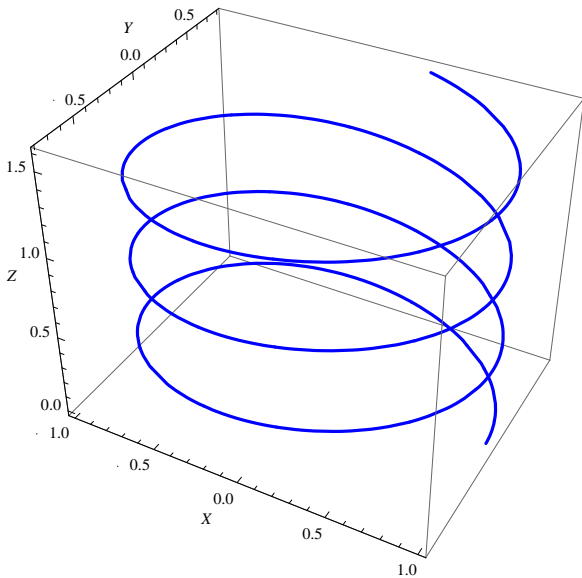


Fig. 7: 3D parametric plot following (13).

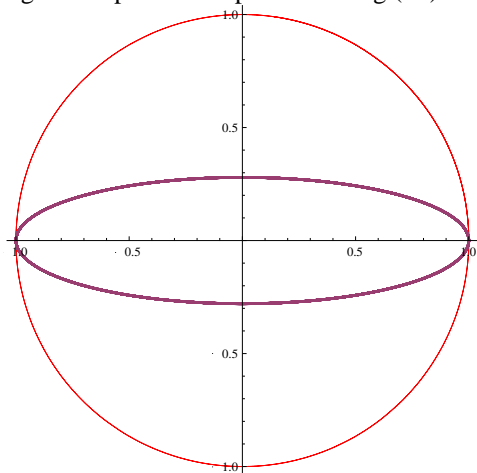


Fig. 8: Parametric plot of real of $CN[u,0.8]$, $SN[u,0.8]$ (in red) and $DN[u,2.8]$, $SN[u,2.8]$ (in violet).

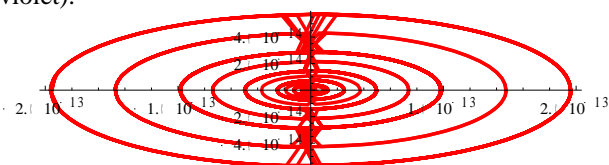


Figure 9: Parametric plot of imaginary of $DN[u,2.8]$, $SN[u,2.8]$ for $0 > u > 100$.

Remarks:

1/. Figure 10 shows the periodic function $Re[\int CN[u, m_1].du]$. It may be observed that the ‘phase’ of this function is (about) like $Re[au]$.

2/. The Laplace transform extend the Fourier transform by using as kernel complex exponential functions but implies a ‘convergence barrier’ equivalent to the Bromwich contour for the inverse Laplace transform. Physically, in electricity, the Laplace transform introduce also the ‘resistor’ and then ‘dissipative components’. Extension in 3D of the complex exponential functions leads to elliptic functions

that imply the ‘barrier of $m_1 = 1$ ’ because for $m_1 > 1$, the function $EllipticK[m_1]$ become complex. Then, such ‘barriers’ seems to constitute a limit of a domain inside which a given item conserve its properties. Outside this domain, the item will lose energy and then its structure will be modified.

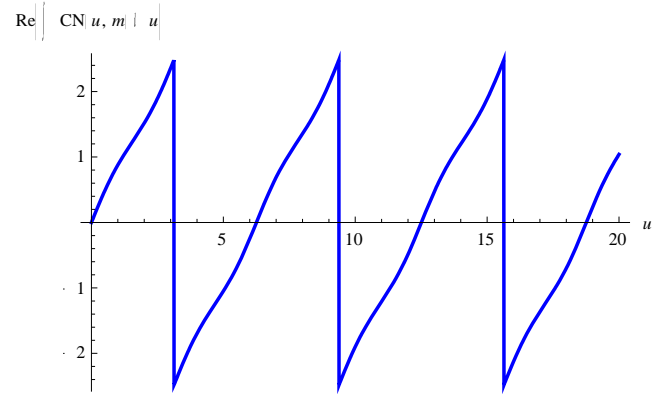


Fig. 10: The function $Re[\int CN[u, m_1].du]$.

The wave equation may have also as solutions elliptic functions and this leads to the ‘sound barrier’ for the acoustic waves and/or to the equivalent ‘light barrier’ for electromagnetic waves. The figures 11 and 12 shows the variation of the Jacobi elliptic SN in function of the elliptic module m_1 . For SN function, it may be observed that a kind of ‘wall of separation’ is centered on $m_1 = 1$ and a kind of even parity (symmetry) exist around this wall. The figures 13 and 14 shows the variation of the Jacobi elliptic CN and DN in function of the elliptic module m_1 and here, a similar even parity exist only between CN for $m_1 < 1$ and DN for $m_1 > 1$.

The ‘sound barrier (Mach=1)’ was actually overpasses by aircraft using ‘jet motors’ but the old ‘helix’ motors. In fact, the helix transfer inertial energy to the environment air by creating acoustic and/or ultra-acoustic waves into this air and nearly to $m_1 \cong 1$, it will arrive at the ‘sound barrier’ where its efficiency will diminish. As ‘jet motors’ used heat to eject the incoming air, even at the ‘sound barrier’ speed of the aircraft, the acoustic and/or ultra-acoustic waves of this incoming air will be modified by the heat and this hot air will be ejected at higher speeds than those corresponding to the sound speed. By ‘reaction’, the aircraft will modify also the acoustic and/or ultra-acoustic waves corresponding to its inertia and, with some (more or less) vibrations around the ‘sound barrier’, will acquire a bigger speed than the sound. Actual aircraft may fly at more than 6 Mach!

3/. A motor of a vehicle may be considered as a (kind of) transducer [14] between an energy source and the desired trajectory of this vehicle. The use of a bidirectional transducer as motor and of a ‘rechargeable energy source’ has the big advantage that the energy source may have a smaller

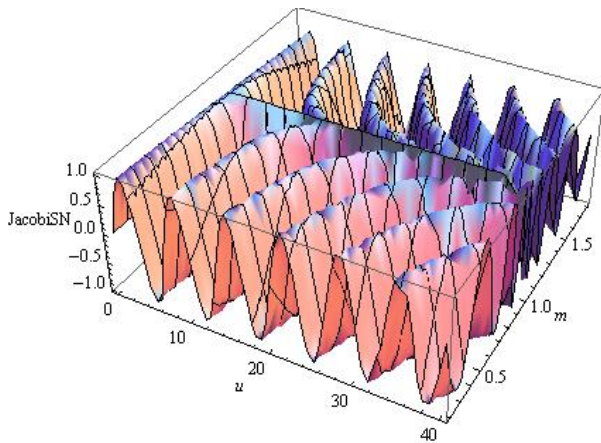


Fig. 11: The function $\text{Re}[SN[u, m_1]]$ over $u=0, 40$.

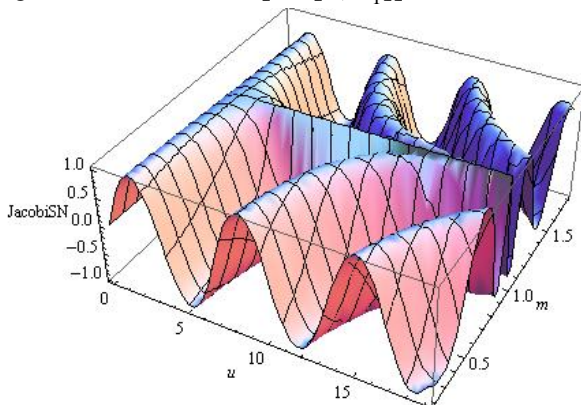


Fig. 12: The function $\text{Re}[SN[u, m_1]]$ over $u=0, 20$.

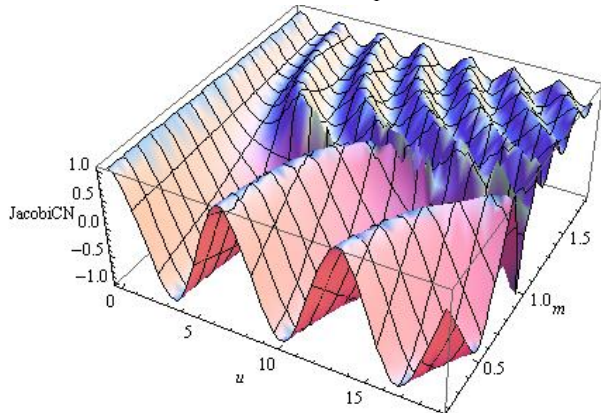


Fig. 13: The function $\text{Re}[CN[u, m_1]]$ over $u=0, 20$.

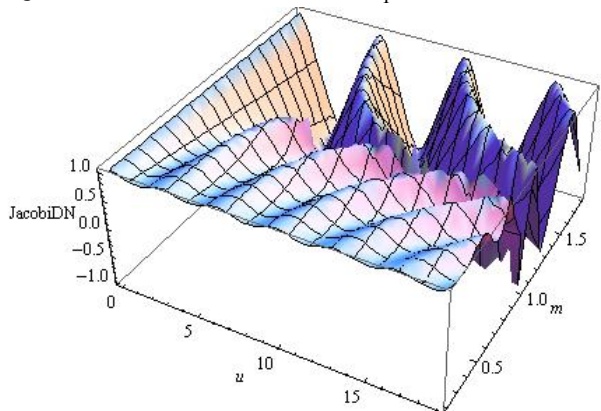


Fig. 14: The function $\text{Re}[DN[u, m_1]]$ over $u=0, 20$.

capacity for an equivalent range of trek. Actual motors transfer energy to the inertia of their vehicle and this inertia energy is dynamically stocked into the mass of the vehicle as some special acoustic and/or ultra-acoustic waves. A better manner to transfer energy to the inertia of a given vehicle is to ‘pump directly the energy by injecting these corresponding acoustic and/or ultra-acoustic waves’. This may be done by using saser [15] and/or any (others) convenient acoustic and/or ultra-acoustic actuators. Of course, a special system has to be used to insure that the new ‘transferred waves’ are well synchronized with the actually existent waves into the mass of the vehicle and also to ensure the future desired trajectory and speed of this vehicle. To avoid some artifacts even if the existing wave shapes are not very well known, equivalent techniques to high frequency sampling of ‘Pulse Wave Modulation’ may be used especially around $m_1 \cong 1$ where the shapes of the acoustic and/or ultra-acoustic waves change more. Evidently, acoustic and/or ultra-acoustic waves are 3D and depend on the (actual) trajectory of the vehicle. For redundancy reasons and to avoid some local forces that may overpass the resistance of the vehicle structure, such system must imply an equivalent 3D lot of acoustic actuators and sensors, conveniently disposed on the mass of the vehicle. Using the signals of the acoustic sensors, the inertial information about the position, speed, acceleration of the vehicle, the information about its desired trajectory and speed of the vehicle, a digital processor must compute the (approximate) shape and amplitude of the acoustic waves to be send to each 3D actuator and ensure a convenient supply in wave energy of these actuators. Of course, a special care may be used especially around $m_1 \cong 1$. For a manned vehicle, this system must also ensure that the maximal resulted accelerations are supported by the vehicle team.

4/. Following the figures 4, 5 and Noether theorem [16], it results that the waves (and/or gravitational field) that may be modeled by elliptical functions conserve their energy for all values of $m_1 < 1$. This is equivalent to say that for the acoustical waves, the speed of the sound is the maximal speed for such a wave that may propagate into a given matter and conserve its energy. Similarly, for the electromagnetic waves, the speed of the light is the maximal speed for such a wave that may propagate into free space and conserve its energy. More, any material object cannot have a speed greater that those corresponding to $m_1 = 1$ without losing energy and then changing (in some way) its structure. We may observe that particles that move at a higher speed than the light in a given dielectric generate a special radiation known as Cherenkov radiation [17] and then loose energy. Nearly similar waves are created by a motorboat speeding across the calm water and more similar waves correspond to the ‘sonic boom’ created by a supersonic aircraft [18].

The (acoustic and electromagnetic) wave equation is given by [31]:

$$\frac{\partial^2 u}{\partial t^2} = a_w^2 \Delta u; \tag{14}$$

where t is the time, Δ the Laplacian of the 3D Euclidian space and a_w a constant that depends on the environment medium of propagation of the wave. From here it is obvious that an aircraft that fly at a speed greater than Mach=1 need a (convenient) source of energy and motor. By analogy with a supersonic aircraft, a starship may overpass the speed of the light if it will have a convenient source of energy and motor. Such motor may be ‘inertial’ and realized based on the Levitron top system pumped electromagnetically with energy [8] but this implies an electro-mechanic motor with small reliability. In theory, based on the analogy between a Levitron top and an atomic particle, forces/torques may be induced into a given mass by this method but the electromagnetic pumping waves must be used for any equivalent atomic particle of this mass. Then, it seems that a better motor has to pump directly energy to the mass by using acoustic and/or ultra-acoustic waves that correspond to its inertia. It may be also observed that the spectral frequency bandwidth of these waves depends on the considered mass and for bigger masses, the equivalent frequencies are lower. Then, such starship might ‘take-off and landing’ like a vertical take-off and landing (VTOL) aircraft [19] and of course, overpass the ‘sound barrier’. Once in ‘free space’ on a given trajectory, this starship may follow this trajectory only by its inertia. To overpass the speed of the light, convenient acoustic and/or ultra-acoustic waves must be pumped into the mass of this starship. In accord with the figures 7, 11 to 14 and with the relations (12) and (13), for $m_1 > 1$, the X projection of these acoustic and/or ultra-acoustic waves must be changed from CN to DN and the Z projection from $\text{Re}[\Delta DN[u, m_1]]$ to $\text{Re}[a.u]$. Until all the acoustic and/or ultra-acoustic (inertial) waves has not been modified, very probably the speed of the starship will remain near to the light speed but after, function of the new parameters of these waves, the speed of the starship will increase to values greater than the light speed. By analogy with the manned supersonic aircraft where the pilot needs remote systems to be able to control his aircraft, a superluminal starship will need also remote systems to be controlled. Can we also suppose that following these ideas, an atomic particle accelerator may be also modified to obtain superluminal speeds [20], [21]?

5/. It is known that a given ferromagnetic mass do not display attractions forces even versus a stronger magnetic field if its temperature overpass the ‘Curie point’ [22]. It is like as the ferromagnetic properties of this mass were only ‘dynamically masked’ by the heat waves over the ‘Curie point’ temperature. We remember that the supersonic aircraft used also in some way the ‘heat’ to overpass the ‘sound barrier’. As heat and inertia are some kinds of dynamical polarization of the matter, we may observe that heat is also ‘dissipative’

but (generally) inertia only ‘conservative’. Then, as elliptical functions may be also solutions of the heat equation [23], we may simply consider for these heat waves some barriers connected to the state of the matter [24]. In fact, in ordinary earth conditions, a given matter state is (nearly) conservative but if we want to pass to another state, some special energy is needed. By analogy with the ‘light speed barrier’ we may consider the barrier of ‘helium solidification’ as example. As example, all these leads to the idea that replacing the ‘conservatives’ waves by (also) ‘dissipative’ ones may dynamically ‘mask’ some properties of the matter like is the case for the ‘Curie point’. By extension, we may suppose that replacing the acoustic and/or ultra-acoustic inertial (conservative) waves by waves where the inertial direction force has a statistical random distribution in 3D so that the mean value of the resulting inertia will be (nearly) zero, may lead to a ‘mass with less (and/or even no) displayed inertial (weight) forces’ as it is the situation in free space where the ‘weight’ of a mass (equivalent in some way to its ‘inertia’) does (nearly) not exist. A nearly similar situation exists on the earth satellites, where the gravitational earth attraction is compensated by the centrifugal force. On the other side, if we consider that a given mass m_e is attracted by the gravitational earth field with a force $F_e = m_e \cdot g$ where g is the earth gravitational (supposed constant) acceleration then, the energy stored in this mass during its trajectory on the time interval $0, T$ will be

$$E_{m_e}(0, T) = \int_0^T \frac{m_e \cdot v^2}{2} \cdot dt = \int_0^T \frac{m_e \cdot (g \cdot t)^2}{2} \cdot dt = \frac{m_e \cdot g^2 \cdot T^3}{6} .$$

From here it results that to avoid the inertia of this mass, the equivalent energy of E_{m_e} inertial waves existing into this mass must be converted into statistical random direction distribution in 3D inertial waves. We remark that nearly an equivalent procedure may be used to avoid the interaction between a ferromagnetic mass and any strong magnetic field and once the desired temperature is acquired, the necessary energy transfer to maintain this state is low.

It is known that the gravity of the earth is quite useful to the life. It induces ‘inertia waves’ that leads to ‘weight’ and then gives a ‘direction’ for the 3D space. ‘Inertia waves’ well different from the ‘earth gravitation field’, may lead to catastrophic situations like for the tsunami and/or earth quakes. Then, may we suppose for example, that at least for a (small enough) building, it will be possible to dynamically protect it against an earth quake by modifying the energy of the incoming inertial waves into waves with a random direction distribution in 3D so that the displayed external mechanical forces of this building will be less than the acceptable values?

III SPIN 2-BOSON.

The 3D mathematical model of the electromagnetic waves generated by a kind of Levitron top is presented in the relation (3). Each space projection of this wave may be considered as an ordinary electromagnetic wave that may be also represented by a photon. All these projections are generated starting from a single Weirstrass elliptic function and then are ‘correlated in some way’. As results, the equivalents photons of these projections are also ‘entangled in some way’. This 3D wave is equivalent to a mass-less item that can spin in 3D space only through 2 independent angles: the precession and nutation movement of the equivalent gyroscope and then it may be considered as spin-2 boson. Now, when the gravitational waves are proved to exist [25], may we consider the waves represented by the relation (3) as a ‘man-made gravitational wave’? It can also be observed that extensions in 4D may lead to spin-3 bosons for the equivalent of ‘4 entangled in some way photons’ and so on. As this wave may be used to control in space a Levitron type top, may we consider it also as a ‘tractor ray’? It can be also observed that using wi-fi waves, we can see through the walls [26]. Such system uses 3 USRP N210 software radios [USRP N210, <http://www.ettus.com>. Ettus Inc.], 2 as sender and one as receiver, connected to an external clock so that they act as one MIMO system. In this manner and also because the received signal implies nearly the same ‘scene’, the generated and received waves (and then ‘photons’) are ‘entangled in some way’. It seems that these waves may also be considered as gravitational waves. Of course, a new ‘human interface’ in the receiver may lead to a ‘direct view through the walls’. May we suppose that such a system can ‘keep the contact between a spacecraft and earth’ even if the spacecraft is ‘occluded by a planet’?

As any electromagnetic wave, these equivalent gravitational waves will propagate at the speed of the light and it can be observed that the 3 (and/or more) equivalent photons may propagate in different space directions. As results and also by analogy with the 3D phonons waves in a sea water, only a single photon of such a wave may probably exist into a small space domain far enough from the (gravitational) sender. Then locally, the energy of such gravitational waves may be small and this (single) photon may be also considered as an ordinary electromagnetic wave and/or as noise. In some special cases and by analogy with the laser waves, if a kind of ‘3D resonator structure’ exists, ‘focalized gravitational waves’ may results as in the cases of ‘tsunami’.

On the other side, it is known that inside a cabin of a supersonic aircraft, sounds propagate as ordinary on the earth in spite of the fact that the speed of the aircraft is greater than Mach=1 and the noise of the aircraft motors cannot be heard inside the cabin. It is like as the (cabin of) aircraft ‘isolate’ the inside sounds wave from the external ‘sound barrier’ due to its speed. It is also known that inside a ‘cyclone eye’ [27], the weather does

not present any ‘storm effects’. By analogy, the cabin of a superluminal starship may be normally illuminated in spite of the fact that the light of the stars in front of the starship will change their spectrum due to the Doppler effect and that the light of the stars behind the starship will be not visible. It can be also remarked that the gravitational waves are not very useful to keep the contact between a superluminal starship during its superluminal trek. Probably, by analogy with the very successful Photonics, a new field of Gravitonics will appears.

IV CONCLUSION.

A mathematical model of the gravitational field and waves based on elliptic and ultra-elliptic function interpret in a different manner the associated physics and then may open new opportunities. This had leads eventually to new analogies and then to inertial motors based on the equivalence between the Levitron top toy and the atomic particles and also to inertial motors based on acoustic and/or ultra-acoustic waves. A physical model of ‘inertia’ is presented and used to conceive a special motor. In theory, such a motor is (relatively) simple and do not need anything like helix, wheels, etc., outside of the vehicle hull. A big advantage is also the fact that the weight of a vehicle equipped with such motor will (nearly) not change during its trek because it need not eject mass as for the rocket motors. To operate, such motors need an electric energy source that with actual technology, for big vehicles and long-time treks, is possible only by using nuclear reactors [28]. More, superluminal speeds may be envisaged with such motor.

Like for the drones, a technological research is needed to first realize a ‘working prototype’. Experiments with this prototype will lead to improving it but also to gain some ‘insides’ on the presented theory. It can be observed that the use of high efficient bidirectional transducers may lead to the possibility to ‘recycle’ in some manner the energy of the (existing) acoustic and/or ultra-acoustic waves in order to follow a new desired trajectory and also spare time and energy. It seems that a convenient choose of some actual technologies may eventually be used to built such a motor. Probably, like for the supersonic aircraft, a number of experiments are needed to probe the superluminal capabilities of such motor.

Of course, during a superluminal trek, a contact with earth using electromagnetic and/or gravitational waves cannot be envisaged. Similarly, due to the limited speed of these waves, the contact between earth and a far away planet cannot be very useful. In fact, due to the limited speed of such waves to the light speed c , an answer may be only obtained after a time delay

$$t_d \geq \frac{2 \cdot s_d}{c} \text{ where } s_d \text{ is the distance between the sender}$$

and receiver. It results that even for only a year light distanced planet, more than 2 years are needed to get an

answer! A solution may be the teleportation [29] if the equivalent technology holds for these situations.

One can observe that the mass may be considered as a group of (dynamic) assembly of atomic particles and that for this group, some properties of the atomic particles that compose it may be 'hidden' [30]. As example, generally a solid state mass does not present an external electrical charge and then, without a corresponding 'polarization', will not display electrostatic forces. From here it results that changing in some way the structure of a given mass leads to a mass with same new properties. Such changes may results naturally like for the radioactive and/or chemical instable masses but also may be 'induced' by external actions and/or fields. Then as an example, by a special 'polarization', a given (special) mass may become a 'permanent magnet' but this property may be also 'nullified' by a convenient ('heat') polarization and/or mechanical shocks. Similarly, the interaction between a mass and the gravitational field may be reinforced and/or diminished. An inertial system as the Levitron top is an example. This proposed theory is only a hypothesis based on many well known facts but if confirmed in practice it will open very interesting opportunities in many fields.

I hope that using a (new) convenient technology, a vehicle equipped with a motor based on acoustic and/or ultra-acoustic waves may be realized. This will confirm the presented theory, open also new terrestrial opportunities and, may be, leads to the possibility of superluminal speeds and telecommunication using gravitational waves that will make possible treks to other (may-be habitable) faraway planets.

REFERENCES

- [1] Wikipedia Noether lemma, https://en.wikipedia.org/wiki/Noether_normalization_lemma
- [2] Levitron™, U.S. Patent # 5,404,062, 1997, Fascination Toys&Gifts
- [3] Robertt Bruce Lindsay, "Physical mechanics", D. Van Nostrand Company, INC. Princeton, New Jersey, Totonto, London, New York, 1961.
- [4] Dan Ciulin, "Models for some smart toys and extensions.", CISSE 2010 Online E-Conference, December 3-12, 2010.
- [5] Tarek Sobh, Khaled Elleithy "Emerging trends in computing, informatics, system sciences and engineering", Springer, 2011.
- [6] Dan Ciulin "Contributions to a future inertial motor and more ", International Journal of Strategic Technology and Applications, **January-March 2013, Vol. 4, No. 1, IGI Publishing.**
- [7] Dan Ciulin, " Physics based on energy transfer postulate", International Journal of Strategic Technology and Applications, October-December 2014, Vol. 5, No. 4, IGI Publishing.
- [8] Martin D. Simon, Lee O. Heflinger, S. L. Ridgway, 'Spin stabilized magnetic levitation', American Journal of Physics, 65 (4), April 1997.
- [9] Dan Ciulin, " About Space-Time and More", International Journal of Strategic Information Technology and Applications, 4(3), 1-41, July-September 2013 1.
- [10] Dan Ciulin, "Some forgotten problems" to be published.
- [11] Wikipedia Thermoacoustic_heat_engine , https://en.wikipedia.org/wiki/Thermoacoustic_heat_engine.
- [12] Wikipedia Polaron. <https://en.wikipedia.org/wiki/Polaron> .
- [13] Dan Ciulin, " A nearly one-to-one method to convert analog signals into a small volume of data. First part: 1-D signals.", International Journal of Strategic Technology and Applications, October-December 2010, Vol. 1, No. 4, IGI Publishing.
- [14] Wikipedia Transducer, <https://en.wikipedia.org/wiki/Transducer>
- [15] Wikipedia Saser, https://en.wikipedia.org/wiki/Sound_amplification_by_stimulated_emission_of_radiation.
- [16] Wikipedia Noether_theorem, https://en.wikipedia.org/wiki/Noether%27s_theorem.
- [17] Wikipedia Cherenkov radiation, (https://en.wikipedia.org/wiki/Cherenkov_radiation).
- [18] Edwin F.Taylor, John Archibald Wheeler, "Space-time Physics", F.H. Freeman and Company, New York, 1999,
- [19] Wikipedia VTO, <https://en.wikipedia.org/wiki/VTOL>
- [20] Wikipedia Particle accelerator, https://en.wikipedia.org/wiki/Particle_accelerator.
- [21] Inner Workings: Building accelerator afterburners with plasma, <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4747720/>.
- [22] "Curie-point", <https://www.britannica.com/science/Curie-point> .
- [23] Wikipedia Heat equation, https://en.wikipedia.org/wiki/Heat_equation.
- [24] Wikipedia State of matter, (https://en.wikipedia.org/wiki/State_of_matter).
- [25] Wikipedia gravitational-waves, <http://www.sciencemag.org/news/2016/02/gravitational-waves-einstein-s-ripples-spacetime-spotted-first-time>.
- [26] Fadel Adib, "See Through Walls with Wi-Fi" <http://dspace.mit.edu/bitstream/handle/1721.1/82183/862074328-MIT.pdf?sequence=2>.
- [27] Wikipedia Eye of a(cyclone), [https://en.wikipedia.org/wiki/Eye_\(cyclone\)](https://en.wikipedia.org/wiki/Eye_(cyclone)).
- [28] Wikipedia Nuclear submarine, https://en.wikipedia.org/wiki/Nuclear_submarine.
- [29] Wikipedia Quantum teleportation , https://en.wikipedia.org/wiki/Quantum_teleportation
- [30] Dan Ciulin, "Some forgotten problems", to be published .

[31] V. Smirnov, “ Cours de mathematique superieures“
tome 2, edition MIR Moscou, 1988.

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Dan Ciulin was born in Bucharest, Romania on 4 July 1934. He studied to the Polytechnic School of Bucharest the section radio and telecommunication and obtained his degree in 1959. Then, he worked as researcher at the Institute of Biology and Radiobiology and also as lecturer at the Polytechnic School of Bucharest. In 1980, after 2 years passed as lecturer at Institute of Telecommunication Oran, Algeria, he moved as researcher to the Research Institute Robert Bosch in Lonay, Switzerland. Here he worked in telecommunication, optics and gravitation. Now he is professor at E-I-A (Ecole d'ingénierie Appliquée) in Lausanne. He had published many research papers on electronics, sound and image processing and gravitation and has also a number of patents. His main fields of interest are electronics, sound and image processing, electromagnetic and gravitational fields and time.