The Oron Sea- The Medium Under Elementary Particles and Photons

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Abstract

This article is the first of a new theory: "The Oron Sea Theory" (OST). The theory uses a new way of treating physical phenomena. It uses analogies instead of physical laws. OST attempts to explain all the phenomena in physics. The theory assumes the existence of a "non-continuous active ether" composed of relativistic tiny particles, herein called "Orons", which fills the entier universe as a huge sea, "The Oron Sea". OST assumes that all the phenomena that exist in an ordinary molecular fluid sea, exist also in the oron sea, as well as in cosmology. OST explains the postulates of the Theory of Relativity as well as the Michelson-Morley experiment. Elementary particles are supposed to be vortices of different kinds in the oron sea. OST explains the four basic potentials: Gravitation is due to sinks in an irrotational oron sea. Electromagnetism is due to streams in a rotational oron sea. The Yukawa potential is due to strong spiraling streams in a funnel vortex. The weak potential is due to the "eye" at the center of a funnel vortex. We give a new representation of a photon, as a pair of cylindrical vortices in the oron sea. This pair behaves as a particle as well as a wave at the same time. Antiparticle is a vortex of the same kind as the particle, but with opposite rotational direction. The same representations of elementary particles, as vortices, also explain the shape of galaxies as well as the expanding of the universe. This phenomenon is explained as the result of the relative motion of galaxies, due to their position on a huge funnel spiral vortex in a "star sea". The "black hole" is explained as a hole in the narrow side of a funnel vortex in the star sea. The "cold dust" is explained as an "empty" space in the star sea. Many other phenomena are explained very simply by OST. We predict the hypothetical possibility of creating, in a vacuum, artificial elementary particles, using strong magnet.

1. **Introduction**

Oron Sea Theory (OST) is a new theory which attempts to give reasonable answers to open issues in all branches of physics. Many examples exist in nature where a behavior of many bodies create phenomena. For instance, the behavior of many molecules in ocean create waves, streams and vortices; the behavior of many stars create galaxies, etc. At the other end, modern physics shows that one may explain the behavior of any body by assuming it to consist of many phenomena, e.g. waves. Moreover, a phenomenon may be treated as a body, and vice versa. For instance, a galaxy may be treated as a phenomenon, created by many stars, while at the same time, it may also be treated as a body when dealing with a cluster of galaxies. Another important feature is that frequently nature uses 10^{11} or more bodies to create a phenomenon, e.g. the number of stars in our galaxy. All those points raises the question of whether nature repeats itself again at the level of elementary particles and photons. Is it possible that a photon or any elementary particle such as an electron or a neutrino, may be composed of many, say 10^{10} or even 10^{24} (approximately Avogadro number), small particles. OST assumes the answer is positive and it attempts to investigate possible characteristics of such particles.

In this article we introduce the basic ideas of OST, some basic definitions and issues from classical mechanics, relativity, cosmology, gravitation, electromagnetism, strong and weak fields. Included are simple explanations to the duality of light, the Michelson-Morely experiment, quantization, electric charge, spin, antiparticle, etc.

2. **Oron Sea Theory**

2.1) **General Scope**

OST assumes that all the phenomena in nature may be explained as the result of the behavior of many very small particles, herein called "orons", moving randomly in a huge sea of orons, herein called the "oron sea". (The meaning of "oron" in Hebrew is small light.) OST assumes theoretically that in this "oron sea" are all the phenomena one may find in ordinary molecular fluid. The following are the consequences of this simple assumption. We are looking for correspondences between all that we know in physics and that assumption, using analogies and parameters from different branches. We assume that those orons are very small, almost massless, and have very high free flight velocities. We define orons as particles whose free flight velocities v_f are in the range $c-\delta \leq v_f \leq c$, while c is the theoretical velocity of light in a vacuum, and $0 \leq \delta \leq 1.5$ cm/s. In order to appreciate what oron sea means, let us assume, for example, that an electron is composed of 10^{24} orons. For the sake of simplicity we also assume that the rest mass of orons are 10^{24} times smaller than the rest mass of an electron. Thus, in this case the rest masses m_0 of orons are in the range $0 \leq m_0 \leq 9*10^{-52}$ gr. If in this case, the average distance between two orons in an electron is more than twice their dimensions r_0, we may treat them as having dimensions in the range $0 \leq r_0 \leq 2*10^{-21}$ cm. Thus, we may regard orons as relativistic tiny particles. As mentioned above, we assume the oron sea fills the entire universe. If we also assume that, as in some ordinary molecular fluids, the free flight distances of orons are less than 100 times their dimensions, then the densities in the oron sea, in this case, are more than 10^{56} orons per cm^3. This example shoes that in oron sea we may have to deal with unordinary orders of magnitudes. According to the relativistic theory, since for orons $v_f \approx c$, they may change their mass and dimensions by many factors while their velocities change by very small amounts. Thus, in the oron sea there are orons of differing dimensions and masses. Let us determine the relativistic factor $\gamma \equiv \sqrt{[1-(v/c)^2]}$, while v is a linear velocity to be determined in Sec. 3.1. For orons, in the first approximation ,$\gamma \approx \sqrt{(2\delta/c)}$. Thus, in the oron sea $0 \leq \gamma < 10^{-5}$. If we mark the rest mass and dimension of an oron, by m_0, r_0, respectively, then its mass and dimension during motion, are obtained from the relativistic equations $m=m_0/\gamma$ and $r=r_0/\gamma$ .We therefore see that in the oron sea there are probably orons with different sizes, masses and velocities. This may remind us of the situation in ordinary sea. One may regard the oron sea as a relativistic active ether. Latterly, we show how such an ether is consistent with the Michelson-

Morley experiment and how it may resolve the problems which led Einstein to develop the Theory of Relativity. We explain, using OST, why this theory is correct and why Quantum Theory has its own justification as well. OST assumes that one may consider the universe as consisting of a ladder of seas at successive levels of dimensions. At each level there are basic particles which are composed of the many basic particles of the lower level. One possible ladder is the following: universes, clusters, galaxies, stars, bulks of hot gases, molecules, elementary particles, A-orons, B-orons, C-orons, D-orons, etc. The last seas will be explained latter. The general idea of OST is that one may receive all the phenomena in one sea by a mere magnification of a intervals of space and time of a lower sea. For instance, OST assumes that one may receive all the phenomena measured in elementary particles by looking towards the cosmology through a "reversed telescope", i.e., a telescope which reduces the pictures of galaxies, instead of magnifying them, by a specific factor. In addition the rates of events, i.e. time intervals, should be reduced by about the same factor. The correspondence between OST and fluid dynamics is as follows: streams of orons are the carriers of energy; velocity distributions of orons are field potentials; collisions between streams of orons are responsible for some kinds of forces; waves in the oron sea are electromagnetic and other kinds of waves; different kinds of vortices of orons are photons and other elementary particles, and huge multi-vortices are macro-bodies. We shall see in this article that the gravitational field is due to a sink in a non-rotational streams of orons; the electromagnetic field is due to rotational streams of orons; the strong field is due to helical streams of orons; and the weak field is due to holes, or vacuums, in the oron sea due to closed rotational streams of orons. In cosmology we find several major types of galaxies. OST assumes that the same kinds of vortices give different kinds of elementary particles. As we assume at this stage of the research, the electron family is expected to be a globular vortex of orons, as much as the shape of a globular galaxy. The neutrino family is expected to be a ring vortex of orons. The quark family is expected to be a funnel spiral vortex of orons. A proton is expected to be a combination of three funnel vortices, one twisted around the other as in a plait, giving a funnel shape as in a composite tornado. A photon is assumed to be a pair of cylindrical vortices of orons, while the cylinders are in opposite rotational directions. The quantum numbers of elementary particles as well as the composition rules, will be explained in the next article using simple arguments. OST is a very simple theory. It is so simple that it also gives us the opportunity to understand the most basic concepts of human thinking: body, character, space, time, velocity, energy, force, etc.

2.2) **Body and Relative Characters**

In OST we define several basic concepts which in other theories are accepted intuitively. We define a "body" as a collection of orons in the "oron sea", which are assigned to have one or more common relative characters, as seen by an observer sitting on an oron. For instance, a relative character could be: "being in some volume of space, as seen by a specific observer", or "all the orons in a specific wave, as seen by a specific observer", or "all the orons which have passed through a specific volume of space at certain periods of time, as seen by a specific observer", etc. In the following we may omit the word "relative", but it should be emphasized that every character is always relative. This is a general property of nature. For instance, a red body of a specific frequency, cannot be influenced by bodies emitting red color of exactly the same frequency. That is, it cannot feel them. But it may feel frequencies above or below that specific frequency. Suppose there is a body composed of N orons, all with the same specific character but in different amounts. For instance, all have different amounts of red color. Let us mark the amount of a character of an oron i by a real number c_i, while $-\infty<c_i<+\infty$.

Let us define the "net of the characters" by $n_c=\Sigma_i c_i$, while the summation is over all the orons of the body. We define "character C of a body" by:

$$C \equiv (\Sigma_i c_i)N = n_c/N \qquad (2.1$$

This definition is very general and may be useful while treating any phenomenon of nature. In addition, suppose those N orons have another character relative to that observer, say g_i, than he may define a character G of the body by $G\equiv(\Sigma_i g_i)N=n_g/N$. Since c_i, g_i are real numbers, the observer may define other characters of oron i as any combination of those two characters.

For instance, the following may also be regarded as characters: c_i+g_i, c_i-g_i, c_ig_i, c_i/g_i, $c_i^ng_i^m$ while n and m are any real numbers. The characters of the body may be defined here, as in (2.1), by special marks:

$$C+G \equiv \Sigma_i(c_i+g_i)]/N \,, \qquad (2.2$$

$$C-G \equiv \Sigma_i(c_i-g_i)]/N \,, \qquad (2.3$$

$$C^*G \equiv \Sigma_ic_ig_i)/N \,, \qquad (2.4$$

$$C\%G \equiv \Sigma_ic_i/g_i)/N \,. \qquad (2.5$$

In addition, if one defines a zero character 0, as well as a unity character 1, one receives from these definitions the conditions for a determination of the algebraic concept "field". Thus, we have a field which we may call a "character field". The usefulness of this field will be shown in OST. It is clear from these equations that the characters of a body are not multiplied or divided as usual numbers.

2.3) **Position**

Let an observer, seated on a specific oron, define an orthogonal system XYZ while he is at the origin. Suppose that at a specific moment the oron sea is frozen so that all orons are motionless. Suppose this observer defines the following character: "having x units along the X axis relative to the origin". Now, suppose he marks a specific oron j, which he may distinguish by some property, e.g. the color red, while all others are blue. Let him define a body of N orons by the character of their position along the X axis relative to that red oron. If that oron is in x_0 relative to the origin, then the character of oron i in that body may be written as $dx_i=x_i-x_0$. The character of that body may be defined by that observer as, "the position of that body along the X axis, relative to the red oron." We mark this character DX. According to (2.1) we may write this character by

$$DX \equiv (\Sigma_i dx_i)/N = n_{dx}/N \qquad (2.6$$

while $n_{dx}=\Sigma_i dx_i$, is the "net X position relative to the red oron" of this body. If there is a small number s, so that for most orons in that body $(x_i-x_0)^2 \leq s^2$ then the observer may regard the body as localized in the range x_0-s through x_0+s. This may remind us of the intuitive way we regard the position of a body. We may notice that, according to our determination some orons may belong to the body despite the possibility that they are far away from the red oron. In addition, if we stop the freezing for a while, and than refreeze, and repeat the determination of the X position of the body as above, in (2.6), relative to the same red oron, then there could be other orons in the body, but the body may be seen by that observer as the body of the first freezing. Parallel definitions may be applied to the other axes Y and Z. The general position in three dimensional space may be accepted by applying (2.6) and (2.2) on X, Y, Z.

2.4) **Time**

Let us return to the situation of an unfrozen "oron sea". Suppose our observer, who sits on some oron, decides to determine the following character: "The number of orons collide with his oron after it has collided with some specific green oron." Now, this observer may look at the body of N orons which were determined above, with the character of X position relative to that red oron, or at any other body. He determines the character of each oron in this body as follows: he follows the red oron until it collides with a specific yellow oron. Than he counts n0 collisions of his orons with other orons. During this numeration he also counts the collisions of each of the orons in the body and labels those numbers: n_i, i=1,N. Then he determines a character dt_i of oron i by $dt_i=n_0/n_i$. This character is actually a measure of the interval time of i oron in units of time of the observer's oron. Thus the observer may define "interval time of the body" by

$$DT \equiv (\Sigma_i dt_i)/N = n_t/N \qquad (2.7$$

while here $n_t=n_0\Sigma_i(1/n_i)$. Since $n_i \geq 0$ for each i, $n_t \geq 0$. Thus, $DT \geq 0$. This result is a consequence of the way we have determined the process of counting. In principle, one could receive negative n_i simply by counting the collisions back to before the moment the red oron collided with the yellow one. This would lead to DT<0, so that we can speak about negative times. A body in this way could have a negative velocity, say in the x direction even if its DX were increased. We also see in (2.7) that DT depends on the distribution of n_i as a function of the number of orons. If there are a majority of orons with small n_i, then, the DT of the whole body is determined by this group. In addition we see that the determination of time depends on the oron sea level we choose. The same may be said about the definition of space, through the definition of a position, as in (2.6). Thus, if there is a character which depends, directly or indirectly, on time or space, defined at a specific sea level, it follows the same transformations as time and space do, under the same action at that sea level. For instance, if four-vector space-time transfers Lorentz transformation, under the action of a constant linear velocity in a specific oron sea, then any other four-vector in this oron sea, which somehow depends on space and time, e.g. the electromagnetic four-vector, may transfer using the same method. In the same way, mass, forces, Doppler shift, etc., which depend indirectly on the definition of time in the oron sea, should include in their expressions the same factors as that of time, while they are under the same act, e.g. a constant linear velocity, in this oron sea. There is more to say about the meaning of time as a consequence of (2.7). A special article in preparation.

2.5) **Velocity**

The observer in the last paragraphs may wish to determine a character v_{xi} of oron in that body by the relation $v_{xi}=d_{xi}/d_{ti}$. According to (2.5), (2.6) and (2.7) he may define the property Vx of the body by

$$Vx \equiv DX\%DT =(\Sigma_i v_{xi})/N. . \qquad (2.8$$

Parallel determinations may be applied to the other axes Y,Z with velocities of the body in those directions, Vy, Vz. Thus, a velocity of a body is a character which is determined by the properties of the many compositors of the body. This may explain the vector characteristic of a velocity and is the justification for decomposing this vector to x,y,z components, etc. We also note that, according to this determination of velocity, one generally finds that DT%DX is not equal to 1/Vx. The same may be said of other couples of characters. We shall treat the results of this property of a character field when discoursing on relativity.

2.6) **Vacuum**

According to OST the known bodies are imbedded in the oron sea and they may move or rotate as a result of the existence of streams of orons. We wish to understand the medium which carries these streams. As in any ordinary fluid, one may treat two situations of the oron sea. The first situation is that of a calm oron sea where in any volume there are no linear or rotational streams of orons. The other situation is that of an uncalm, or turbulent oron sea, where one may find many phenomena such as: streams, waves and different kinds of vortices. In OST we assume that all the phenomena in nature are the expressions of streams, waves and vortices in an uncalm "oron sea". Let us imagine some volume in the oron sea in which the sea is becalmed. Suppose now, that at a specific moment, a stream of orons arrives from outside that volume. We assume this should cause the "oron sea" inside that volume to become turbulent, having many streams, waves and vortices. Thus, elementary particles (vortices) of different kinds, may be created in pairs and gain velocities, in all directions, as the result of those streams. These particles may collide among themselves and eventually reach some average free flight velocity. If one directs more streams towards that volume, the oron sea inside it may become more turbulent and the average free flight velocity of these particles will increase. Thus, the amount of none quietness of the "oron sea" plays the same role as entropy. This simple example may explain what the quantity is which transfers from a hot place to a colder one. That quantity seems to be streams of orons. Orons are so small that they may very easily penetrate any elementary particle. Their "collisions" with other orons, which compose the elementary particles, bring changes in the motions of those particles such as happens to vortices in the ocean which are moved by streams of water. Thus, we may understand the vacuum in which particles are created, and destroyed, in pairs. It seems to be a calm oron sea. All those phenomena are very well known in ordinary fluids [1] [2]. Accordingly, one may wish to define vacuum as a calm oron sea where there are no streams at all. In Sec. 3.1 we determine the linear velocity of a body. As the first step, we may use the definition of linear velocity to define vacuum by establishing the requirement that, in any infinitesimal volume, the linear velocity vector is zero. This requirement stipulates that there are no rotational streams of orons in the vacuum. We now proceed to the second step in the definition of the vacuum. In OST we regard the basic particles of one oron sea, say "A-oron sea", as composed of basic particles of a lower oron sea, say "B-oron sea". The A-oron sea may be calm while, at the same time, the B-oron sea is stormy. This situation is similar to observing a calm ocean, which is a molecular sea. In this sea we may not see any stream, thus we may regard it as a vacuum from the point of view of vortices (bodies) in this ocean. However, at the same time, the elementary particles inside these molecules are in the un-calm situation, i.e., there are streams and vortices of elementary particles. When we talk about a vacuum we have to describe in which sea the vacuum exists. The third step in defining a vacuum concerns our point of view of characters. Velocity is only one kind of character in a body in a specific oron sea. This definition of a vacuum, i.e., using velocity, is being used because of traditional physics. In fact, we may regard a vacuum as referring to other properties. For instance, one may define, in a specific sea, a character as "having green color". If that sea is red everywhere, then this sea is a vacuum regarding the green character. It may be stormy regarding the velocity character, but it is still a vacuum regarding the green character. Another example is the way Dirac defined a vacuum by regarding the negative and positive states of electrons. Thus, we may treat a vacuum referring to a specific character as the background of this character. The definition of a body by a specific character in a specific sea may be regarded as a perturbation in that background. Thus the definition of a vacuum, in a specific sea, regarding a character C, defined as in Sec. 2.2, is

$$C=0 \qquad \text{(for any body in the specific sea)} \qquad (2.9$$

This definition of a vacuum may allow us to understand several phenomena in physics .

3) **Mechanics in OST**

3.1) **Linear velocity**

Let us imagine that we are looking at an "oron sea" from a point outside this sea, such as one looks at the ocean from a coastal mountain. We define "homogenous oron sea" as an "oron sea" of one kind of oron, i.e., where all the orons seem to have the same size and character, except that they may move, or rotate in different directions. In the following treatment we use the "homogenous oron sea". We define "linear velocity of a body" as the average of the linear velocity vectors of all the orons in the body. By definition, these orons have free flight velocities v_f very close to c. The linear velocity vector of oron i may be written as $\mathbf{v}_i = v_f\mathbf{n}_i$, while $\mathbf{n}_i$ is a unit vector in the direction of $\mathbf{v}_i$. We define "linear net direction of a body" by $\mathbf{n} = \Sigma_i\mathbf{n}_i$, while the summation is over all the orons in the body. Let us look at a body of N orons in an "oron sea". The linear velocity v of that body is:

$$v \equiv (\Sigma_i v_i)/N = (v_f/N)\mathbf{n}. \qquad (3.1$$

We will show how this simple equation can lead us to an understanding of the basic laws of mechanics. In ART 17 of [1] one may find a definition of "velocity potential" ϕ in fluids, by, $v_x=-\delta\phi/\delta x$; $v_y=-\delta\phi/\delta y$; $v_z=-\delta\phi/\delta z$, while δ represents here partial differentiation. Thus $\phi = -\int(v_xdx+v_ydy+v_zdz)$. In OST ϕ has a simple explanation: By inserting the components of **v** from (3.1) you will get $\phi = -(v_f/N)\int(n_xdx+n_ydy+n_zdz)$. Thus , ϕ is the averaged spatial integration of the linear net direction n, multiplied by v_f. We may call it in OST "linear velocity potential" and mark it by ϕ_v. Thus ,

$$\phi_v= -(v_f/N) \int\mathbf{n}*d\mathbf{s}. \qquad (3.2$$

This simple meaning of linear velocity potential may be useful not only in oron sea but in any ordinary fluid as well as in cosmology. The meaning of potential energy will be treated in Sec. 3.3.

3.2) **Force and Inertial Mass**

We would like to use the Oron Sea Theory to explain force and inertial mass. As in the previous paragraph, we here demand that the magnitude of the linear velocity of all the orons in the "oron sea" are the same. Their directions may be different. For the sake of simplicity, we assume here that there are only elastic collisions between orons in this "oron sea". Let us imagine two bodies of orons concentrated at two volumes, V_1 and V_2, in the "oron sea", e.g. two vortices. Let the number of orons in these bodies be N_1 and N_2, respectively. Let us also assume that an observer sees these bodies at rest on the x axis of an orthogonal system. This means that, from his point of view, the linear net direction of each body is zero: $\mathbf{n_1},\mathbf{n_2}=0$. Suppose now that at a specific moment, body 1, which is at the left of body 2, sends n orons in the positive direction of x toward body 2. Thus, body 2 has a linear net direction n towards +x, while body 1 has a linear net direction n towards -x. According to (3.1) we may write the linear velocities of those bodies respectively, as:

$$\mathbf{v}_1= - v_f n/(N_1-n)\mathbf{i}; \quad \mathbf{v}_2= + v_f n/(N_2+n)\mathbf{i}, \qquad (3.3$$

while **i** is a unit vector in the +x direction. If $n << N_1,N_2$ then we may approximate these two equations to give $v_1=-v_f n/N_1$, $v_2=+v_f n/N_2$. Thus, $v_1N_1=-v_2N_2$. We will see in Sec. 5.4 that inertial mass is a "hole" in the oron sea. Here we use "inertial mass" at the usual way. Let us mark the inertial masses of body 1 and body 2 by M_1, M_2, respectively. For the sake of simplicity, suppose that all the orons have the same inertial mass, m, and that the inertial masses of those bodies are, $M_1=mN_1$, $M_2=mN_2$,. Thus, the former equation may be written $M_1v_1=-M_2v_2$. We therefore receive the conservation law of linear momentum. Suppose now that body 1 sends towards body 2 these n orons, not in one shot, but as a stream of orons with a rate, dn/dt.

Thus, the increment of the linear velocities dv_1, dv_2, during dt becomes in that approximation: $dv_1=-v_f dn/N_1$; $dv_2=+v_f dn/N_2$. Therefore the linear accelerations of these bodies are respectively: $a_1=dv_1/dt=-v_f(dn/dt)/N_1$, $a_2=dv_2/dt=+v_f(dn/dt)/N_2$. Thus, $a_1N_1=-a_2N_2$. We may write here $a_1M_1=-a_2M_2$, and, in general we may write $a_1M_1=-a_2M_2$. In this way we obtain Newton's third law in a simple way, as a consequence of directing a stream of orons, from one body toward the other. From this treatment one may also deduce the meaning of force, expressed by Newton's second law $\mathbf{F}=M\mathbf{a}$:

$$\mathbf{F}=mv_f(d\mathbf{n}/dt). \qquad (3.4$$

This is a general consequence for any fluid, as well as for the oron sea. If $v_f \approx c$, as in the case of orons, we have $\mathbf{F}=mc(d\mathbf{n}/dt)$. Thus, a force acting on a body leads to a change in the net direction of that body by a rate of $d\mathbf{n}/dt$. If we push an object, we actually transfer to it orons at a specific rate which determines the amount of force we extract. Since we change also, in the opposite direction, our net direction of orons (we are bodies in the "oron sea") we are repelled while pushing the object. Transference of orons is not the only way to change the net direction of a body. Any act, inside or outside the body, which changes that net, e.g. reversal of some orons of the body, gives the same result. Reversing the argument, one may define the inertial mass of a body as the amount of the rate of change of the linear velocity, while the body is acted by a specific stream of orons. According to this definition, a body of zero mass, e.g., a photon, and a body of infinite inertial mass, will not change their velocities while acted on by a force (a stream of orons.) Thus, one may understand the relativistic equation of an inertial mass in a relativistic velocity, in which, the inertial mass goes to infinity, as the velocity approaches c, but at v=c the inertial mass should be zero. This definition of inertial mass leads to the equivalent of inertial and gravitational masses, and one may also connect it to the number of orons of a body, N, through the equations of this part.

3.3) **Energy**:

In ordinary physics we talk about many kinds of energies and we deal with transformations from one kind of energy to another. In OST this is not necessary. Here we may define "energy" as the ability to change the net direction of a body. This definition covers all cases. Let us take the original definition of mechanical energy as the work W which is exerted on a particle along a specific distance S by a force **F**: W=**F***S. Using (3.4) we may write W=mc(d**n**/dt)***S**. When the particle is transferred along S it gathers more and more change in its net direction. The total net direction it reaches may be used to enhance its linear velocity, rotational velocity or even for internal changes in that particle. We now deduce the general case of any potential energy U between two points: U=-∫**F***d**r**. Using (3.4) we may write U-=mv_f∫(d**n**/dt)*d**r**. Let us define the magnitude of the total net direction between these points by n_q=-∫d**n**/dt)*d**r**. Thus, the general form of any potential energy may be written as:

$$U = mv_f n_{q..} \qquad . \qquad (3.5$$

One may easily extract the kinetic energy of the body from (3.5). For this purpose one should replace, in the expression of n_q, d**r** by **v**dt and using (3.1): U= - (mv_f^2/N)∫**n***d**n**. The integral is ½(n_2^2-n_1^2). Thus, if we define the kinetic energies at points 1 and 2 respectively, as K_1=½$M_1v_1^2$, K_2=½$M_2v_2^2$, we extract U=K_1-K_2. The potential energy, as well as the kinetic energy are consistent with that definition of energy. Let us now treat the energy of a rest mass as deduced from Einstein: E=Mc^2. Suppose there is a body 1 of N_1 orons, which is at rest relative to an observer. Each of these orons has mass m and free flight velocity of magnitude of approximately c. We assume as before that the orons in that body do not influence each other except during their elastic mutual collisions. Thus, the total mass of the body is mN_1. For simplicity, let us assume that the body is arranged as a die of length L. Since the body is at rest, its linear velocity is zero, which means that the net direction is zero. Suppose there is another body 2 at rest relative to this observer with N_2 orons, while N_2>>N_1. Also suppose that at a specific moment, somehow, all the orons of body 1 will be directed along the length of the die towards body 2. When the first orons of body 1 arrive at body 2, the net direction of 2 begins changing. Since the orons of body 1 move at speed c, the time it takes for all these orons to reach body 2, is dt=L/c. The total change of the net direction of body 2 is $dn=N_1$. In addition, body 1 has applied this force while it moves the distance equals the length L. Inserting all this into (3.5) we extract for body 2: $U_2=mcn_q=mcLN_1/(L/c)=mN_1c^2$. Since $M_1=mN_1$ we receive: $U_2=M_1c^2$. Thus, body 1 has become the addition of energy to body 2 in the amount M_1c^2. This addition of energy may change the parameters of body 2 in different ways. To see some of these influences let us recall that in the above equation the factor c is an approximation of the free flight velocity v_f of the orons in the specific homogenous oron sea we are treating. Thus, from the exact form of (3.1) we may write $\mathbf{n}=(N/v_f)\mathbf{v}$. The time derivative of $\mathbf{n}$ is:

$$d\mathbf{n}/dt=(N/v_f)d\mathbf{v}/dt + (1/v_f)\mathbf{v}dN/dt - (N\mathbf{v}/v_f^2)dv_f/dt. \qquad (3.6$$

The first term in the right side of this equation may be regarded as the change in the linear velocity of the body. The second term is a change in the composition of the body (chemical energy), and the third term may give the change in the temperature of the body (heat energy.) Thus, we see how one may treat mechanics using the concept of net direction which has a clear meaning, instead of using non-direct concepts such as force, mass and energy. Einstein's equation $E=Mc^2$ may lead one to very important conclusions: Suppose we look at a volume of fluid of mass M, which is at rest relative to an observer. Recall the virial theorem which says that if that volume consists of particles whose mutual forces obey the inverse square law, the average kinetic energy of those particles equals minus one-half their average potential energy. Thus, the kinetic energy of that volume of fluid seems to be $K\approx)\frac{1}{2}E=\frac{1}{2}Mc^2$. The potential energy is also approximately ½E. If there are many N particles in that volume, with the same mass m and the same free flight v_f, than their kinetic energy is $K=\frac{1}{2}mNv_f^2=\frac{1}{2}Mv_f^2$. Equating the two right sides of these equations of K, give us $v_f \approx c$. That implies the receipt of orons. Thus, it would seem that Einstein's equation provide a hint as to the possibility that orons do indeed exist in nature.

3.4) **Angular velocity**

So far we have treated the consequence of the assumption that there is a linear free flight velocity of orons. Let us assume that orons also have an intrinsic angular velocity and moment of inertia. It might be easy to accept that assumption if we could imagine the oron itself as composed of many smaller orons. We may be reminded that one way to treat ordinary fluids is by assuming that they are composed of small droplets which have intrinsic angular velocity. As in the linear velocity treatment, we are dealing with homogeneous oron, in which all the orons have, in addition to the above properties of equal mass and free flight velocity, equal intrinsic angular velocity w_f as well as equal moment of inertia I_f. The vector of the intrinsic angular velocity of oron i is $\mathbf{w}_{fi} = w_f\mathbf{k}_i$, while $\mathbf{k}_i$ is a unit vector in the direction of $\mathbf{w}_{fi}$. Let us look at a body of N orons in an "oron sea". We here define "angular net direction of a body" by $\mathbf{k}=\sum_i\mathbf{k}_i$, while the summation covers all the orons of the body. By analogy to (3.1) we here define the "angular velocity of a body " $\mathbf{\Omega}$ by

$$\mathbf{\Omega} = (\textstyle\sum_i\mathbf{w}_i)/N=(w_f/N)\mathbf{k}. \qquad (3.7$$

There is a full analogy in physics between the equations of linear velocities and those of angular velocities. For instance, the conservation laws of momentum and energy. One may obtain the parallel equations for angular velocity by repeating the above treatment, starting from the similarity between (3.7) and (3.1), and using the usual marks for the case of rotational dynamics. This will not be shown in this article. However, we wish to emphasize several important points: The first is how to deduce the conservation law of angular momentum $\mathbf{J}=\mathrm{I}\mathbf{\Omega}$. As in the case of linear momentum, let us begin with two bodies of orons, 1 and 2, which are both of zero $\mathbf{\Omega}$, that means $\mathbf{\Omega_1}, \mathbf{\Omega_2} = \mathbf{0}$. The meaning of zero $\mathbf{\Omega}$ is that the $\mathbf{k}_i$s of the orons in the body are isotropic distributed. Let the number of orons in these bodies be N_1, N_2, respectively. Suppose also that the bodies are at rest along the z axis, are of the same shape, have the same moments of inertia I_1, I_2 about the z axis, and that

$N_1=N_2$. This means there is some constant b which, for this case, one may write as $I_1=b\ I_fN_1$, $I_2=b\ I_fN_2$. Now, let us take from body 1 k orons with the same rotational direction, say +z, and transfer them to body 2. Thus, body 1 has an angular net direction k in the -z direction, while body 2 has an angular net direction k in the +z direction. If $k<<N_1,N_2$ then from (3.7) we may approximate $\mathbf{\Omega_1}=-(w_f/N_1)k\mathbf{z}$, $\mathbf{\Omega_2}=-(w_f/N_2)k\mathbf{z}$, while z is a unit vector in the z direction. Thus, $N_1\mathbf{\Omega_1}=-N_2\mathbf{\Omega_2}$. Multiplying both sides by bI_f gives $I_1\mathbf{\Omega_1}=-I_2\mathbf{\Omega_2}$. We therefore, have the conservation law of angular momentum $\mathbf{J}_1=-\mathbf{J}_2$.

Let us go on with the analogies. By analogy to (3.2) let us here define the "angular velocity potential of a body" by

$$\phi_w = -(w_f/N)\int \mathbf{k}^* d\boldsymbol{\theta}. \qquad (3.8$$

while $d\boldsymbol{\theta}$ is an element vector of an angle $\boldsymbol{\theta}$ over which the integration is performed. The analogue of (3.5) is $U_w= Iw_fk_q$, while $k_q = -\int(d\mathbf{k}/dt)^*d\boldsymbol{\theta}$. The components of the torque $\mathbf{T}$, which is the time derivative of $\mathbf{J}$, may be accepted by $T_i = -(\delta U_w/\delta\phi_i)$, while i represents here x,y or z. Other analogies may be deduced at the same way.

Let us treat a very important point which regards the intrinsic rotational energy of a body with zero $\mathbf{\Omega}$. According to the Einsteinian identity, the energy of a body consisting of N non-interacting orons of mass m, is E=mNc2. The parallel equation, from angular velocity treatment, may be $E=I_fNw_f^2$. A-priori, there is no reason to prefer the linear treatment to the angular treatment. Both treatments may be used to establish the intrinsic energy of a body at rest. Thus, one may deduce that $mNc^2=I_fNw_f^2$. Therefor in the general case:

$$w_f=c\sqrt{(m/I_f)} \qquad (3.9$$

If $I_f \approx mr_f^2$, as in the case of a uniform cylinder about its axis, and r_f is its radius, then $w_f \approx c/r_f$. This result seems reasonable since it states that the smaller orons inside an oron are moving in a velocity close to c. This property defined orons above. If r_f is of the order, say, of $3*10^{-21}$ cm then $w_f \approx 10^{31}$ rad/s. Thus such an oron will be seen as a rigid particle despite the possibility that it consists of, say, 10^{24} smaller orons.

3.6) **Interactions between streams**

In consistency with the definition of a force, see (3.4), most of the forces in nature are due, in OST, to the influence of one stream of orons over another stream. As in ordinary fluid, if two equal streams of orons are streaming along the same line in opposite directions, then, while they collide, the streams in these directions become weaker and streams moving backwards are created, in addition to two equal and opposite streams in the vertical direction, outside of the interacting streams. An example in Fig. 2a. We call the orthogonal streams: "side streams". Let us call this phenomenon: "the interaction of two opposite streams". If two rotational streams of orons run parallel, and they are close enough, they will attract each other, much as happens in ordinary fluid. In this case there will be, due to the interaction, side streams inward of the interacting streams. See Fig 2b. Let us call this phenomenon: "the interaction of two parallel streams". These two kinds of interactions give us some hint to the possible reasons for several kinds of repulsion and attraction forces, as we will see in Chapters. 6 and 7.

In view of the definition of a force in (3.4) we understand how these interaction between streams, lead to forces acted on the bodies which created these streams. If v_1, v_2, are the magnitudes of the streams before the interaction take place, then we assume that after the interaction, the magnitudes of the side streams, v_s, are:

$$v_s=b_f v_1 v_2 \,, \qquad (3.10$$

while b_f is a constant which may be found using statistics. Using the definition of v in (3.1) we see the dependence of v_s on the specific oron sea we deal with .

3.7) **Funnel Spiral Vortex**

One of the best examples we have found of a macro representative of several basic elementary particles, is a funnel spiral vortex, such as a tornado in a thunderstorm[4]. In OST we recognize a funnel spiral vortex as an elementary particle or as cosmological particles, i.e. galaxies, or as a basic particles in any other sea. In Fig. 1 we see a general schema of a funnel vortex. As we will show latter, funnel spiral vortices of different kinds have all the characters we are used to regarding to an electron, a proton and other elementary particles. In Fig. 1 the spiral lines represent the spiral streams of the funnel vortex of orons in an oron sea. The dotted lines represent other streams regarding that spiraling vortex. The letters in this figure represent field potentials due to those streams: G, E, M, S and W represent, respectively: gravitational, electric, magnetic, strong and weak field potentials, to be discussed in chapters 5, 6 and 7. In these chapters we discuss possible consequences of our assumption regarding the specific shapes of elementary particle.

We wish to obtain a mathematical representation of a funnel spiral vortex which explains the characteristics of an elementary particle as we will show in the following chapters. Imagine a funnel shaped of one spiral. Suppose the longitudinal axis of this spiral is along the Z axis of an orthogonal system XYZ, while the +Z is in the direction of the narrow side of the funnel. The center of the wide side of the funnel is at the origin of the system. Let us further imagine a small bead in the spiral at point (X_0,Y_0,Z_0). Let this have an initial velocity (V_{x0},V_{y0},V_{z0}). Let us mark by θ the angle of that particle, in a plane parallel to the XY plane, relative to the initial position. We look for the position of the bead while it goes along the spiral. We look for a representation which includes the rotational as well as the ir-rotational characteristics of the vortex. We feel intuitively that the following general equations may represent the position of that small particle within the spiral:

$X=A(EXP-\beta\phi-\delta n)COS\theta$ (3.11

$Y=A(EXP-\beta\phi-\delta n)SIN\theta$ (3.12

$Z=B(EXP-\mu R+b\theta)$ (3.13

While A and B are parameters which may depend on time if the narrow side of the vortex is in linear or other kind of motion, relative to the origin . ϕ and n are function determined by $\phi \equiv k_z/N$, $n \equiv n_r/N$, while k_z is the z component of k of Sec. 3.4 dealing with angular velocity, n_r is the "radial net direction" of Sec. 5.3 dealing with gravitation. N is shown there to be proportional to $1/R^2$. The rotational parameters are β and b. The irrotational parameters are δ and μ . These four parameters may be of any sign, as well as zero. They may be found from initial conditions and by the arguments in the rest of the article. For a right handed spiral the sign of β is the same as the sign of θ .

For the sake of simplicity we regard A as independent on time. We determine R as the distance of the bead from the Z axis: $R^2=X^2+Y^2$. From (3.11) and (3.12) one finds

$R= A(EXP-\beta\phi-\delta n)$. (3.14

Let us define the circular velocity: $V_\theta=R(d\theta/dt)$. We assume there is a constant of the rotational motion, K_0, so that

$V_\theta =\pm K_0/R$, (3.15

while the sign in this equation is as the sign of θ . This equation is obtained if :

$d\theta/dt=\pm K_0/R^2$. (3.16

The left side of this equation is Ω_z which is determined in (3.7). It is proportional to ϕ . From the reasoning given in Sec.5.3 one may deduced

$dn/dt=g/R^2$, while g is a constant of the ir-rotational motion. By analogy we assume $d\phi/dt=w/R^2$, while w is a constant of the rotational motion. From this assumption and (3.16) we conclude ϕ is a linear function of θ . When θ increases we expect ϕ increases as well. If β is not equal 0, then R decreases while θ and Z increase .

Thus, in (3.11)-(3.14) there is an analog representation of the rotational functions as of the irrotational functions. If there is only rotational motions, then $\delta=\mu=0$. The parameter β indicates the behavior of the funnel as a sink (source) at a rotational sea. If there is only irrotational motion, then $\beta=\gamma=0$. In this case the parameter δ indicates the behavior of the funnel as a sink (source) at an irrotational sea. If a sink, we have the gravitational phenomenon. If a source, we have a continually expansion phenomenon, as in the core of some galaxies.

The orthogonal velocity to Z axis, V_r, is determined here by $V_r=dR/dt$. The velocity in the Z direction is determined by $V_z=dZ/dt$. From (3.13)-(3.16) we get:

$$V_r= \pm \beta w/R \pm \delta g/R \qquad (3.17$$

$$V_z=[(dB/dt) \pm (Bw\beta\mu/R) \pm (Bg\delta\mu/R) \pm (BKb/R^2)]EXP(-\mu R+b\theta). \qquad (3.18$$

In Sec. 6.2 we will show that the first term of (3.17) is due to the rotational velocity of orons. It resembles the electric potential. The parameter β seems to be proportional to the electric charge of the particle (funnel vortex). The parameter w seems to be connected with the constant in Coulomb law. The second term of (3.17) is due to the gravitation potential of the particle. It is a result of the behavior of the vortex as a sink of nonrotational streams, as we discuss in Sec. 5.3. The fourth term in (3.18) may be connected with the magnetic field around a funnel vortex, as we will discuss in Sec. 6.3. The third term in (3.18) may be connected with the Yukawa potential. It is due to the irrotational strong streams of orons at the vicinity of the narrow side of the funnel. We will discuss this potential at Chapter 7.

The total linear velocity of the bead is determined by $V=\sqrt{(V_\theta+^2V_r^2+V_z^2)}$. In OST this velocity has an upper limit determined by the free flight velocity, v_f, of the components of the particle (the bead in this example). Therefore, there is a minimum distance from the Z axis, R_{min}, where the particles compose the vortex exist, before being broken to their components. This R_{min} is the radius of the quiet eye of the funnel vortex. These components may create a weak spiral funnel vortex inside this eye. The mathematical representation of this weak funnel vortex may be the same as in (3.11)-(3.13) but with other parameters. Thus, in this domain there is expected to be the weak potential, as we discuss in chapter 7. Since R depends on θ , through ϕ , the term in the exponent of (3.14) may change sign, as θ reaches a specific value. Equations (3.11)-(3.13) are general .One may use these to treat all the kinds of vortices. If β , 0=we have a cylindrical vortex, or a ring vortex. If the ring rotates about X or Y axis, we have a spherical vortex with a hole in its center. If a funnel vortex rotates about the X or Y axis, there could be peculiar shapes, some of which are seen in cosmology. If θ is taken as negative, we may change also the sign of β , in order to get a spiral vortex with the opposite rotational direction. This gives the anti-particle, as we will explain in chapter 7. When there are more than one spiral in the funnel vortex, each spiral may have its own parameters. In this case the situation is more complicated, since now the spirals may interact in a verity of ways. A multiple tornado is an example to such a situation.

3.8) **Quantization**

OST is a quantum and continuum theory at the same time. Since we regard oron sea as composed of particles, we thereby have the quantum part of the theory. On the other hand, every particle in OST is imbedded in a sea of smaller particles, while those particles are also imbedded in smaller particles, etc. The theory does not limit the smallness of the particles. Thus, any particle may behave as if it is imbedded in continuous matter. In the same way, one may regard the characters, defined in Sec. 2.2, as being quantized or continuous, depending on the point of view preferred. Even space and time may be regarded as quantized or continuous, as one may note from (2.6) and (2.7). Thus, velocity may also be regarded as quantized or continuous, depending on the way one prefers to look at the situation, see (2.8). This duality in the theory may be reflected by the phenomena it explains. We shall see in Sec. 5.3 how gravitational mass may be regarded as quantized. In Sec. 6.4 we shall see why light behaves in duality. Thus, OST gives a very simple answer to the duality of phenomena in nature. The problem is not in nature, but in the human understanding of space and time. We shall deal with a possible solution to this problem in a separate article .

4) **Relativity in OST**

When we see all the phenomena one may explain by OST we can't ignore the possibility that there is, in reality, an "oron sea", which has the characteristics mentioned above, and where all the phenomena of nature takes place. The real question is not whether such an oron sea does exist, but whether one may explain the Michelson-Morley experiment using OST. We have to remember that this experiment has caused the cancellation of the notion of ether by the theory of relativity. OST is supposed to be consistent with special relativity as well as with general relativity. Thus, OST has no justification, unless it also explains that experiment. In an ordinary molecular fluid the sound velocities actually determined by the free flight velocity of the molecules composing that fluid. Therefore, the sound velocity, in the fluid, is independent of the movements of the object which creates or absorbs sound waves. The sound velocity is a characteristic of the medium alone, not of the objects immersed in that medium. This explains why we continue to hear an airplane, which is flying at a speed greater then sound velocity, even after it has passed over our heads. Today we know of many phenomena in aerodynamics which resemble phenomena occurring in electromagnetic waves. For instance, "Mach number" M, the relation of the linear velocity of a body V to the sound velocity in its local surroundings v_s: $M=V/v_s$, a factor which we find in many aerodynamic equations resembles relativistic equations. E.g., the drag coefficient C_d depends on $1/\sqrt{(1-M^2)}$; The "Mach cone" of a sound source, moving supersonically, resembles the characteristics of the "light cone", Which one may see in Chapter 9 of (9); treatments in shock waves, below or beyond Mach number, etc. We also know that a body cannot measure its own velocity relative to its immediate surroundings by sound waves or other waves, with no other reference. This is why a submarine uses the Doppler effect in its SONAR, bouncing sound waves against a referent body, (e.g. ground, another submarine, etc.) and analyzes the return sound wave. If one would try to do a Michelson-Morley experiment with sound waves in a submarine one would find the same negative results as was found in the original experiment with light waves. Otherwise, determination of ones own velocity would be in contradiction to the postulate of the theory of relativity: that one cannot know whether he is in inertial motion or the other objects are. These properties of sound are a result of the connection between the sound velocity in the specific medium, and the free flight velocities of the molecules in this medium. While a body is moving in a fluid it influences its surroundings in such a way that from its point of view it cannot realize the fact that it is in motion, unless there is no time for the surroundings to compensate for the changes as a result of this motion, as in an accelerated motion. All these phenomena are well known in ordinary fluids. We do not see any reason why these same phenomena cannot be valid in a medium-like oron sea, which differs from ordinary fluid only by the free flight velocity of its particles. Since the free flight velocities in the oron sea are very close to c, the speed of light in vacuum, it seems natural to expect that the velocity of light in this oron sea, will not be dependent upon any object except the characteristics of the oron sea itself. In OST we expect that, while a body is in motion, it influences the oron sea in its surroundings in such a way as to cancel its ability to realize its own motion. According to OST, Earth is composed of many orons. The negative results in the Michelson-Morely experiment is the consequence of the changes in the oron sea, due to the motion of the Earth through it. The question is what are those changes, and how they may lead to the Lorentz Transformations. OST answers this in a very simple argument. We use here an analog treatment with ideal gas. For simplicity, let us consider a homogenous oron sea as determined in Sec. 3.1. Let us consider a cubic body of orons defined in this sea by an observer sitting on some oron, not necessarily included in this body. For the sake of simplicity, suppose the observer regards the 6 faces of this cube as 6 parts of the body. Now, suppose the observer sees the body as at rest relative to himself. That means that the "net direction linear velocity" of the body is zero, as this observer counts it. Thus, the directions of the velocities of the orons, on all the faces of that body, are distributed randomly. That also means that the orons impinge on the faces of this body from outside, doing it equally. For the sake of simplicity, let us only regard the collisions with the body in directions normal to its faces. Suppose all the orons have the same free flight velocity v_f. Suppose also that every oron which impinges from outside onto a face, reverses its direction after the collision. We assume that the body is at rest, relative to that observer. The observer wishes to determine the time interval of the body. He will use the definition of time interval of a body as in Sec. 2.3. He will count n0 collisions of orons with his own oron between two specific collisions. In the meantime, he will also count all the orons which impinge on that body onto all the 6 faces. Since the body seems at rest, from his point of view, the number he will count for each face of the body is equal, say n_f. Thus he defines the time interval of each face of the body at rest as $dt_{fi}=n_0/n_f$, while i represents face i of the cube. The time interval of the body at rest is determined by (2.7) to be $DT_f=6(n_0/n_f)/6=n_0/n_f$. Now, suppose the body somehow receives a constant linear velocity v_x in the +X direction, perpendicular to face 1. Our observer will again count the number of collisions with the body, while his oron collides the same n0 times as before. The observer will see that there are orons which move at the speed v_f towards face 1, while that face has a velocity v_x toward those orons. It is accepted in OST that, as in gases, the rate of collision is proportional to the relative velocity. Thus the rate of the collisions in face 1 is greater than in the rest case, by a factor $(v_f+v_x)/v_f$. That is, the observer counts for this face 1 $n_1=n_f(v_f+v_x)/v_f$. Meanwhile, the opposite face, 2, moves away, from the orons which impinge on it, at the same velocity v_x. Thus $n_2=n_f(v_f-v_x)/v_f$. For the other four faces, which are parallel to the motion, there is a small change in the number of collisions relative to the rest case, as a result of the non-normal component of the impinging orons on those faces. Let us treat one of the orons. The impinged oron is at a velocity v_f, which strikes the face at an incident angle (relative to the normal of the face) θ so that $v_x/v_f=\sin\theta$. The normal component is $\sqrt{(v_f^2-v_x^2)}$. Thus the number of collisions in this parallel face at the moving case is changed, relative to the number in the rest case, by the factor: $(\sqrt{(v_f^2-v_x^2)})/v_f=\sqrt{[1-(v_x/v_f)^2]}$. Thus, $n_i=n_f\sqrt{[1-(v_x/v_f)^2]}$, while i=3,4,5,6. The time interval of the body in the moving case is $DT_v = (\sum_i n_0/n_i)/6$. Inserting the above parameters into the last equation, one finds the connection between the time intervals of the body at rest and at inertial motion:

$$DT_v = \frac{DT_f}{\sqrt{[1-(v_x/v_f)^2]}} \{2/3+ (1/3)/ \sqrt{[1-(v_x/v_f)^2]}\} \qquad (4.1$$

Therefore if we insert c instead of v_f we receive a factor γ which resembles the one in the Lorentz transformation, $1/\sqrt{[1-(v_x/v_f)^2]}$, with an addition which resemble the differences in times in the Michelson-Morely experiment, (3) (chapter 3). We have to remember that we have determined the time of a three dimensional body. In the Michelson-Morely experiment the argumentation regards one dimension only.

The determination of three dimensional space may be accomplished in the same manner using the free flight distance of orons in a "homogenous oron sea". Now, that we have a way of defining time interval, dt_f, of an oron, we may use it, in addition to the free flight velocity v_f, in order to define the unit of length for this oron, dl_f, by $dl_f=v_f dt_f$. We may repeat the above argumentation for a cubic body. It is clear that when a body is at rest, relative to the observer he sees the orons in the surroundings of the 6 faces so that they are distributed equally, with a free flight distance dl_f, which depends on the density, the size of the orons, as well as on v_f. Much the same as in gases. While the body is in motion in the +X direction, with a constant linear velocity v_x, there is an enhancement in the density of orons near face 1 of the cubic body, since orons which have collided with this face are reversed, as mentioned above. Due to the motion, the rate of reversing of orons increases, thus the density increases also. Here we have to take into account the change in the shape of the layers which are built in front of face 1 while in motion.

When the body is at rest there is a flat layer, parallel to face 1, where one may count the orons which collide in face 1 and enhance the density. When the body is in small motion some of the orons which move in the orthogonal direction to v_x also reach that face. Thus the layer is curved towards -X. As v_x increases, that curve becomes sharper and we receive the known cone such as in front of a bullet fired into water. This is a known phenomenon in fluid dynamics. It depends on the Mach number in fluids, that is on v_x/v_f. When the body is at rest, the immediate surroundings of face 1, as seen by that observer, is composed of, say, q_f, orons with v_f in the +X direction, and the same number q_f of orons in the -X direction. When the body is in motion we expect that the observer will see that in the same surroundings of face 1, the density of orons in the +X direction is changed by a factor $v_f/(v_f-v_x)$, while the number in -X direction changes by the factor $v_f/(v_f+v_x)$. Thus, due to this contribution alone, without the influence of that cone, the density is changed by the factor $2/[1-(v_x/v_f)^2]$. The addition of the influence of the cone seems to contribute a factor proportional to $1/\sqrt{[1-(v_x/v_f)^2]}$. This is due to analog treatment in the orthogonal directions Y, Z as was used in the treatment in time. The relation of the density at rest and at motion, seems to be like the relation of the times in (4.1). Since the free flight distance is proportionally inverse to the density, we receive the relations between the lengths at rest relative to at motion, as the inverse relation of the times. We may mention here the dependency of Cd on the density of fluids due to motion, and the dependency of Cd on the factor $1/\sqrt{[1-(v_x/v_f)^2]}$, while v_f is sound velocity in the local surroundings of the body.

Equation (4.1) hints that the Lorentz Transformations may need a correction by a factor such as the one in the { } of this equation. This line should be pursued. Thus, we accept in this article the Lorentz Transformations without modification, and using them along the other ideas of OST. In OST we assume that Lorentz Transformations holds at all kinds of seas, while we replace the relativistic factor γ by γ_f which is determined by:

$$\gamma_f \equiv 1/\sqrt{[1 - (v/v_f)^2]} \qquad (4.2$$

Our simple definition of time in oron sea has brought us to a deeper understanding of the relativistic equations. We now see why, in the Michelson-Morely experiment, they did not find any difference between the velocities of light in the orthogonal directions. The Earth is composed of orons and it moves in an oron sea. That is why the velocity of light is independent of the direction it goes or upon the velocity of the object emitting the light or receiving it. It also explains the Doppler effect in electrodynamics and why light is not dragged with the Earth, thus giving rise to the aberration phenomenon. Thus, the simple explanation to the Michelson-Morley experiment is the possible existence of a medium which is composed of particles which have free flight velocity equal, or very close to, the theoretical speed of light in a vacuum, c. This is exactly what we mean by the oron sea.

OST also explains other phenomena of the relativistic theories which, in fact, uses concepts taken from phenomena in fluids. For instance, the principle of relativity, which states that the laws of physics are the same for any moving body in a constant linear velocity (inertial system). A transparent submarine which travels in a constant linear velocity inside a quiet ocean has no way of determining whether it moves forward, or whether the water in its near vicinity moves in the opposite direction. This is one of the ways of expressing that the laws of physics do not change in uniformly translated motion (3). Since in OST we regard the oron sea as any fluid, it seems reasonable to expect that the principle of relativity may hold in that oron sea also. The possible existence of an oron sea may give us the reason why the principle of relativity is true. Now it is not an axiom. It is the immediate result of our assumption that the oron sea exists .

5) **Cosmology in OST**

5.1) **General Scope**

According to the point of view of OST all the phenomena in cosmology are similar to phenomena in fluids. The only differences occur in the scales of space and time. The medium in cosmology is the "star sea". Stars are the basic particles of this medium. Their size is of order $10^{11\pm2}$ cm, which means 24 ± 2 orders of magnitude greater than the size of a proton. In Sec. 2.4 we regard the mean time between mutual collisions of the basic particles of a specific medium, as the unit time of that medium. For a molecular sea the unit time is of the order of magnitude of 10^{-10} sc. If at the core of a galaxy the mean time between collisions of stars is of the order of $10^{7\pm2}$ years, then the unit time of star sea is also obtained by the same magnification factor, 24 ± 2 order of magnitude. Thus, we may expect, in the cosmos, all the phenomena one may see in a molecular fluid. We only have to magnify the intervals of distance as well as the intervals of time. For instance, the different kinds of galaxies seem similar to the different kinds of vortices in a fluid. Regarding OST, most of the galaxies are shaped of funnel spiral vortices. We see them at different angles of view and different rotational axis. (See pictures of the galaxies at the Atlas of Galaxies (10).) There are also ring galaxies which are a special case of funnel spiral vortex, as we see in Sec. 3.7.

Were we to look down upon our home galaxy, it probably would appear as a pair of funnel spiral vortices, with opposite rotational directions. The wide sides of these funnels are close to each other. The sun is on a spiral of one funnel vortex of this pair. From (3.13) one may explain the "core" of our galaxy, as the two narrow sides, of these funnels, which move in opposite directions. One move toward +Z direction; the other toward -Z direction. The black strip along the Milky-Way is probably a space between these vortices, not necessarily a "cold dust".

According to this idea, we suggest to calculate the distances between our sun and other stars in the Milky-Way using the assumption that they are on the spirals of these two funnel vortices. The velocity of each star may be computed by its position along the spiral, so that the angular velocity, about the longitudinal axis of the galaxy, is constant. One may find out the parameters of these vortices as describe in Sec. 3.7. From (3.18) we see that one of the intrinsic characteristics of a spiral funnel vortex is that each particle, moving on the spiral, sees all the other particles as moving away. Thus, all the stars surrounding the sun seem to be expanding, even if all of them are going downstream toward the narrow sides of the funnels. According to the Hubbell phenomenon, in which galaxies seem to be moving away, (one from the other), it seems reasonable to suggest the possibility that all galaxies seen today are moving on a spiral of a funnel vortex, which we may call "universe vortex". There should be at least one more universe vortex, with opposite rotational direction to the one which we belong to.

Some of the peculiar galaxies resemble other mutual rotational interactions between two or more vortices, as in ordinary fluids, i.e., galaxy M51 and its neighbor. Both could be funnel vortices, seen at specific angles, which may fit for a mutual rotational interaction of opposite rotational directions. The "black hole" phenomenon at the center of a galaxy, could be explained as a bottom of the eye of a funnel vortex in a star sea, as much as the eye of a tornado. Only at a specific angle can one see the bottom of the eye. On the arms of some spiral galaxies, i.e. M51, one sees small clusters of stars. This phenomenon may resemble electrons in orbits around the nucleus of an atom. This situation raises the possibility that even in an hydrogen atom, the electron may move in a specific orbit, orthogonal to the axis of the proton vortex in the oron sea. The galaxy in Andromeda group of stars, is seen as an ellipse with a dense core. It is suggested by OST that we regard this galaxy, and others like it, as funnel spiral vortices, with a circular shape, not elliptical; while its longitudinal axis is at some angle with respect to us. Thus, we see how one may use all the phenomena of fluids in cosmology, merely by magnifying the scales of space and time by a factor of $10^{+24 \pm 2}$ or some other factor yet to be discovered.

5.2) **Cosmological Mass**

The treatment in Chapter 4 is so general that we expect it to hold for any fluid as well as in cosmology. For example, let us look at a cluster of galaxies. In OST, the galaxies are vortices in what we call the "star sea". Let the average free flight linear velocities of those stars be v_{fs}. Suppose there is one galaxy in that cluster which is at rest, relative to a certain star in the cluster. Let the rest mass of that galaxy be M_0. If that galaxy receives a linear velocity v relative to that star, while v is computed by (3.1), then, by our general conclusions above, the mass M of that galaxy becomes:

$$M=M_0/\gamma_f. \qquad (5.1$$

Thus, that star may feel a gravitational attraction regarding to M, which is greater than M_0 by a factor $1/\gamma_f$. We may name M as the "Cosmological Mass". Let us follow one galaxy in such a cluster. Suppose at a specific moment it is at rest far away from the center of the cluster. Then it starts moving under the gravitational force of all the other galaxies. Eventually it approaches the center while acquiring a very high linear velocity v, maybe even very close to v_{fs}. According to (5.1) M $=M_0/\gamma_{fs}$, while γ_{fs} is γ_f of (4.2) where v_{fs} replaces v_f. Since the same may happen to other galaxies also, the center of the cluster becomes much more gravitationally attractive than if $M=M_0$. Thus, the acceleration of the galaxies at the center becomes stronger, not weaker, as in classical mechanics. Equations (3.17)-(3.18) express mathematically this characteristic. We see how the cosmological mass influences our computations. As the galaxy approaches the center, it may eventually reach a linear velocity v_{fs}. That means all the stars in that galaxy will move in the same direction. Now it is no more a galaxy but a stream of stars. If that stream does not meet another stream, or a galaxy, it may go out of the cluster. If it meets another stream in an orthogonal direction, they both may interact to become a new galaxy. If the collision between these streams is frontal then we may expect the stars of these streams to be scattered in all directions. Thus we have an "explosion" which means that there are fewer galaxies in the cluster and more stars in the star-sea. Therefore, we see how galaxies in the center of the cluster may decompose to stars. Now, suppose that each of these stars is composed of, say, 10^{24} clumps of gases, which behave as vortices (particles) with a free flight velocity of $v_{fb}>v_{fs}$. These stars may be thrown far away from the cluster, i.e. we may have an explosion, which lowers the attraction force of the center of the cluster very sharply. Some of the stars may be attracted back to the cluster. Thus, the returning stars may acquire velocities much higher than v_{fs}, and eventually may arrive very close to the center of the cluster with a velocity equal to v_{fb}. These stars may decompose to the clumps of gases. The process may repeat itself with the clumps, which may reach the velocity of sound, and decompose to molecules. These molecules may decompose latter to elementary particles of different kinds. There is no reason why the process should not be repeated with these elementary particles, which may decompose to orons of a specific size, say A-orons, with $v_f \approx c$. These orons may decompose latter to smaller orons, say B-orons, with greater v_f, but yet less than c, etc. As of today, we have no way of measuring orons directly. Thus, we do not see where matter goes at the center of a cluster or a massive star. It is important to note that this argument may explain that great question in cosmology.

It is also important to note that this process may happen at the level of elementary particles. As we shall explain in Chapter 7, we regard an elementary particle as a funnel vortex of orons in an oron sea, while its mass m is due to the behavior of the vortex as a sink. If that process also occurs here, i.e., orons which reach the narrow side of that funnel acquire a velocity equal to the free flight velocity of their compositors which are much smaller orons, and decompose there, then we have an answer to the question "what happens to the orons which are sunk into the elementary particle" ?

An analog treatment may be given to the rotational properties of galaxies in clusters. When those galaxies reach angular velocity, which is too close to the free flight angular velocity of the stars, the galaxy may be decomposed into many stars. The process discussed above for linear free flight velocities of the compositors of the bodies in each level, returns until we are left with orons, or the process may stop somewhere if there is not enough attraction at the center, at some stage. In reality these two processes of repeating decomposition may take place together. Thus, we may explain by OST what we measure by telescopes and other instruments, in a very simple way, which does not use complicated parameters from thermodynamics, chemistry or other branches of science.

An interesting consequence of this treatment can be mentioned here. According to that interpretation regarding what might be the processes inside a cluster of galaxies, one may conclude that there is an upper limit to the linear, or rotational, velocities of a galaxy. Above some critical velocities the galaxy may decompose into its components, stars, and the treatment in this case should be changed. Thus, there is a justification for treating the old problem, regarding the stability of a cluster, by a truncated Maxwell-Boltzman distribution, as was done by Zeldovich and Podurets [(7)]. This explains why clusters are bounded .

5.3) **Gravitational fields**

In OST we regard the gravitational field as due to the behavior of a body as a sink in irrotetional oron sea. Classic arguments from fluid mechanics show the analogy very clearly. See Art. 56 in (1) and Sec. 2.5 in (2 .(There is a full analogy between the flow rate of a fluid towards a sink and the gravitational field. Both depend on the distance to the center, s, like $1/s^2$, at least when s is great enough. The irrotational velocity field u(x) of a fluid towards a sink has exactly the same equation as that of the gravitational field[(2)]: $\mathbf{u}(x) = -\mu\mathbf{s}/(4\pi s^3)$, while here μ is defined as the strength of that sink, which is equal to the total inward flux of fluid volume across any closed surface enclosing the point of the sink. In OST we regard that property of a body as a sink in irrotational oron sea, as responsible for the gravitational attraction of an elementary particle. The strength of that sink is recognized in OST as the gravitational mass m. There are several processes which may lead to the creation of a sink in the oron sea. One of them is by the recombination of basic particles of a fluid, or oron sea, to give a growing grain which brings to a creation of a "hole" in the fluid, where the velocities of the particles are much slower than those over the entire fluid. This process is believed to occur in the center of stars.

There is another lesser known process, which may give a sink and is used here to explain some phenomena in cosmology and elementary particles. This process deals with a destruction of particles inside the core of a body. Let us treat this process here in detail. Let us consider an oron sea of a specific size of orons, to be marked here as "A-orons". The oron sea of this size may be marked "A-oron sea". Suppose these A-orons are composed of much smaller orons, B-orons, in a B-oron sea. This situation is analog to the cluster of galaxies composed of stars discussed at Sec. 5.2. Suppose also that the average free flight velocities of the A-orons and B-orons are respectively v_{fa}, v_{fb}. It is clear from chapter 1 that $v_{fb}>v_{fa}$. Suppose that, at a certain time t_0, the density of A-orons is constant all over the A-oron sea. We may treat the situation as in ordinary gas fluid. In such a gas there are always particles with much higher velocities than the average free flight velocity. The Maxwell-Boltzman distribution function is one of the ways of expressing this characteristic. Thus, we assume that in the A-oron sea there are A-orons which reach a velocity equal to v_{fb}, the average free flight velocity of their components, B-orons. Suppose that at a latter time, t_1, two such rapid A-orons collide at some point, p. Thus, as in the case of the cluster, Sec. 5.2, these two A-orons decompose into B-orons, which are spread in all directions. Thus, in the A-oron sea there is a "hole" at point p, which means that at point p the density of A-orons is less than in other places. It does not mean that the density of B-orons is less at point p. The other A-orons around point p continue to move freely. Some of them may enter the hole at point p, thus creating a hole at another point. Thereafter the hole moves freely in the A-oron sea with the same average free flight velocity v_{fa}. Suppose that at a latter time, t_3, two other A-orons with very high velocities, collide and decompose into B-orons exactly at the place where that hole has arrived. The hole is enlarged and the process continue. The hole may enlarge more and more, while traveling in the A-oron sea, and A-orons are streaming towards it, while the velocities of those streams are more and more enhanced. These streams add to the velocities of the A-orons around the hole. Thus, more and more A-orons reach the hole with velocities v_{fb} and are decomposed into B-orons. Therefore, we have a process of a constant sink of A-orons, while the position of that sink may move in the A-oron sea, with a decreasing velocity, since it takes more time to fill the enlarging hole. Thus we see how a sink in the A-oron sea may be created spontaneously. The number of B-orons is conserved, while the number of A-orons decreases.

It is reasonable to assume that this process will reach some point of equilibrium, in which the rate of A-orons destroyed in the sink, is the same as the rate of A-orons reaching the sink. This rate may be deduced in OST as "the strength of the sink". Let us show that we may recognize this strength as the gravitational mass of that body (hole) in A-oron sea. Let us assign the origin of an orthogonal system to the center of that sink. An observer at that origin sees streams of orons reaching from all directions. Suppose the observer determines a "body" in the A-oron sea, as a small spherical shell of radius r and width dr, while in the center of the sphere. We will be reminded of the definition of a "body" in OST, Sec. 3.1. Let us take the minimum dr possible in that case: $dr=L_{fa}$, while L_{fa} is the average free flight distance of A-orons in the A-oron sea. Let the total number of A-orons in that shell be N, and suppose, for the sake of simplicity and without losing generality, that from the observer's point of view the A-orons are moving radially either towards or away. This observer counts, at a period dt, N_+ of A-orons moving radially away, and N_- of A-orons which move radially towards the observer. Thus, $N=N_++N_-$. Let us define here "radial linear net direction" by $n_r=N_+-N_-$, and "radial linear velocity of a body" by:

$$v_r = (n_r/N)v_{fa}. \qquad (5.2$$

If N and v_{fa} are constant in time, then the "radial acceleration" of that body may be written:

$$a_r = dv_r/dt = (dn_r/dt)v_{fa}/N. \qquad (5.3$$

If there is no sink of A-orons at the origin, then $n_r=0$ for any r (even if there are sinks in other places). If there is a sink in the origin then for every such spherical shell body at different distances r but with the same dr, n_r is clearly the same since we assume that, a priori, before the sink was created, the density of A-orons is constant all over the A-oron sea. If this density is marked by σ_a then one may write (5.3) by:

$$a_r = v_{fa}(dn_r/dt)/(4\pi\sigma_a r^2 dr). \quad (5.4$$

That is, we received a dependence of a_r on $1/r^2$, as in the gravitational field. Let us see what happens when r goes to zero. As explained above, very close to the origin there is a region where A-orons collide very strongly and decompose into B-orons. This process creates the sink. The minimum radius of such a region in the A-oron sea, is the distance it takes A-oron to fly at velocity v_{fb}, the average free flight of B-orons. Since this is the velocity needed to decompose the A-oron. This distance is closer to L_{fb}, the free flight distance of B-orons, then to L_{fa}. Maybe, at the beginning of the creation of that sink, the travel distance was greater, but eventually when there are many A-orons, moving in the velocity v_{fb}, are crowded near the origin, their average free flight distance is much smaller than L_{fa}, and closer to L_{fb}. Thus, we see for the first time, why there could be a quantization in the gravitational mass (sink) of a body composed of B-orons in an A-oron sea. If there are other such small sinks very close to the origin, not necessary connected in the A-oron sea, then one may regard them as one big sink, of radius r0, centered at the origin of that system. This is clear by analog arguments in fluids. Let us define a number k such that $r_0=kL_{fb}$. We may assume there is a sphere in the origin, of radius r_0, inside which every A-oron decomposes into B-orons. At a specific moment we may regard this region as empty of A-orons, i.e., in the A-oron sea this region appears as a hole. This hole is full of a B-oron sea, which is now the vacuum, from the point of view of A-orons. The number of A-orons missed in that hole is $N_0=(4\pi r_0^3\sigma_a)/3$. This number is also the number of A-orons destroyed in that region during the period it takes for an A-oron to travel the distance r_0. We assume above that the A-orons which have a velocity $v \approx v_{fb}$ (not v_{fa}), are the candidates to be destroyed. Thus, this period is $T_o=r_0/v_{fb}$. The rate of destruction of A-orons in the sink is $N_0/T_0=(4\pi r_0^2\sigma_a v_{fb})/3$. This rate may be recognized here as the strength of that sink in the A-oron sea. Let us mark this strength by μ_a. Thus, in that case $\mu_a.= (4\pi r_0^2\sigma_a v_{fb})/3$. In a spherical shell outside that r_0 , μ_a is the rate of change of n_r, i.e., $dn_r/dt-=\mu_a$. Thus from (5.4) we have $a_r=-(r_0^2v_{fa}v_{fb})/(3r^2dr)$. If we insert here the r_0 and dr as above, we obtain:

$$a_r = - [(k^2L_{fb}^2v_{fa}v_{fb})/(3L_{fa})](1/r^2). \qquad (5.5$$

In OST we recognize the strength of a sink as the gravitational mass of the hole in the oron sea. We may look upon that hole as a body, on which one may act in order to push it from place to place. Let us suppose that this body has gravitational mass M. The gravitational field produced by that mass is, according to classical mechanics: $g=-GM/r^2$, while G is the gravitational constant. In OST we assume $g = a_r$. Thus from (5.5) we receive:

$$M = (k^2L_{fb}^2v_{fa}v_{fb})/(3L_{fa}G) \qquad (5.6$$

The minimum mass, M_{min} is determined when k=1. Thus, $M=k^2M_{min}$ while

$$M_{min} = (L_{fb}^2v_{fa}v_{fb})/(3L_{fa}G) \qquad (5.7$$

Equations (5.6) and (5.7) are general. They may hold in any fluid, as well as in cosmology. In the oron sea $v_{fa}\approx c$, $v_{fb}\approx c$. Thus, in cgs units, $v_{fa}v_{fb}/(3G) \approx 4.5E26$. In oron sea $M_{min}=4.5E26(L_{fb}^2/L_{fa})$ gr. Let us use the mass of an electron to find possible relations between the parameters of different oron seas. We recall the rest mass of electron to be $M_e\approx 9E\text{-}28$ gr. Let k_e be the k for electron. Thus $M_e=k_e^2M_{min}$. Therefore

$$k_e^2L_{fb}^2/L_{fa} = 2E\text{-}54. \qquad (5.8$$

Thus, we have a connection between k_e and the free flight distances of an A-oron sea and a B-oron sea.

We wish to note here that one may obtain the gravitational potential of a particle using the representation of the particle as a specific kind of a funnel vortex in oron sea, as in Sec. 3.7. The gravitational potential is obtained by the second term of (3.17) which describes the irrotational part of the radial velocity of orons towards the funnel vortex.

5.4) **Inertial Mass as a Sink**

We may regard a "hole" in the A-oron sea, as a body composed of a number of A-orons equal to the number of A-orons missing in that hole. As we explained in Sec.5.3, this hole may be a sink in an irrotational oron sea. It is due to the decomposition of A-orons to B-orons, or due to the recombination of A-orons to basic particles of the sea levels above it, or even as the narrow side of a funnel vortex which may behave as a sink. We assume that there are N_0 A-orons missing in that hole. Thus, according to Sec. 3.2 if one wished to push the hole by a linear acceleration, a, one has to change the linear net direction of this hole with a number of A-orons which is proportional to N_0. Thus, this N_0 is proportional to the inertial mass of the body, a hole in this case. From (5.6) and the argumentation of (5.5), we see that this N_0 is also proportional to the gravitational mass of that body. Thus, up to a factor, the inertial mass equals the gravitational mass. That argumentation explains this well known fact of physics. We may add here a known phenomenon from fluid mechanics, that if the strength of a vortex, as a sink, is enhanced, then one may need a stronger stream of fluid to push that vortex. It is also important to notice that a narrow funnel vortex may has a much stronger sink, than a wide funnel. Some of the tornadoes are good examples. This situation may explain the fact that some elementary particles are seem to have a stronger rest mass in spite of the possibility that they are smaller. If two funnel vortices are far from each other, their property, as sinks (inertial masses), may be added. However, if they are too close the addition rule is not simple. There could be points, in the surrounding of the two funnels, where there is a double strength, while in other points the strength is zero. Thus, we may expect an interference phenomenon for inertial masses. If there are many sinks in a specific direction we may have a resonance phenomenon for masses. We may recognize those resonances as the well known resonances in elementary particles collisions. As mentioned above, we regard, in OST, a funnel vortex as a particle. While this particle moves in the oron sea, there is expected the same phenomenon of drag as in an ordinary fluid. Thus, the inertial mass of the vortex may be referred to as being due to the drag. We expect for funnel vortices of orons the same mechanism regarding drag as in ordinary fluids, i.e. on airplane. We also expect that the drag coefficient, Cd, in the oron sea, should have a similar form as that in ordinary fluid. For instance, we expect the same dependency on Mach number: $Cd \approx Cd_0/\gamma_f$, while Cd_0 is the drag coefficient at very low velocity and $\gamma_f = \sqrt{[1-(v/v_f)^2]}$. This πf is the same as the relativistic coefficient in (4.2). Thus, we have a physical explanation to the dependence of the rest mass on relativistic velocity, without the need to treat relativistic space and time, as usually done in the theory of relativity .

6) **Electromagnetism**

6.1) **General Scope**

The idea of OST occurred to me in 1983 while I was looking into a deterministic explanation for the duality of light. The assumption of the existence of a sea which may be composed of very small particles moving at the speed of light in vacuum, c, gave a first hint to the Michelson-Morely experiment. From this point I started to search for analogies between phenomena in electromagnetism and phenomena in fluids. Ref. 4 gave me some hint that there could be mutual attraction and repulsion interactions between vortices. In addition, it shows that several vortices may combine to give a larger vortex and that a vortex may be decomposed into smaller vortices. Thus, I came to the idea of looking upon an elementary particle as a funnel vortex in an oron sea. I next tried to support that assumption using physics' arguments. Sec. 3.7 of Ref. 5, regarding solitons, shows that I was pointed in the right direction. But it did not exhibit a deep treatment for interactions between solitons, although it reminds attraction between kink and anti-kink. Thus, I began looking for treatments in fluid dynamics. Looking at

Refs. 1 and 2 was a surprise for me. There seem to be many analogies between phenomena in fluids and phenomena in electrodynamics. However I found that before the first article by Einstein appeared in 1905, electromagnetism, as well as other branches of physics, was explained using a hypothetical ether. Rene Descartes (17th century) introduced the concept of ether as a continuous medium in which there are vortices which seem to appear as bodies. Let us call it here, "active continuous ether". Since then, the concept of ether has changed and many of its first characteristics removed. At the end of the nineteenth century one finds a concept of ether as a continuos medium at absolute rest. It carries electromagnetic waves at the speed of light in a vacuum. Let us call this "passive continuous ether". Relativity theory was, at that time, the last action of the abandonment of the concept of ether. It, however, did not remove all the problems, especially those regarding quantum mechanics. Dirac overcame the problem by introducing the concept of a perfect vacuum as "a region where all the states of positive energy are unoccupied and all those of negative energy are occupied". That led him to the assumption of a positron, & 73 in Ref. 6. One may regard this point of view as returning to the concept of continuous ether which has embedded in it the relativistic theory relations. As we know, the idea of the pairing of particles has been proven experimentally. Thus, the concept of ether is justified, but it may need adaptation to what we know today. This is what OST does. The contribution of OST is that we regard the ether as a non-continuous medium whose particles (orons) have free flight velocities very close to c. We regard this as a "relativistic non-continuous active ether", or as we call it in OST the "oron sea". The idea that bodies in nature are some kinds of vortices in an oron sea, seems very promising. The adaptation of a special family of vortices to a special family of elementary particles will be explained in our next article. Here we will investigate some characteristics of a funnel vortex in order to understand electromagnetism. Let us quote directly from Ref. 1, which uses many analogies between equations of fluids and equations of electrodynamics. In Art. 148 of this reference the analogy of Halmholtz is given: "The vortex-filaments correspond to electric circuits, the strengths of the vortices to the strengths of the currents in these circuits, sources and sinks to positive and negative magnetic poles, and, finally, fluid velocity to magnetic force". Let us take this analogy and use it, with a small change, for one funnel vortex only: The circular streams surrounding the funnel vortex corresponds to electric fields. The vorticity strength of the vortex corresponds to the amount of the electric charge. The wide side of the funnel behaves as a sink of rotational oron sea. The narrow side of the funnel behaves as a source of rotational oron sea. Thus, we may regard the funnel vortex as a doublet sink-source of rotational oron sea. These sides resembles negative and positive poles of a magneton. The streams which emerge from the narrow side of the funnel may loop and return to the funnel through its wide side, identified in Fig. 1 by the letter M. These streams, which may have linear velocity of rotational fluid, correspond to the magnetic force, according to the Halmholtz analogy.

Therefore, when we regard a funnel vortex, in an oron sea, as one kind of elementary particle, we see that it may have an electric charge and behaves like a small magneton. In addition, it behaves as a sink in non-rotational fluid, i.e. it may has a gravitational mass. These arguments are really simple, however using OST we may better understand those phenomena in an oron sea as well as in fluids.

6.2) **Electric field**

Apart from the strength of a funnel vortex as a sink of irrotational oron sea, it also has a strength relating to its vorticity. Following several years of investigations, we arrived at the conclusion that the electric field, around an elementary particle, is probably a result of the gradient in the vorticity strength of the funnel. This gradient is the result of the behavior of the funnel as a sink (source) of rotational oron sea. The result is a spiraling of rotational streams of orons around the longitudinal axis of that vortex. While approaching this axis, the angular velocity of the stream, about this axis, enhanced while keeping the angular momentum constant. In Fig. 1. We represent this field by the letter "E". Mathematically, we may explain this field using Sec. 3.7. Let us remark the rotational parts of (3.11)-(3.18) using an index e. The rotational part of the radial velocity V_{re} is:

$V_{re} = -\beta w/R,$ (6.1

while w is a constant. It depends on initial conditions and characteristics of the oron sea $.\beta$ is the rotational slope parameter, determined in (3.11). This velocity V_{re}, of rotational streams of orons, is recognized by OST as the electric potential field $.\beta$ seems to be proportional to the electric charge Q of an elementary particle, as we will see in (6.2). This parameter $,\beta$,is connected to the vorticity of the vortex. It gives the amount of the slope of each complete turn of the spiral of the funnel vortex. In the case of zero slope of the spiral, i.e. $\beta = 0$, we get a cylindrical vortex or a ring vortex. In this case the electric charge is zero.

The sign of the electric charge seems to be due to the direction of the rotation of the spiral; whether it is counterclockwise or clockwise. At the first case we take $\theta > 0$ and $\beta \geq 0$. In this case the thumb of right hand shows the +Z direction. At the clockwise case we take $\theta < 0$ and $\beta \leq 0$. Now the thumb of left hand shows the +Z direction. As in fluid mechanics, two vortices with the same rotational directions push each other; while two vortices with opposite rotational directions attract each other. The dependence on the distance between the two vortices is the same in fluids as in an electric field. The reason for this behavior in vortices may be explain using OST. When two vortices of the same rotational direction become closer, the rotational streams of the two vortices collide. There is created opposite streams in the vertical directions to the line of collision, as we see in Fig 2a. Thus, we have the phenomenon of the interaction of two opposite streams, as mentioned in Sec. 3.6, while regarding the magnitude of the velocity according to (3.10). This means that side streams are created toward the longitudinal axes of the two vortices which, according to (3.4), cause each of the vortices to be pushed in the directions of those new streams. Therefore, we have a repulsive force. When two vortices have opposite rotational directions, as in Fig. 2b, then, on a line that is perpendicular to their longitudinal axes and connects those axes, the streams of the two vortices are parallel. Thus, we have a phenomenon of interaction of two parallel streams. According to Sec. 3.6 there are created inward side streams, and the streams attract each other. This causes the two vortices to be pulled toward each other. This phenomenon may be understood better while one looks at attraction between two opposite vortices in an ordinary fluid. We see that one may explain attraction and repulsion between two vortices of orons. The slope of the funnel vortex is needed if we wish to explain why the attraction, or repulsion, strength is changed while the distance between the vortices is changed. The rotational motion of orons in the vortex give rise to the property of the vortex as having a spin, as we will explain in Sec. 7.3, while the slope of the funnel vortex gives rise to an electric charge. Thus, elementary particles with zero electric charge are supposed to be cylindrical vortices, i.e. pipes, without any slope. A vortex ring is a special case of a cylindrical vortex. Vortex rings are seen in cosmology as ring galaxies, as well as in ordinary fluids, as in a smoke of a cigarette. If the parameter μ of equation (3.13) is zero, we get a plane spiral vortex. If in this case β is non zero, then there is an electric field with Q proportional to β .

All the treatment of irrotational oron sea which leads us to the gravitational mass, as well as to the inertial mass, Sec. 5.3, 5.4, may be repeated here, word for word, for a rotational oron sea, with only a change of notation, to explain electromagnetism. All that we have to do is to discuss rotational velocities instead of linear velocities. Thus, we may treat the angular velocity of a body Ω in an oron sea which is determined by the rotational velocities w_i of its components, as we did in Sec. 3.4: $\mathbf{\Omega}= (w_f/N)\mathbf{k}$. By analogy to the treatment regarding irrotational oron sea, we may look upon the strength of a sink of intrinsic angular velocities of orons in a rotational oron sea as the electric charge. The analog of the gravitational mass M in (5.6), for a rotational oron sea is the electric charge Q, while instead of G we use the Coulomb constant K, or another factor, depending on choices of units. Instead of L_f, the averaged linear free flight between two collisions of an oron, while moving at linear velocities, we have to determine L_w as the averaged angular free flight between two collisions of an oron, while moving at angular velocities. We will also determine k_w by $R_{0w}=k_wL_{wb}$, while R0w is the radius of the "hole" in the rotational A-oron sea, and L_{wb} is the free flight angular distance in the B-oron sea. Therefore, we find for the electric charge of a body

$$Q=(k_w^2 L_{wb}^2 w_{fa} w_{fb})/(3L_{wa}K). \quad (6.2$$

The minimum Q in A-oron is akin to the analog to (5.7):

$$Q_{min}= (L_{wb}^2 w_{fa} w_{fb})/(3L_{wa}K).. \quad (6.3$$

If this is 1/3 of the electron electric charge Q_e, then

$$Q_e= (L_{wb}^2 w_{fa} w_{fb})/(L_{wa}K). \quad (6.4$$

Thus , we see the connection of Q_e with the rotational characteristics of the oron sea.

The analog of a linear stream in an irrotational oron sea, is the angular stream in the rotational oron sea. This provide magnetic fields B. Thus, the analog of the "inertial mass" is an "inertial electric charge". This is a subject to be in motion as a result of a net of angular velocities, produced by the angular stream at the sink-hole of A-orons in a rotational A-oron sea. It is the luck of science that the motion of an electron under a magnetic field was discovered after the discovery of electric charge. Otherwise, we would be pondering the same questions as occurred with gravitational mass and inertial mass.

6.3) **Magnetic Fields**

6.3.1) **Rotational Streams**

While rotational streams of orons in the oron sea approach the vortex, they are sunk into the funnel vortex through its wide side. Along the spiral way to the narrow side of the funnel, there are created small vortices, which may be regarded as orons of higher level. While these small vortices approach the narrow side of the funnel, they may collide with other small vortices and may be broken to smaller, or secondary orons. Thus, a sink of rotational oron sea is created. Another possibility: the orons in the funnel reach, near the narrow side of the funnel, an angular velocity very close to the free flight angular velocity of the secondary orons of which the larger orons are composed. Therefore, turbulent streams of the secondary orons emerge out of the narrow side of the funnel vortex. Thus, we obtain a source of rotational secondary orons. Therefore, we have a doublet of sink-source of rotational oron sea. The streamlines of such a doublet are as in & 2.6 of Ref. 2. These streamlines resemble the magnetic fields surrounding a magneton. Therefore, we conclude that a magneton is a vortex doublet in a rotational oron sea. The streams due to this phenomenon surrounding a funnel vortex are marked in Fig. 1 by the letter "M". This phenomenon may also be seen in pictures of tornadoes or in other funnel vortices in ordinary fluid.

It is clear that if we bring two funnel vortices with the narrow sides of their funnels opposed to each other, then these secondary streams push each other backward establishing a repulsion. If we bring two vortices with the wide sides of their funnels opposed, then the secondary streams of one funnel, which go along the way around the funnel, opposed the same streams of the other funnel. Once again we have a repulsion. If we bring the narrow side of one funnel vortex close to the wide side of the second vortex, this second vortex attracts the first, since this wide edge is the place through which the secondary orons are pulled into the vortex. Thus, we see that one may treat a funnel vortex as a magneton, in which the narrow side of its funnel is the "South" side, and the wide side may be treated as the "North" side of that magneton. The choice of South and North is, clearly, only for our convenience. We see that the magnetic force is also a result of interactions of oron streams which are created by funnel vortices. There should be a correlation between the electric and magnetic fields created in that way by the same funnel vortex. This correlation should be of the same kind as in the vortices of ordinary fluids.

As we see in (3.18) the rotational part of V_z, i.e. V_{ze}, when $\mu=\delta=0$ is:

$$V_{ze}=(bK_0B/R^2)(EXP+b\theta) = bK_0Z/R^2. \qquad (6.5$$

Partial differentiation of V_{ze} with respect to Z, F_m, is:

$$F_m = bK_0/R^2. \quad (6.6$$

Thus, we obtain a mathematical form which is very close to the form of u_v in & 2.6 of Ref. 2. which is similar to the behavior of a magnetic potential. therefore we recognize, in OST, V_{ze} as the magnetic potential of an elementary particle. All the phenomena regarding magnetism are explained by our conclusion that a stream of rotational small orons is the field potential of the magnetic force. For example, the transparency of many substances to magnetism is the result of the smallness of the orons in the stream; the velocity of the magnetism induction is the result of the free flight of orons, which is very close to c; the side deflection of a charged particle (rotational vortex) in a magnetic field is similar to the deflection of a rotating body in a linear stream of ordinary fluid (see Fig. 6.6.2 of Ref. 2); this deflection is also the explanation of the creation of a current in a wire vertically to the field lines of a magnet; the ferromagnetism and diamagnetism may be explain as the result of turning the positions of funnel vortices (e.g. protons) while the stream of orons passes along them, etc.

6.3.2) **Prediction for creating particles**

The idea that a magnetic potential is a stream of rotational orons seems to be so promising that we feel free to predict the following wonderful possibility: If two or more strong magnets, which are far away of each other, are directed so that the continuations of the straight lines from their North (or South) poles meet at a specific place in a vacuum, then in this meeting place there will be created elementary particles, i.e. there will be funnel vortices of kinds which depends on the strength of the magnets, the encountering angles and other parameters. If our prediction is true then we have a way to create artificial elementary particles far away of the laboratory. This possibility also may explain how elementary particles are created "spontaneously" in a vacuum, as some theories of elementary particles assume .

6.4) **Electromagnetic field and photons**

Electromagnetic fields may be explained simply using the following reasoning. In ordinary fluids, if one creates for a short period a vortex in a rest fluid this vortex disappears gradually while creating small vortices around it. Each of the small vortices disappears gradually while creating much smaller vortices around it, etc. The total vorticity of the fluid is constant. But as time passes, the front of the rotational fluid comes farther away from the original vortex, advancing with the speed close to the free flight velocity in the specific fluid. If the original vortex continues to exist, like a motor inside the fluid, we will perceive around it a field of vortices with decreasing sizes as we move away from that motor. Thus, we have a circular standing wave. If the original vortex oscillates, we will receive a transverse wave of vortices of alternating rotational direction. See Fig. 6.6.2 in Ref. 2.

In OST we assume that the same phenomena occurs in an oron sea. Thus, the spiral streams of a funnel vortex of orons creates many small secondary funnel vortices around that funnel. Each of the secondary funnel vortices may disappear while it creates around itself much smaller funnel vortices of orons, etc. If the spiral funnel of orons also oscillates we expect a transverse wave of alternating vortices propagates with a speed equals or very close to the theoretical speed of light in vacuum, c. We see now the roots of the Huygens electromagnetic wave theory which in fact, was taken from the phenomena of fluid.

Following several years of investigations, we come to the conclusion that in OST we have to regard a pair of small cylindrical vortices of orons as a photon.

As one may see in Fig. 5.11.4 of Ref. 2, there is in ordinary fluid a wave of "vortex streets" in the wake of a circular cylinder moving steadily. In the front of a moving body we expect circular waves propagating in the speed of light or very close to it. This waves are like those in the front of a flying airplane. When the speed of the airplane is close to 1 Mach we have the known shock waves. If the body oscillates we expect the creation of pair of vortices at the turning points of the body. These vortices are carried by the streams surrounding them, which are the result of the frontal waves. Since the streams are propagating in the speed of light, the vortices are propagating in this velocity as well. If the body also rotates about an axis perpendicular to the line of oscillation, there is only one vortex at the wake of the body. See Fig. 6.6.2b in Ref. 2. The rotational direction of this vortex depends on the direction of rotation of the body and the direction of its linear velocity, as one may see in this figure. If the body rotates and oscillates we expect two vortices of opposite rotational direction, creating at the two turning points of the orbit of the body. The strength of the vortices depend on the acceleration. If the acceleration is high the strength is high. The two vortices behave as a pair if there are the specific values of the relations between the strength and the distance between them. Thus, even if we have continues frequencies of oscillations, only some of them will give a stable pair. The acceleration at the turning points of the orbiting body is supposed to be higher as the orbit is shorter. This will be true if the velocity of the body is the same in all orbits. Thus, we have the mechanism of creating a specific pair. Its frequency is the frequency of the oscillation of the body in the oron sea, its speed in calm oron sea is about c, its half-wavelength is the distance between the pair along the direction of propagation and the strength of the each vortex is higher while the wavelength is shorter. These are the main properties we expect of a photon. The other properties concern the behavior of this pair at different circumstances. We will see now these properties.

When the vortex continues to oscillate in the oron sea, it creates a "vortex street". As one may see in Fig. 5.11.4 of Ref. 2 this street seems like a wave. In Art. 156 of Ref. 1 we find the treatment in a vortex street due to Von Karman in ordinary fluids. We expect the same properties of vortex streets in the oron sea. The stability of the vortex street depend on certain parameters, which are supposed to hold also in the oron see. If the body is spherical, the small vortices in the wake are expected to be cylindrical. In OST we expect the electron to be of a spherical shape. Thus we expect that while the electron is oscillating in the atom it creates these pairs of cylindrical vortices. Thus, an electromagnetic wave is probably a vortex street in the oron sea which is created by the oscillation, linear or non-linear, of a vortex. The wavelength of that wave is the distance between three vortices. i.e. between two vortices of the same rotational direction. It propagates with the speed of light if it does not encounter other vortices, i.e., in a calm oron sea, or what is regarded as a vacuum, as we have explained in Sec. 2.6.

That wavelength may be changed if the street vortex encounters another vortex. The reasoning for such a change is that while a pair of vortices passes near by a third vortex, one of the vortex of the pair may be attracted to the third vortex, and the other vortex of that pair may be repulsed by the third vortex. Thus, in addition to the influence of the third vortex on the direction of that pair, it may influence the distance between the vortices of every pair as well. Since this process may append to more than one pair in the chain, we receive a change in direction and wavelength of that wave. This explains the Compton effect.

If the pair of cylindrical vortices, which we recognize as a photon, passes too close to a third vortex, e.g. an electron vortex, this pair may be captured by the streams of the third vortex if the strength of the vortex in the pair is high enough. Since the pair has a great linear velocity, close to the speed of light in a vacuum, both the pair with the third vortex, receive great linear velocity. during the movement of the electron and the photon together, there is a possibility of parting. Thus, we may revert to electron and photon. This is an explanation of the photoelectric effect. Thus, we see how the pair (photon) behaves as a particle. Imagine a pair of opposite rotational cylindrical vortices, moving in a medium occupied by many vortices, in a direction orthogonal to the longitudinal axis of both cylinders. While the first cylinder passes near by one of these vortices it is pushed (or pulled) by it. While the second cylinder passes near by that vortex, it is pulled (pushed). Thus, the pair moves in a twisted curve (like the curve of a snake), while the average is along a straight line. The speed along the curve is c, the speed of light in vacuum !!! However the advancement speed of the front of the curve is at a speed less then c. It depends on the curvature of the twisted line. Thus we obtain the wave shape of the ray of light as a consequence of the existence of a string of pairs which interact with the molecules of the substance. When the string reaches a new medium its twisted curve is changed.

Thus, the averaged speed of the front of the string is changed. Thus the speeds of the string in the two mediums are different and we are at the same reasons to the diffraction phenomena, including Snell's law.

In a ray of light there could be many vortex-streets, each contains pairs of cylindrical vortices. Some of the cylinders may collide with vortices in the new medium with angels which cause them to be bent outside. Thus we perceive the reflection phenomenon.

Now we come to the interference phenomena. If two equal vortices with opposite rotational directions meet, they attract each other and there is a mutual annihilation, as we explain in Sec. 7.4. If they have the same rotational direction they will repulse each other. Now, when two street vortices, which have originated by the same vortex, and who passes the same distances from that source, meet at a specific point away from that source, their vortices may meet either with equal rotational direction or with opposite rotational direction. In the first case they will repulse each other and we will receive a stronger intensity of light in that point, while in the second case there is a complete annihilation of both vortices and the intensity from that point is zero. If the vortices that meet are not equal in size than we will receive a partial gain or annihilation.

The dispersion of light, while it propagates, is clear from the mechanism we have described above regarding creation of secondary vortices. All other phenomenon of light which are explained by both models, the particle model and the wave model, have simple explanations using OST model of a photon. Thus, we see that light is probably a string of pairs of particles, photons. This solves the mystery of the duality of light. We may regard the vortices in an oron sea as quanta of orons. Thus, a photon which in OST is a pair of cylindrical vortices, is also a quantum of orons. This gives the justification to the Quantum Theory, as well as to Wave Theory and to Particle (in pairs) Theory of light .

7) **Nuclear Forces**

7.1) **Strong Force**

OST helps us to understand the reason for a strong force. Let us look again at the funnel vortex in Fig. 1. It is clear that when one is close to the narrow side of the funnel spiral vortex, the streams are at the strongest intensity and the spiral becomes more and more aligned with the longitudinal axis of the vortex. In Fig. 1 we marked those streams by the letter "S". We expect to find in this area a behavior which resembles the strong force. That means a force whose dependence on R is like in the Yukawa potential:

$$U= -(R_0/R)U_0EXP(-R/R_0). \qquad (7.1$$

Recalling (3.18) we see the irrotational part of Vz, Vzr, which is obtained when β=b=0: V_{zr} = $(\mu\delta gB/R)EXP(-\mu R)$. In OST we recognize velocities of streams as field potentials. If we define R0=1/μ we may bring Vzr to the form of Yukawa potential by an appropriate definition of U0: $U_0=-\mu^2\delta gB$. R_0 is not R_{min} of the funnel vortex mentioned in & 3.6. R_0 seems to be due to the distance from Z axis were the V_{zr} of the spiral becomes important, relative to the other components of V. This form of V_{zr} may indicate the existence of a strong field in the vicinity of the narrow side of a funnel spiral vortex. In this surrounding there is a large component of V, V_{zr}, which is parallel to the longitudinal axis of the vortex. If we bring two funnel vortices close to each other so that their narrow sides almost touch, then their spiral streams in this surrounding are approximately parallel. We perceive a strong attraction, due to the parallel streams interaction mentioned in & 3.5. This attraction is independent of the directions of rotation of these funnel vortices. This is exactly what we expect of the strong force.

7.2) **Weak Force**

The weak force may be explained by OST as the result of the possibility that within the vicinity of the longitudinal axis of a funnel vortex should be a region of very weak streams, or no streams. In a tornado we call this region "the eye", or simply, the quiet region. Here we refer to it as a "quiet cone". One may see a quiet cone in vortices in water; even in a cup of tea. (See photographs in Ref. 2.) In Fig. 1 we have marked that region by the letter "W". This quiet cone seems to be created by the gradual destruction of small vortices, which are part of the funnel vortex. This destruction may happen because of collisions or as a result of reaching hige velocity, close to the free flight velocity of their 7.3 OST/1 components. The broken vortices create much smaller vortices, which are broken again while approaching the Z axis. In a tornado one will find lower intensity of winds while approaching the center of the eye. This explain why the weak potential has similar form as of the electromagnetic potential. Both potentials are the result of gradually decreasing vortices. Very close to the Z axis there could be a long column of minimal radius, $R_{min,}$ inside of which the orons creating the funnel do not exist, but orons of lower level do.

Recall the requirement in Sec. 3.7, that the total velocity, V, of a small vortices in the funnel spiral vortex is limited by the average free flight velocity of the orons, v_f, i.e. $V \leq v_f$. If we approximate $v_f \approx c$, we may take the R_{min} as the radius where V=c. The equations in Sec. 3.7 may help to finds R_{min}. Any small body inside the quiet cone may feel only weak streams, i.e., weak forces. These are rotational streams which result from the rotational streams on the wall of the quiet cone. As one approaches the Z axis from this wall one perceives weaker rotational streams. At the Z axis there are no rotational streams at all. Thus, the streams resemble the electromagnetic streams mentioned in Sec. 6.4, with much lower intensities.

The parameters K , β and b in (3.11)-(3.18) seems as representing the influence of the weak potential. These parameters, as well as μ and δ , depend upon the characteristics of the orons in the oron sea. If $\delta = \mu = 0$, then in these equations R depends upon K , β and b, the rotational parameters. When θ increases we approach the narrow side of the funnel. At a specific θ , say θ_{max}, R=$_{Rmin}$. Below R_{min} There are rotational streams due to secondary orons, i.e. much smaller orons than at R>Rmin. Thus K , β and b are much smaller than at $R>R_{min}$. Therefore the velocities V_θ , V_r and V_z are much lower than at the region far away of R_{min}, where there is mostly electromagnetic potentials. This simple explanation for the weak forces may help us to understand how elementary particles are composed of other elementary particles. We will deal in this issue in the next article.

7.3) **Spin**

One of the most important quantum numbers of an elementary particle is the spin. OST helps us to explain this parameter and the reason for the rules of additional of spins. It is clear that every vortex has an intrinsic angular momentum, since it has rotational velocities of orons. The rotational direction may be clockwise or counterclockwise, while looking at the direction of the narrow side of the funnel, from its wide side. In & 2.6 of Ref. 2 we see the definition of the "strength of a an element $\delta \mathbf{l}$ of a line-vortex". This strength is determined by a volume integral of the local vorticity **w** around $\delta \mathbf{l}$. Using Gauss's theorem they show that this strength is independent of the surface integral, enclosing any volume inside which $\delta \mathbf{l}$ exist. This strength may be recognize by OST as the spin of the funnel spiral vortex (particle). The factor 1/2 connected with w is explained in Eq. (2.3.11) of Ref. 2. In Eq. (2.6.5) of this Reference we see the reason for the exponential connection between R and β as appears in (3.14) above. In (3.15) we determined the constant K_0 as V_θ=K_0/R. In (5.7) we determined the minimum mass, M_{min}, of a funnel vortex. In Sec. 3.7 we determined R_{min} where V=v_f. In the case of orons $v_f \approx c$. It seems reasonable to expect that Plank's constant, h, which is connected with the spin of an elementary particle, may be obtained in OST as:

$$½h=cM_{min}R_{min}\ . \qquad (7.2$$

We wish to understand how the spin of a funnel vortex (particle) influences its surrounding: The rotational streams of a vortex cause every linear stream or a body in linear motion, which passes near that vortex to be bent (see photographs in Ref. 2). In ordinary fluids the characteristics of the medium, i.e. viscosity, density etc., determine how such a linear stream is bent or pushed, due to the rotational streams of a vortex. In OST we may expect the same phenomenon. It seems to us that Planck's constant, h, is a characteristic of the medium, i.e. of the oron sea. It also appear that 0.5h gives the amount of the push or action (momentum x length), that a linear stream of orons, including any particle (vortex) within it, may feel while passing by any other vortex of orons in an oron sea. If we wish, we call this property "the spin of a vortex" and we may say that it has a spin 1/2. See Fig. 3a. If we accept that point of view we may explain all the spins of elementary particles in a very simple way. In this way we do not use mysterious rules for addition of spins. Our new way may be used in Mechanics as well. In the next article we will treat building of known elementary particles using different kinds of vortices in an oron sea. This treatment includes vortices representing quarks. Here we give several possibilities which may illustrate our view point regarding addition of spins.

Let us start with two vortices, not necessary of equal size. Suppose both have opposite rotational directions. If they become close, any body or stream which passes between them may feel two pushes (see the picture of the vortex street in Ref. 2). Therefore, the total spin of that pair is 1. See Fig. 3b. This may explain the spin 1 of a photon which in OST is a pair of opposite rotational cylindrical vortices (Sec. 6.4). It also explains the connection between the energy E and frequency v of the electromagnetic wave. According to our determination of wavelength in Sec. 6.4, that frequency is in fact the frequency of the double-pushes of the photons creating the wave. Each double-push is of the action h. Since action is also (energy x time) we have the known connection $E=h\nu$.

If the two vortices have the same rotational direction then, on the line perpendicular to their longitudinal axes, the inner rotational streams of both are opposite. Thus, there is no action on any linear stream which tries to pass between them. The total spin of these two vortices together is zero. See Fig. 3b. If charged mesons are composed of such two vortices, this may explain their spin 0. With one vortex inside the other, as in Fig. 3c, the spin is unchanged, since streams outside the large vortex are untouched by the inner vortex. If some barions are composed in this way, it may explain their spin 1/2. The explanation of the spin of Ω^- may also be simple. This particle may be regarded as three vortices orbiting one around the other, as in Fig. 3d. There are three pushes to a linear stream which may pass between these three particles. Thus, the total spin of Ω^- is 3/2. We see how our concept of "spin" may help us to find a way for composing elementary particles using funnel vortices in an oron sea. A funnel vortex may have other kinds of rotations. These kinds may lead to the other quantum numbers of elementary particle, as we discuss in the next article.

7.4) **Antiparticle**

Another important issue concerns the notion of an antiparticle. In OST we regard a specific elementary particle as a specific funnel vortex of orons in an oron sea. The antiparticle of that particle seems to be the same funnel vortex but with opposite rotational direction. It has the same mass, electric charge, spin and other quantum numbers, except that it has the opposite sign of the electric charge and any other property that may be connected to the rotational direction of the funnel vortex. As in ordinary fluids, vortices are created in pairs of opposite rotational directions. A stream of water which passes through a quiet pool creates pairs of vortices along its path. Thus, in OST we say that a stream of orons creates pairs of funnel vortices (elementary particles) along its path.

If one brings two equal funnel vortices, with opposite rotational directions, very close to each other, one creates a very strong attractive force due to the interaction between parallel streams over the entire funnel, not only at the narrow sides. In this case the funnel vortices may eventually merge. At this moment their streams are opposite at every point of their funnel. According to the interaction of opposite streams, mentioned in Sec. 3.6, there is mutual repulsion at every point of the funnel and there is an immediate mutual annihilation of the two funnel vortices. They are destroyed, and their orons are spread in all directions, possibly creating the spread of waves of small cylindrical vortexes, which we recognize as electromagnetic waves. Such a phenomenon may occur in ordinary fluids. Mutual annihilation of two vortices in a molecular sea creates the spread of waves.

7.5) **Unification of Fields**

We wish to finish this Chapter by pointing out that according to our concept, it seems clear why the three forces: electromagnetic, strong and weak, can be unified; while it is so difficult to include the gravitational force also. The reason is that these three forces are connected to the rotational streams of the funnel vortex, while the gravitational force occurs when the funnel vortex behaves as a sink of irrotational streams. We know that, in an ordinary fluid, when a sink of irrotational streams is in a linear motion, we obtain a funnel spiral vortex. According to the way a "hole" is created, see Sec. 5.3, we understand why a sink is in motion. Thus, a particle which has a mass, also has a spin and/or other quantum numbers connected to vortices. (Mesons are suppose to be composed of basic elementary particles which have a spin. They therefore do not violate our conclusions.) This connection between mass and spiral streams is also a clue to the idea of general relativity; that a body moves in non-straight or geodesic lines. The explanation of a gravitational force as a force due to streams which converge toward a sink, also helps in understanding Einstein's idea of identifying acceleration and gravitation. A particle (funnel vortex) which is immersed in an oron sea, and is pulled by the streams of another particle which behaves as a sink is accelerated with those streams toward the other particle. This acceleration which is independent of the intensity of the second (vortex) particle, as in fluid dynamics, is, as we explained in Sec. 5.3, the reason for gravitational acceleration. Thus, we see how OST gives reasonable explanations to the four fundamental forces in nature.

8) **Conclusion**

Oron Sea Theory is based on the simple assumption that: all phenomena in a sea of one level of an order of magnitude are the same as those in another level of magnitude. Therefore we have deduced the shapes and characteristics of elementary particles, as well as galaxies, using analogies from ordinary molecular fluids. We have also reached a better understanding of the characteristics of light as well as the basic concepts in mechanics. Our success raises the possibility that the argument can go in the opposite direction: i.e., vortices in molecular fluid may have the same interactions as elementary particles, if we only adapt the parameters, e.g. vf, to those of ordinary fluids. This possibility may aid in overcoming the great problem of fluid dynamics, while using the Navier-Stokes equation for practical cases, as in aerodynamics.

After seeing all the phenomena of the different branches of physics which are explained by OST, it seems reasonable to assume that orons do exist and behave as particles of fluid in an oron sea. The real questions are not of their existence. They are: why orons behave in a similar way as in ordinary fluid? what are the "forces" that govern their behavior? why are there levels of sea, i.e. oron sea, fluid sea, star sea, etc.? Is there any level under the oron sea? The answers to these questions can be found in our perception of the concepts of time and space. The understanding of these concepts was the main aim when we started to develop OST. Regarding the last question: we assume the answer is positive! There are interesting consequences. We will treat this subject as well as others in other articles to follow. One may wish to regard a turbulent oron sea as a "chaos". Spirals of vortices of orons, as well as vortex streets, may be regarded as "strings". Thus, one may use OST for developing other theories in physics. OST is a theory which provides answers to many open issues in physics and at the same time it opens new issues which may lead to a deeper theory. Some of the predictions of OST in cosmology may be proven easily by new telescopes. The prediction of the new way to create elementary particles in a vacuum, far away of the laboratory, using strong magnets, can be checked without too many difficulties. If this prediction becomes true we may begin a new age in physics .

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Captions to Figures

Fig. 1: Model of a funnel spiral vortex in the oron sea. This vortex may represent some kinds of elementary particles. The lines represent streams of

orons at the directions indicated by the arrows. The velocities of these streams are supposed to be the field potentials due to the vortex: S - strong, W - weak, E - electic, M - magnetic, G - gravitational.

Fig. 2: The streams due to two close vortices. a) Repulsion due to two vortices of equal rotational directions. b) Attraction due to two vortices of opposite rotational directions.

Fig. 3: The spin due to bending of a linear stream, due to different combinations of vortices, as suggested by OST .

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Copy of the three letters to Scientific Editors regarding OST-90. (Given here without corrections) .

Letter A

May 3, 1990

Editors, Physical Review	Israel Fried
1 Research Road	15 Miller St.
Box 1000	Rehovot, 76284
Ridge, NY 11961	Israel
USA	Tel: (8) 475049

Dear Editor,

I have the honour to submit the attached article: "The Oron Sea- The Medium Under Elementary Particles and Photons". This is an interdisciplinary physics article which attempts to explain, by a very simple argument, many open issues in all branches of physics: elementary particles, electromagnetism, mechanics, cosmology, etc.

I rushed the submission of the article before the commencement of the scientific operation of the Hubble Telescope. Some of the predictions, in the cosmological part of the article, may be proven by this telescope. Therefore, I submit the article despite the fact that it may need delicate editing and adaptation to the format of Physical Review.

It is also important to prove the new concept using analogies from all branches of physics. Therefore, I submit this long article at once. You may feel free to separate it into several articles for the appropriate issues of Physical Review.

I have an M.A. in Theoretical Physics, Jerusalem, 1975. Until recently I was employed as a General Physicist in the aircraft industry. I developed the new ideas over more than 7 years during my free time. I would appreciate the article being published without the usual payment, as there is no organization supporting my work. I hereby agree that this article will be published in any issue of Physical Review according to the rules of The American Physical Society. This article was not submited to other publisher. Please let me know if there is anything I can do in order to assist the publication.
Thank you for your kind attention.
Sincerely, -------------- Encl. (3)
Israel Fried

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Letter B

July 13, 1990

Editorial Office	Israel Fried
Nuclear Physics B	P.O.B. 2368
NORDITA, Blegdamsvej 17	Rehovot
DK-2100 Copenhagen 0	ISRAEL
DENMARK	

Dear Editor,

I have the honour to submit the theoretical article: "The Oron Sea- The Medium Under Elementary Particles and Photons".
I would appreciate the article being published in Nuclear Physics B.
Thank you for your kind attention.

Sincerely, ----------- Encl. (2)
Israel Fried

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Letter C

September 15, 1990

Dr. K. Jones	Israel Fried
Nuclear Physics B	P.O.B. 2368
NORDITA, Blegdamsvej 17	Rehovot
DK-2100 Copenhagen 0 ISRAEL DENMARK	

Dear Dr. Jones
Thank you for your letter of August 15, 1990 regarding my article "The Oron Sea- The Medium Under Elementary Particles and Photons", No. 4488 in your office.

I am aware of the possibility that some of the ideas in this article are seems to be of a speculative nature. I have mentioned those in order to emphesize the broad spectrum of possibilities of the main idea of the new theory, the "Oron Sea Theory" (OST): the prediction of the existence of an active medium under elementary particles and photones, which we call "oron sea". OST was born in 1983. It is so simple and surprising that I have needed several years to be convinced that it is not a mere speculation. I was astonished again and again while new experiments and theories of the last years have proved some of the predictions of my new theory: the last developments of the String Theory which may be easily included in OST (strings are seems to be spiral vortices in oron sea); the last discoveries in cosmology, e.g. that in the center of some galaxies there is a "black hole", as much as OST predicts; the "belts" of galaxies in the universe, etc. In my opinion, OST is not of a more speculative nature than other physical thoeries, e.g. fields, strings, quarks etc. I would even say that if one would consider all the experimental facts we know today, knowing not of any physical theory, one would try first OST.

I have desided to submit the article for publication while I was convinced that I can answer any criticism regarding that main idea of the thoery. During the last 7 years I have done a lot of computations supporting OST. I think it is preferable to publish them after this article of a broad perspective is published. I believe the article is important to all brabches of physics. I would kindly request the reconsideration of the publication of the article in Nuclear Physics B. You may feel free to suggest corrections and/or omission of any part of the article which seems to be of a speculative nature.

For your convenience I enclosed the copy of the manuscript you have returned to me. Thank you for your kind attention.

Yours sincerely, ----------------- Encl. (1)
Israel Fried