To
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My dear sir,

In the attached letter, you had been acquainted with my purpose. Let me go to the subject, straight.

The difficulties of luminous ether are about its rigidity, density, and whether it is at rest or in motion. We may assume it to be somewhat gaseous, but since it is a continuous substance, there is nothing like intermolecular space, everything is stuffed with substance, thus accounting for its rigidity and density.

It is considered to be rigid because of its enormous resistance offered, the example I will soon give.

When photons travel along they are considered as light waves. \( E = hv \) is latent in the wave energy. The energy-wavenumber density \( E \) of \( hv \) is equivalent to mass. This \( E \) in waves has been transformed into \( E \) in giving the motion of light waves. This \( E \) in overcomes the resistance of ether, \( R \) and gives the velocity of \( C. \text{ } E = RC. \text{ Again } E = mc^2. \)

\[
R = mc^2 \text{ or } R = mc
\]

\[
Rc = mc^2 \text{ or } R = mc^2
\]

\[
\therefore m = \frac{Rc}{c} \text{ This is given by the resistance of ether divided by the velocity is clearly explained.
\]

Therefore we see that the velocity of electrons makes these bodies less immune from the resistance of ether, thus giving the mass. From here it is clear, that the mass of a photon \( m \) varies inversely as its velocity:

\[
m \propto \frac{1}{c}
\]

According to Stoke's theorem:

\[
F = 6 \pi R \mu V
\]

Here again, \( RV = F. \) As \( V \) increases, \( F \) increases more, being multiplied by those constants, thus, \( R \) also increases more and so does the ratio \( \frac{R}{c} \).

Now it can be clearly stated that \( m \propto \frac{1}{c} \).

This increase of mass with velocity may be interpreted by Einstein's

\[
m = \frac{m_0}{\sqrt{1 - \frac{v^2}{c^2}}}
\]

\[
The two formulae may be combined, this way:
\]

If \( m \propto \frac{1}{c} \) and \( R \) is the proportionality constant, then \( m = R \cdot \frac{1}{c} \text{ must be equal to } \frac{m_0}{\sqrt{1 - \frac{v^2}{c^2}}} \cdot \sqrt{1 - \frac{(mc)^2}{c^2}} \times \frac{1}{c} \).
Then \( R \) must be equal to \( \frac{m_0}{\sqrt{1 - \frac{v^2}{c^2}}} \) \( \sqrt{1 - \left(\frac{m_0}{m}\right)^2} \).

But \( R = mc \).

Again \( mc \neq \frac{m_0}{\sqrt{1 - \frac{v^2}{c^2}}} \) \( \sqrt{1 - \left(\frac{m_0}{m}\right)^2} \).

The formulae cannot be reconciled.

My formula shall act only with electrons and photons, etc., indeed, perceptible masses do not undergo the resistance of friction of ether.*

By now we may assume that ether is a dense substance but mobile like a gas. As in Hydrostatics, we may consider this as consisting of a number of layers, each one rigid, dense, - like a very thin stretched membrane, along which longitudinal and transverse vibrations are propagated with their velocities.

It is supposed to permeate all vacuum and intermolecular, interatomic and void space within atom (let us from now denominate these as \( s_1, s_2, s_3 \)).

This is the idea of extension and impenetrability (we will consider this later anyhow) of ether.

Now let us understand the originatiation of y-rays, this way. They are known to be of short wave electric magnetic radiations, - not corpuscular at all.

As the vibrations of light - electrons are alluded to the originatiation of light, so the electromagnetic shock given to the ether may cause short waves of high frequency - the y-rays. As waves are caused in the sea by the explosion of a mine so the explosion of a radio-active atom may cause such waves. The more violent is the explosion, the greater the resistance of ether and the more intense is the wave. So the explosion of an atomic bomb causes very intense y-rays. Now we have proved the existence and resistance of ether and can speak of its existence as a material substance. Armed with this let me now explain a puzzling problem.

According to Goudsmit and Uhlenbeck the electron inside the atom is rotating with such velocity that its mechanical moment \( J = \frac{s \cdot h}{2m} \) when \( s \) in the skin
quantum. This enables us to calculate \( \omega \).

\[
\frac{a \omega}{C} = \left( \frac{1}{2} \right)^2 \frac{1}{\alpha^2},
\]

where \( \alpha \) is Sommerfeld's fine structure constant. Then the linear velocity of a peripheral point of the electron becomes zero, a fact which has remained incomprehensible to a degree. To explain this would happen when free from all constraint but actually the resistance of ether decreases down the angular momentum. And the layers are knocked back rebounced again and on the whole the rotational momentum has to baffle much pressure against it.

Mathematically, if the force acts on a point on the spherical surface of the electron and if \( \pi \) are \( \pi \) components of the torque of a force \( \vec{F} \), given by

\[
\vec{\pi} = \vec{\pi} \times (\vec{r} \times \vec{L}).
\]

The turning moment of a system of forces is given by simple additions.

The fundamental law of motion is \( \frac{\partial \vec{m}i}{\partial t} = \pi \), and \( \pi_i = m \vec{u}_i \), where \( \vec{u}_i \) denotes the contravariant components of the impulse of a mass point and \( \pi_i \) those of the force. [Say, \( \vec{F} \times x = \pi \times (\vec{r} \times \vec{L}) \), and \( \vec{F} = \pi \times (\vec{r} \times \vec{L}) \).]

In addition to this law the following holds good:

\[
\frac{\partial \vec{\pi}}{\partial t} = \vec{\pi} \times \vec{L}.
\]

The torque of a rigid body is controlled by this. \( L \), \( \vec{\pi} \) and \( \vec{L} \) are vectors of the second order, let us contract.

\[
\vec{L} = L_k^k = \sum \frac{1}{2} \vec{C}^{(0)} = \frac{1}{2} \vec{C}, \quad - \text{a scalar},
\]

and

\[
\vec{\pi} = \vec{\pi} = L_k^k \vec{C} = \frac{1}{2} \vec{C}, \quad - \text{a scalar}.
\]

Now the formula is changed into a simpler one.
— $\frac{dc}{dt} = dc'$. This holds good only when free from all restrains. $dc'$ is acted upon against $R$, the force or etherial resistance.

With the same argument I can indicate Doppler's effect, — the red-shift of a moving nebula. Suppose a gaseous mass travels along at a great velocity. It strikes the layers of ether and something like elastic collisions happen and this vibration is propagated from layer to layer and at the motion of any perceptible mass such longitudinal undulations go on spreading towards the opposite of the direction of motion of the body, — some thing like the waves created by the ploughing of a steamer. But the atoms within the mass suffer from an impact against velocities $s_2$, $s_3$ (page 2).

Suppose an atom, travelling with a velocity $V$, moves away from a world-point $w$, in a time-period $t$. Then push will be acted upon by the resistance of the ether, which will act on a pressure $P$. This will be, however, much greater in an individual atom than on those of the mass. This push upon the extranuclear electrons, — reducing their frequency of vibrations, as $V$ decreases, $\lambda$ increases.

$$\therefore \lambda \propto P \cdot R, \lambda = kP, \quad \lambda = m \lambda$$

$$\therefore R = m \cdot \bar{P} = n \cdot \bar{B} \cdot R \propto P$$

When the $R$ is the amount of redness. Again $R \propto \frac{1}{t}$. The greater the time, the $R$ greater in the distance and larger becomes the velocity and more of $R$.

Then $R \propto \frac{1}{t}$. Again $P \propto V$, $P = \mu V$.

$$R \propto \frac{\mu \cdot V}{t} \implies R = \frac{\mu \cdot V}{t} \cdot \text{let } \mu V = \nu$$

Then $R = \frac{\nu}{t}$.

* The push of the ether head-wind cannot be measured — by the Michelson-Morley experiment — but the verification of these waves, I know of and shall explain.
Now let us consider another problem not thought of before.
It depends upon the idea of expansion of the universe, more or less globular in form, all the nebulae are diverging away not relative to any particular centre but of course the sphere must have a centre — say a world-point w.
As the "time-period" t increases, the spheres become larger in volume. The volume is a function of time.

\[ \frac{4}{3} \pi r^3 = F(t) \]

So a system of unipartent spherical formation gradually issues out, each sphere larger than the one before.

\[ v_1 \text{ at } t_1 < v_2 \text{ at } t_2 < v_3 \text{ at } t_3 < \ldots < v_n \text{ at } t_n, \]

where \( \lim_{m \to 0} t_n = 0 \) anyhow, but where the globe of space-time expands into? Outside universe there is no space.

Then where the material structure material structure of the universe expands into? This is again an unresolved problem.

Now I ask where does it exist? In something nothingness, which is neither space nor time. But if this material structure of the universe can exist in this which is not "Raum und Zeit", we unconsciously revert to space-like property of object.
L = f(Et), when E is the expansion constant of the universe. Let the limit of infinite age be \( t_\infty \). Let the lower limit \( t \) be a fixed quantity, at the present moment. We can form the integral:

\[
\int_0^\infty f(Et) \, dt = \int_0^x f(x) \, dx = \int x f(v) \, dv = y(x)
\]

Now if we suppose the universal space to be filled with ether, that will also expand in the same way, that no vacuum remains. Then its density \( \rho \) will become smaller and smaller with time.

\( \rho \to 0 \) as \( t \to \infty \). There are some ideas of the eternal expansion of the cosmos. Then soon the ether will vanish into nothingness. This is a proof, if ether is a material substance, of the limitation of the cosmic expansion. But still with time, the density of ether is not appreciably changing, the radiations of \( \gamma \)-rays do not lose their intensity. (1) So I am of the mind of \( \eta \)-direct creation of ether out of some thing. What can it be? I think of transmutations of radiation and matter. There are millions of galaxies of radiating masses, losing material substances in radiation. These may again in an unlocalized form change into ether.

It seems that with radiation a 'flotsam' of photons and minute particles escape in space-ether. It is probable to assume that some of these mix up with space-ether, giving volume to ether. Then we can propose the following order of transmutation:

1. Matter → Radiation → Matter → Ether → Matter

If 3 is correct, then 4 must be correct also.

I think to that some energy-ultrasound-density \( t_\infty \) = mass, induced within an unit amount of ether will create a mass. We will however come back to it later.

Let \( U \) be a radiator.

\( U \rightarrow U_1 \) + radiation. Let \( U - U_1 = \bar{U} \).

\( \bar{U} \) is mixed up with space ether.

Let \( \bar{U} \) consist of \( (hv) R \), where \( R \) is a very large integral multiple.

\[ \bar{U} = E \cdot R \cdot \frac{E \cdot R}{c^2} = m \cdot R = M. \]
\[ \int_{V} \left( \frac{\partial}{\partial t} \varepsilon \right)_{0} \; dV = \int_{S} \varepsilon \; dS \]

From the above, we could integrate over a known volume, if it were known, we could integrate over it. Then \( (\varepsilon R) \) is known also.

\[ \frac{d}{dt} \left( \varepsilon R \right) \]

is the rate of conversion of radiation into heat. In the process, there will be formed the quantity \( \varepsilon R \) of radiant energy, which is the work done upon the volume.

In general, the work done on the volume will be

\[ \int_{V} \left( \frac{\partial}{\partial t} \varepsilon \right)_{0} \; dV = \int_{S} \varepsilon \; dS \]

where \( \varepsilon \) is the intensity of radiation at frequency \( \nu \). Let \( \varepsilon \) be measured by some of the methods of physics. So we may give these methods the work done by some of the methods of physics.

The following relations may be converted into mass and energy, and may be explained in the following way:

\[ \frac{dE}{dt} = \varepsilon \]

and

\[ \frac{d\varepsilon}{dt} = \varepsilon \]

Here, we shall explain some of the methods of physics. The following relations may be explained in the following way:

\[ E = \text{electromagnetic energy} \]

\[ \phi = \text{gravitational energy} \]

Energy may be converted into mass, and mass into energy. All forces had been neglected in the adoption of the five-dimensional continuum. It has been suggested by various suggestions of the idea of gauge theory. Some may give these suggestions of the idea of gauge theory. Some may give these suggestions of the idea of gauge theory.
we know however something of the greatness of V. 1., our result will be great also.

Now consider other as a fundamental mechanical substance, dense and rigid but still continuous and mobile. Each layer is somewhat like a solid elastic.

An any permissible mass rushes along the etherial ocean, the impact makes the layers vibrate. They give way and the vibrations are propagated along as longitudinal waves. Elastic collisions happen, so the friction is not undergone and bodies are not much harmed in their cosmic travels.

Then about this longitudinal waves, — the analysis on page 4. Attracted by the tremendous energy of that burning mass, the sun, the comet revolves round the sun in an elliptical orbit. Now the gas is much more mobile and consequently, should be more powerfully attracted than the comet head, — the solid nucleus. The gravitational energy of the sun and mostly the moon causes a portion of the water to have up and form the tide in our ocean. Were this a powerful tide, represented by a column of the gaseous tail pointing towards the sun, should have happened in the tail of a comet as it sweeps past the perihelion of its orbit. But this is not the case. Let TF represent this force.

The pointing of the tail towards AF is ascribed to "die prinzip des light-quantum." Let QP represent this force. Those etherial waves propagate along WF? The greater the motion of the comet, the more powerful will be the force of WF which shall end to win the tail towards WF. So these 3 forces will act.

Assuming QP > TF, the forces do not neutralize but another force will act towards QP.

The resultant of QP, WF, and R, a little one the east to QP. And we see that the tail is not pointing to QP exactly but towards a little east. Assuming TF to be > QP, R will point to QP, an abnormal direction. Then we will assume, — the atoms of the tail of a comet are electrified, — that

The ionized cations and anions attract each other and this affinity makes the tail rigid as a whole, that is do not yield to other forces. Let this
form of rigidity act as y. Then the R of R, by point, towards g, which will all right.

Now this ether is co-ordinated with space. The three dimensions of space are co-ordinated with the other three dimensions of ether. So universe is a 7-dimensional affine space, 6 of space - ether one of line, with Kaluzza’s projection.

So Minkowski’s,

$$ds^2 = dx_1^2 + dx_2^2 + dx_3^2 = dt^2,$$

shall be changed into

$$ds^2 = (dx_1^2 + dx_2^2) + (dx_3^2 + dx_4^2) + (dx_5^2 + dx_6^2) + dt^2.$$

But now we understand that $\Sigma_1^2$, $\Sigma_2^2$, $\Sigma_3^2$, and $\Sigma_4^2$ are respectively $dx_1^2 + dx_2^2 + dx_3^2$.

For universe in a spherical globe of space with the ethereal fluid in it. Imagine a globe of water. globe in the space - in it is co-ordinated the dimensions of the water globe. Its dimensions fall in those of space. We cannot consider the dimensions of space different from those of the water. So Minkowsky-Brahmachary’s geometry is only to show that space and ether are not co-ordinated.

Is ether at rest or in motion? It is at both, because the idea of motion is entirely relative. Because of the expansion of space, the ether is moving relatively to the universal centre. But to every other object, it moves apparently at rest, because it moves with the same velocity and towards the same direction.

Has ether got any mass or weight? It is the propagator of gravitational waves. It is supposed to be the carrier of longitudinal waves, - with velocity $\sqrt{\frac{1}{c^2} + \frac{1}{c^2}}$, while the transverse light waves have a velocity of $\sqrt{\frac{1}{c^2}}$; formerly gravitational action was thought to be instantaneous. But as they are propagated as transmission of signals, they are thought to have a velocity of c or $\sqrt{\frac{1}{c^2}}$. But then I can show that the velocity of

*Notes: Minkowsky-Brahmachary’s co-ordinate system of asterisk in page 9.
gravitational waves is at least 2c.

Let \( v = \sqrt{\frac{\lambda + 2 \mu}{\rho}} = \sqrt{\frac{\lambda}{\rho} + \frac{\mu}{\rho}} \) where \( \lambda \) is

only \( \frac{\mu}{\rho} \). Then we will assume that the group velocity is equal to the velocity of light but somewhat as in Beamps's pilot waves the individual
undulations may be speedier than light.

Now since ether, the fundamental substance, is materially existing it must have some inertial mass equal to the gravitational mass.

\[ m_0 = M \] — Equivalence hypothesis.

If there exists a special gravitational field for ether to be affected upon, — ether shall have weight.

Now there are many ideas of a nucleus of the universe. As the universe is so rapidly expanding, the moving celestial ocean trembles and vibrates so that universe looks like a tumbling expanding soap bubble. It would have far greater and burst unless some electric charge in a specially solidified ethereal centre with its specially propagated gravitational waves, had been acting upon the universe with an attractive force. Let a tensor \( A_{ik} \) represent the vibrations of ether. Let it be resolved into three independent variables, — longitudinal, longitudinal, transverse, transverse, transverse,

because of the splitting up of the constant symmetric cal tensor \( A_{ik} \) into three summands:

\[
\begin{align*}
| a_{11} & a_{12} & a_{13} | + | a_{21} & a_{22} & a_{23} | + | a_{31} & a_{32} & a_{33} |
\end{align*}
\]

(\( 1 = l, 2 = l, 3 = t \)).

The first sort of wave is specially meant to give ether a gravitational mass, the second one, the general gravitational waves and the third one for light waves. The second class also consists of electric and magnetic waves (explained next)
After the above assumption: 

Suppose the universe to consist of a number of points of space ether, each having the mass unity. As it moves along with the expansion of the universe in presence of the gravitational field, the potential at the centre of the universe, each geodesic, representing the motion of the point ether to become a curved trajectory. Thus the whole surface becomes a curved one and we see that the curvature of that space is dependent upon its large surface.

Now \( C \propto M, V \), \( C \propto M \); \( C = \phi M \); \( M = \frac{C}{\phi} \)

As \( M \to \infty \), \( C = \phi M \to \phi(\infty) \), independent...

(i)

The velocity of any such point-mass is greater than the velocity of light in vacuo, being about \( 10,000,000 \) miles/sec so with velocity (let it be) increasing, mass becomes greater.

As \( M \to \infty \), \( V \to 0 \). \( MV \propto C \); \( MV = k \cdot C \)

\[ MV \propto \frac{M}{\phi} \]

\[ MV = k \cdot \frac{C}{\phi} \]

which is again indeterminate...

(ii)

As the velocity becomes \( B \), the etherial point-mass increases in magnitude.

\[ M = \frac{m_0}{\sqrt{1 - \left(\frac{10,000,000}{186,000}\right)^2}} = \frac{1}{\sqrt{1 - \left(\frac{5000}{93}\right)^2}} \]

\[ m_0 = 1 \), already taken.

\[ = \text{approximately} \frac{1}{\sqrt{1 - \left(\frac{100}{19}\right)^2}} = \frac{1}{\sqrt{1 - 2.500}} \]

\[ : \quad MV \cdot 2500 = 1 \text{ or } M^2 (1-2500) = 1 \]

\[ M^2 = \frac{1}{2500} \quad (iii) \]

So mass seems to be a small negative fraction. \( M \), however becomes imaginary.

For physical purposes however I think that the mass will be a larger negative fraction. As a mathematical inference it is, I think only to show us our conclusion about something else, let us find it out.

Before, let us see about the volume.
The volume is given by the ratio: $1 : \sqrt{1 - \frac{u^2}{c^2}}^2$ or $1 : \sqrt{1 - (\frac{\frac{u}{100}}{100})^2}$ or finally $1 : \sqrt{1 - \frac{u^2}{c^2}}$

or $1 : (\sqrt{\frac{u}{c}})^2$ or $1 : \frac{u}{c}$. This way will be interpreted by the volume, decreasing towards the direction of motion, negatively; that is, increases.

When mass is negative,

$$c = \phi M = \phi (\frac{-u}{c}) = - \frac{u}{c}$$

That is the idea of universe having a negative curvature. The result of (iii) is only to show us this.

As I am interpreting the negative mass, volume this way, it will not be adequate to say actually that here negative curvature will be one to contain more volume, in a given radius of that circ. diam. $> \pi$. I only can mean it this way: the curvature in the opposite direction, it concave changing into imaginary convex. The figure explains.

\[\text{(12)} \quad ( \text{11} \leq \text{11}) \]

But there are conditions of curvature which had been indeterminate. For these I will not change completely, new 2. Then the resultant sphere becomes like this: $\text{(11)}$. Then the universe tends to become ellipsoid or spherical in form.

Considering the negative curvature, usually,$\frac{\text{circum}}{\text{diam}} > \pi$, Ludolph's number. That is the length of the periphery increases more than the considered diameter. Then the periphery becomes an ellipse and the considered diameter, the minor axis. My conclusions only say that universe is not spherical but it may be ellipsoidal, parabolic or hyperbolic. If space is closed it will be ellipsoidal. In (Nature) of 1939, two physicists wrote that universe is negatively curved. But they considered it to be parabolic or hyperbolic.

Ether and heat.

The vibrations of a number of molecules in a hot body ought to be stopped because of the resistance of ether. In these vibrations, mostly, inelastic collisions occur between the vibrating mass and rigid layers of ether round it, like the impact.
between two molecules as in the kinetic theory of gases, in extreme cases of heated vibrations, in still higher temperatures, some etherial waves may be caused as hoped for. These will be the extreme short wave radiations. Then I think this is the origin of cosmic rays. It has been found out that a small amount of cosmic rays come from sun (Nature, Jan.-June 1930). Mostly they then come from the extremely heated stars from all quarters of the universe.

Now can we assume that ether, while letting heat in general to pass away, shall absorb a little? There is no way of proving it wrong. A bit of the radiation from the sun may be absorbed in space-ether. Thus a lot of heat is absorbed by the whole of the etherial ocean and an equilibrium is restored. Then if a large sheet of ether is heated, we can conceive it for the entropy of the universe has increased and a new equilibrium must be restored. Let such radiational energy absorbed by ether be denoted by $R$. We shall see its significance later.

Then as it heat is induced the inertial energy is greater also.

$E_0 = R$. Let us consider what will happen with increasing $E_0$. In common atomic matter, this will induce a motion in the molecules and atoms and thus will show its presence. But ether is continuous so the only natural phenomenon will be to expand.

Let us consider expansion of substances. A solid is heated, the ether in $S_1, S_2, S_3$ are heated. A lot passes away. A little is absorbed, molecular motion is induced. As $S_1$ increases in area it offers pressure on the electron. The Bohr quantized circle would have been greater in area but for the strong affinity of electron-proton. The pressure of $S_3$ is greater and the molecular affinity is acted upon by this pressure. $S_3$ becomes larger. As cohesion in gas is least, expansion of $S_4$ is greatest.

Let the vol. of $LC. O_B$ are be $V_A$

Let $V_B$ the volume of $S_3$. Let each molecule be $V_C$ with radius $2.5$ Angstrom units: $V_C \sim 2.5 \AA^2$. 
Vol. of each molecule = \( \frac{4}{3} \pi (2.5)^3 \) in Ångström units.

\[ = \frac{4}{3} \times \frac{3.1419 (2.5)^3}{10000} \text{ in Å}^3 \text{ U}. \]

\[ = \frac{12.5676 \times 12.5}{30000} \text{ in Å}^3 \text{ U} \]

\( V_{D0} = x \text{ cubic } 10^{-3} \text{ cm}. \)

The volume of all molecules in \( V_A \) is \( V_D \).

\[ V_D = V_{D0} \times \text{Loch's midt number}. \]

\[ = V_{D0} \times (3 \times 10^{19}) = \frac{12.5676 \times (3 \times 10^{19})}{10000} \]

in cubic Å U.

Then \( V_A - V_D = V_K \), the volume of \( S_3 \) constant.

\[ E \propto V_K. \]

This expansion pressure is equal to \( B a V_K \). \( E = B a V_K \), where \( B a \) is Braham's constant, dependent upon the molecular structure of matter. Now \( V_K \) will denote \( S_1, S_2 \) or \( S_3 \).

The origin of light waves, we ascribe to the vibrations of electrons as \( S_1 \) is to increase in area but cannot, it offers a continuous pressure to the electron, wherever may it be upon the circle.

\( 3V = x \cdot B a V_K \) because \( 3V \propto B a V_K \) or \( \propto E \cdot P \), the expanding pressure. (Vibrations in 3 degrees of freedom.) But as \( B a V_K \), increases \( V \), decreases, that \( x \) increases positively, \( x \) will be negative.

Really then \( x = x \cdot B a V_K \), where \( x \) is a positive constant. Larger the massive volume of a star, greater the \( V_K \) (all \( V_K \)'s of the mass) and consequently, the light emitted is redder. Now the burning gases give so many special colors, that we cannot verify this. However, the larger stars are red ones.

The fundamental cosmical energy is \( \text{curl } E \), the initial energy of ether and this is increasing because the \( R \)-energy absorbed (page 13.).

\( \text{curl } E_t = \text{curl } E_{t0} + \text{R} \), increases with time. We have seen before the possibilities of transformation of ether to matter and reverse. As the universe expands, the ether expands and finally all matter shall
be dissociated into ether, this will go on expanding before the ether becomes 0. That is the universe will not increase in volume for an infinite amount of time.

After the universe begins to expand, the entropy will again go on decreasing, let $\text{Curl } E_1$ be the final entropy maximum. Let $\text{Curl } E_0$ be the minimum entropy.

$\text{Curl } E_1 - \text{Curl } E_0 = \text{Curl } E_{\text{max}} - \text{Curl } E_{\text{min}} = \text{Curl } E_m$ as energy shall create all the matter in the universe.

Let this be $M$. Then $MC^2 = \text{Curl } E_m = (\frac{\partial E}{\partial x} + \frac{\partial E}{\partial y})_m$.

A lot of the curl $E_m$ remains at the present time, as free energy and the rest as mass.

What can the masses of electrons, protons be made of? Ether. Any etherial unit lodged with some energy at a density $T_{ik}$ will form a mass. We will assume all energies to be transformable. The presence of $T_{ik}$ shall be to condense a portion of ether and may be changed into electric energy. Thus making a proton or an electron. A lot of the $MC^2$ is from the initial energy of the ether. Any portion of ether containing energy-density $T_{ik}$ shall be called a field and in this sense a matter shall be carried out from this field which is more fundamental. We are thus forming a new field physics.

Let us denote it by $F_{ik}$, $\phi$ representing the energy nucleus and $\eta$ the positional co-ordinate.

The uncertainty of the position of $\phi$ can be represented usually by a series of non-commutative infinite matrices, say $|\phi| = \begin{bmatrix} \phi_0 \phi_1 \phi_2 \ldots \phi_0 \phi_1 \phi_2 \ldots \phi_0 \phi_1 \phi_2 \ldots \phi_0 \phi_1 \phi_2 \ldots \\
| \phi_0 \phi_1 \phi_2 \ldots \phi_0 \phi_1 \phi_2 \ldots \phi_0 \phi_1 \phi_2 \ldots \phi_0 \phi_1 \phi_2 \ldots |
| \phi_0 \phi_1 \phi_2 \ldots \phi_0 \phi_1 \phi_2 \ldots \phi_0 \phi_1 \phi_2 \ldots |
| \phi_0 \phi_1 \phi_2 \ldots \phi_0 \phi_1 \phi_2 \ldots \phi_0 \phi_1 \phi_2 \ldots |
| \phi_0 \phi_1 \phi_2 \ldots \phi_0 \phi_1 \phi_2 \ldots \phi_0 \phi_1 \phi_2 \ldots |
| \phi_0 \phi_1 \phi_2 \ldots \phi_0 \phi_1 \phi_2 \ldots \phi_0 \phi_1 \phi_2 \ldots |$

Field shall be of two types. Primary and secondary. Magnetic field shall fall under it. I will explain this later.

The $T_{ik}$ of a photon is unity. An integral multiple of this $T_{ik}$ say $K.T_{ik}$ shall form an electron, while $R.T_{ik}$ shall form a proton. $R > K$. For $R.T_{ik} = KT_{ik} + T_{ik}$, for the greater mass. Probably the unit $T_{ik}$ does not make any mass of ether but the larger units condense some ether so any mass becomes enormously dense. It is containing an enormous amount of energy inside. But the lot of $T_{ik}$ as an extra-potential acts, and an electron should have been burnt out. But $E - \text{grad } \phi = 0$.

$\phi$ acts as an electric pressure. Some of this $T_{ik}$
changes into $\phi$. We can assume then an electron to attain somewhat like this $\bullet$. At each point a force of energy is trying to burst out, let there be $n$ such forces. Now like electromagnetic waves let us consider electric waves also. As an electron moves along space, all these $N$ forces act upon layers of ether and waves arise and are propagated along. Throughout a cubic space this will happen and that space we will call the electric-field. All the principles of action at a distance if I think should be alluded to the longitudinal-transverse vibrations of ether. As the amplitude decreases the intensity of the effect decreases also. When it becomes 0, the field vanishes. As the electric waves move along, they strike sheet after sheet of ether at $c = 2$ to the electric waves. These sheets will form another secondary cube, the field or magnetism. So impacts at $t = 2$ to the magnetic field breaks another electric field.

Now electricity itself is a wave. In the new nature of electricity, it is not only accompanied by De Broglie's waves but in itself a spreading wave. I think it is because of its dissociation into electric waves which spread along. \( u(x, y, z, t) \) satisfies $\nabla^2 u = \frac{1}{c^2} \frac{\partial^2 u}{\partial t^2}$.

I think matter is like a bubble in an field—the water. The bubble is a real singularity but it is so unsatisfactory. The spreading of the relation wave is like the swelling of the bubble before bursting.

So I now consider ether to be a material substance having resistance, rigidity and extension. As gravitational and inertial mass are different as well as the same thing, so matter and ether, both, substantial singularities of the universe, are different existence of the same object.
APPENDIX.

I think there is a flaw in the fundamental idea of Michelson-Morley experiment. It is to determine the velocity of earth relative to the ether at rest. But do you consider that with the expansion of the universe, the galaxy of our earth and Milky Way is running along at a finite speed from the centre of the universe? The etherial ocean is also expanding. For every object, the etherial layer around it shall seem to be at rest for both are

* see page 5.
travelling towards the same direction with the same velocity. When a log of wood drifts along the current, can you consider its motion relative to the water at rest?

The null result of Michelson-Morley experiment is very natural, showing there is no absolute motion of the earth relatively to the ether, because both are moving in the same direction with the same velocity. There is a longitudinal motion of 19 m.p.h. relative to ether but a transverse motion of both a few thousand miles per sec. to a correction of even 1% should not do anything.

7th September 45. — M. Ram Chandra Brahmachary.