RECIPROCITY

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LARSON TO GIVE INVITED LECTURE AT SUPERIOR

Mr. Dewey B. Larson, engineer-author of a new unified theory of physics, known as the Reciprocal System, will give an Invited Lecture about it on the campus of the University of Wisconsin-Superior during the Summer Session, 1979 (Thursday evening, July 19, 8 P.M.). It is sponsored by the University College of Letters and Science and its Dean, Dr. Egal Feldman.

FOURTH ANNUAL NSA CONFERENCE THIS SUMMER AT SUPERIOR

The Board of Trustees of NEW SCIENCE ADVOCATES, INC. has decided to hold the 1979 NSA Annual Conference on the campus of the University of Wisconsin-Superior, July 20 and 21, Friday and Saturday.

CONTENTS OF THIS RECIPROCITY

PREPARATIONS FOR FOURTH ANNUAL NSA CONFERENCE

Dr. Rainer Huck (address on this RECIPROCITY masthead) is Program Chairman for this Conference. You are invited to present a paper about an issue or question raised by your study of and tentative findings concerning the Reciprocal System of physics. You are requested to send title of your paper, time and AV aids requested, etc. to Dr. Huck by June 4th. This invitation is extended to NSA members, friendly and enemy critics. (Our best friend may be our bravest enemy, since he or she will keep us on our toes.)

Enthusiasm for this coming Conference in our ranks is great. David Halprin is coming from as far away as Australia to Superior. It should be a lively Conference with several issues to be resolved: If the physical universe is one entirely of motion, the logical definition of every term of physics, velocity, mass, momentum, energy, etc. must be expressible in terms of the two fundamental aspects of motion, time and space. Dewey Larson has done this, is his resolution valid in all cases, e.g., is mass, t^3/s^3; energy, t/s, etc.?

Low cost housing, $6.00 per person per night, will be available in Ross Hall on campus for those who want it. Price includes sheets, blanket, pillow and pillow case but not towels and soap.

1979, EINSTEIN CENTENNIAL AND UPDATING OF LARSON WORK

1979 will be remembered as the year in which D. B. Larson updated and elaborated his great critique of modern physics, first published in 1959. The first of three projected volumes of his new work is scheduled for publication in May, 1979. Its title is NOTHING BUT MOTION. You can reserve your copy by remiting $10 to Dr. Huck, Mr. Ronald Satz or Prof. Frank Meyer (respective addresses on this RECIPROCITY masthead).

1979 also is the centennial of the birth of A. Einstein, who tried unsuccessfully to create a unified physics. Probably no one did more than he (except perhaps Planck) to help establish that neither matter nor energy is continuous, i.e. infinitely divisible. (See his papers on Photoelectric Effect and on Brownian Motion.)

Einstein also questioned Newton's scholia that space and time have nothing to do with one another.

Einstein's own postulates that space and time form a 4-dimensional continuum are quite questionable in denying implicitly that space-time is motion, 3-dimensional and discrete.

More can be learned often from the errors of great men or women than from the truths of textbook writers. Larson has worked in this spirit advocated by Einstein: "From the very beginning there has always been present the attempt to find a unifying theoretical basis for all these single sciences, consisting of a minimum of concepts and fundamental relationships, from which all the concepts and relationships of the single disciplines might be derived by logical process. This is what we mean by the search for a foundation of the whole of physics..... Some physicists, among them myself, cannot believe that we must abandon, actually and forever, the idea of direct representation of physical reality in space and time."

A Comment on the "Discussion of Larson's Gravitational Equation"
(RECIPROCITY, Vol. VIII, No. 4, p. 23f.)
G. Windolph, 1/4/79

The author's statement: "These equations completely confirm Larson's identification of all the fundamental units," can be misleading. My reason for this claim is that the gravitational constant of Newton would come out of these equations no matter what values are inserted for the fundamental units of time, mass, and space. Consider the author's equation (5):

$$G_{cgs} = 9.0567 \times 10^{-48} \frac{F_{nu} s_{nu}^2}{m_{nu}^2} \times 109.7 \text{ dynes}/F_{nu} \times \frac{(.456 \times 10^{-5}\text{cm})^2}{s_{nu}^2} \times \frac{m_{nu}^2}{(.5565 \times 10^{-24}\text{g})^2}$$

$$= 6.67 \times 10^{-8} \text{ dynes cm}^2/\text{g}^2. \quad \text{Subscript nu denotes natural units.}$$

Now consider the origin of the first, second, and fourth terms in the main body of the equation.

First term: 9.0567×10^{-48}. This term is derived in the author's equation (3):

$$G_{nu} = (3.7115 \times 10^{-32})^2/.1521 \times 10^{-15}$$

The numerator in this term is equal to $1/c^3$, as derived on page 26 of THE STRUCTURE OF THE PHYSICAL UNIVERSE, where c is the velocity of light. Therefore, we can shorten the equation to read:

$$G_{nu} = (1/c^3)^2/.1521 \times 10^{-15} \qquad (a)$$

Second term: 109.7. This is derived on page 27 of THE STRUCTURE as follows:

$$(.1521 \times 10^{-15})/((.456 \times 10^{-5})^2 \times G) = 109.7 \qquad (b)$$

where G is the Newtonian gravitational constant.

Fourth term: $m^2/(.5565 \times 10^{-24}\text{g})^2$. The denominator of this term is derived on page 27 of THE STRUCTURE, as follows: $(1/c^3)/G = .5565$ g. The fourth term therefore is equivalent to:

$$m^2/((1/c^3)/G)^2 \qquad (c)$$

Now re-write the author's equation (5), using (a), (b), and (c) in place of the original first, second, and fourth terms: (dropping those symbols which cancel out)

$$G_{cgs} = \frac{(1/c^3)^2}{.1521 \times 10^{-15}} \times \frac{(.1521 \times 10^{-15})\text{dynes}}{(.456 \times 10^{-5})^2 \times G} \times (.456 \times 10^{-5})^2\text{cm}^2 \times \frac{1}{((1/c^3)/G)^2}$$

$$= G^2/G = G$$

From this it seems clear to me that, as far as this equation is concerned, the fundamental units of space ($.456 \times 10^{-5}$cm), time ($.1521 \times 10^{-15}$sec), and mass ($1/c^3$), could have any value whatsoever since they drop out. Therefore to use this equation to confirm the "identification of all the fundamental units" as the author does involves some cirularity in reasoning.

COSMIC RADIATION AND THE OTHER HALF OF THE PHYSICAL UNIVERSE

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A revised edition of a report to the NSF Chautauqua course on "Fundamental Particles" of Professor Max Dresden, SUNY, meeting at the University of Iowa, Iowa City, February 21-22, 1979.

Introduction

"And finally, we hope, some general theory will appear, so broad that all our present branches of physics appear as special cases of it ..... We may hope that progress toward this greater generalization will not be too discouragingly slow." --John C. Slater, MIT, Modern Physics, McGraw Hill Book Company, New York, 1955, p. 304.

The new theoretical chemistry-physics system, the Reciprocal System, whose theory of the so-called elementary particles is briefly outlined in this report, is precisely the kind of product that the scientific profession in the person, for example, of Professor Slater, has been asking for. All that is needed now is an understanding of the theoretical structure and a recognition of the fact that it meets all of the specifications. Amending Slater's comments to bring them up to date, "We may hope that progress toward this understanding and recognition will not be too discouragingly slow." (D. B. Larson)

What the Physical Universe Is

The physical universe, although large in size, probably is only an aspect of existence, rather than all of it.

The currently accepted concept of the physical universe as a universe of matter, in which the basic entities are elementary units of matter existing in a framework provided by space and time, is obviously wrong, because it is now known that matter and non-matter (i.e., radiation) are interconvertible. Specifically, the Rutherford-Bohr nuclear atom model represents no real or actual atom, but is, as du Noüy (1) has pointed out, "only an imposter."

It has long been suspected that the basic entity might be motion, but those who have tried to construct a theory on this basis (Descartes, Hobbes, Eddington, et al.) have been unsuccessful.

D. B. Larson (2), author of the Reciprocal System of physics and chemistry, has found that what has been lacking is the concept of a universe constructed entirely of motion. (This is the essential contribution that he has made to scientific theory).

Larson has determined what properties space and time must have in such a universe, and has expressed them in the form of two postulates:

First Fundamental Postulate: The physical universe is composed entirely of one component, motion, existing in three dimensions, in discrete units and in two reciprocal forms, space and time.

Second Fundamental Postulate: The physical universe conforms to the relations of ordinary commutative mathematics, its magnitudes are absolute and its geometry is Euclidean.

From these postulates some far-reaching consequences can be deduced. Three of these are particularly important:

1. The condition of rest in the physical universe, the datum level from which all physical activity extends, is unit speed, not zero.

2. All physical entities or phenomena are motions, combinations of motions, or relations between motions.

3. For every physical entity or phenomenon there is an inverse, which is identical in all respects except that space and time are interchanged. It follows from this that there is a second half of the universe, which is inversely related to the sector of the universe with which we are familiar.

The Other Half

The other half of the physical universe is only suspected or conjectured to exist by the present world-wide physics orthodoxy. The latter (6) refer to it by the misnomer, "anti-matter." The other half of the physical universe is not "against" matter, as antiChrist is postulated to be "against Christ." The material half and the other half rather coexist and complement each other to make one physical world.

In the theoretical physical universe formulated by the Reciprocal System of the engineer-author, D. B. Larson, the other half is referred to as "the cosmic sector", or "the inverse half." A good reason for naming it the cosmic sector is that it is the source of the well-known cosmic rays.

According to the Reciprocal System, the physical universe as a whole is a steady state, as a consequence of the coexistence of the hitherto virtually unnoticed cosmic sector with the familiar material sector. With cyclical change characteristic of both halves, the whole physical universe remains essentially changeless.

"Antimatter" and "antiparticle" are misnomers for the cosmic sector, because all the particulars of this sector are the inverse, not the negative, of the corresponding particulars of the material sector.

The basic inverse character of the relation between the cosmic particles, e.g., the cosmic electron and cosmic positron, and their corresponding material particles, the electron and the positron, is a special case of the reciprocal relation between space and time.

Motion, Time and Space

What is new and different about the Reciprocal System are the roles assigned by it to motion, time and space. Anxious to avoid philosophical argument altogether, modern orthodox physicists have committed a major error by failing to question the alleged existence of elementary particles and the assumed truth of traditional axioms concerning the nature of space, time and motion. Werner Heisenberg (3) warned against this error as early as 1975. The author of the Reciprocal System, D. B. Larson (2), by this kind of questioning and combining of philosophy with physics, has made the epochal discovery that all motion involves a reciprocal relation between space and

time and nothing else. Larson (4) has made this finding the fundamental postulate for creating a unified general physics.

In most instances, but not all, the Reciprocal System arrives at the same conclusions as conventional physics, though the two theories rest on different foundations. About 90% of what now passes for scientific knowledge is incorporated into the Reciprocal System either just as it stands or with nothing more than a change in the language in which it is expressed. Another 5% or so retains the mathematics in the existing form, for example, the Lorentz transformation equations, but alters the physical interpretation. Not more than 5% of conventional physics has to undergo any scientific change, and these major reconstructions are confined to the far-out regions: the realms of the very small, the very large, and the very fast, the same regions in which orthodox physics is encountering its most serious problems.

Modern orthodox physics has been constructed on the conventional wisdom that "matter and motion are inseparable" (5); that the idea of motion is inapplicable to time (Barrow, Einstein) and to space (Newton, Einstein) and that motion without something moving is meaningless and impossible. Similarly, it has been taken for granted, although never proved, that nothing in the physical universe can travel faster than 3×10^5 kilometers/second.

The theory of relativity in asserting that the speed $c \cong 3 \times 10^5$ kilometers/second is a limiting speed is not altogether incorrect. The speed c is more than just the speed of light in vacuo. It is the absolutely constant unit speed, according to the Reciprocal System, of the space-time progression, whether or not the space-time locations are populated by photons, each of which remains in the space-time location in which it originates. Nothing can move faster than the speed c in space, and nothing can move slower than the speed c in time. In this sense, therefore, the speed c is both an upper limit and a lower limit, even though Einstein's assertion that nothing can move faster than the speed c, the speed of light, is incorrect. All entities in the cosmic sector exceed this speed.

According to the Reciprocal System, motion is the nature of all physical entities, including material, cosmic and (photons) immaterial particles. Hence all physical entities and phenomena are manifestations of motion.

The essence of motion is space-time, both the necessary and sufficient condition of all motion. While time is indispensable to the existence of the physical universe, it is not enough to assure this existence and does not exist by itself. Time without its reciprocal or inverse, space, is non-existent. Likewise, space without its reciprocal, time, is non-existent. While space is indispensable to the existence of the physical universe, it is not enough to assure this existence and does not exist by itself. Thus, in the absence of either time or space, the physical universe could not and would not exist, because the physical universe is a universe of motion, which requires both space and time.

Motion is the relation of space to time and of time to space; it is a unity of the opposites, space and time; it is the continuity of quantized space-time units. The discrete units of space ($\cong 0.45 \times 10^{-5}$ cm) and the units of time ($\cong 0.15 \times 10^{-15}$ sec) are equal to each other, since time and space are reciprocals.

In its simplest form space-time is a uniform, scalar progression, a one-dimensional motion at the finite rate of one space unit per one time unit equal to $c \cong 3 \times 10^5$ kilometers/second, distributed over three dimensions by the operation of probability.

Rest in the Physical Universe

Max Born in The Restless Universe says: "It is odd to think that there is a word for something which strictly speaking does not exist, namely, rest."

In the physical universe in which motion is absolute, absolute rest does not exist, because it cannot. Rest appears only relative to motion and is indistinguishable from uniform rectilinear motion, as disclosed by Newton in his postulate, called the first law of motion. This is sometimes forgotten in mechanics when statics is defined as the science of bodies at rest and dynamics as the science of bodies in motion. Such a distinction is meaningless in the light of the first law. In fact, statics is the science of bodies in unaccelerated motion, while dynamics is the science of bodies in accelerated motion.

Non-zero (unit) constant speed is just as much a case of unaccelerated motion as (zero) constant speed.

A conspicuous advantage of the Reciprocal System is that it casts new light on the structure of the physical universe by discarding the traditional arbitrary choice of the mathematical zero, the number zero, choosing instead the number one or unity as the preferred physical zero providing the reference origin in a more suitable frame for measuring motion and motion rates.

When and where speed measurement is at issue, less than, equal to and more than unit speed (or unity) makes for a physically more meaningful division of speed classes compared with less than, equal to and more than zero speed. The unit speed c is no arbitrary choice for reference origin, since one unit of space per one unit of time, c, unity, is the uniform rate of the space-time progression, from which all other motions are so many various speed displacements.

Time Region and Space Region

Two physically significant speed classes are those which Larson (3) identifies as the time region and the space region.

Two kinds of speed displacement from c = ls/lt can occur: time displacement, l/t and space displacement, s/l.

The time region is that portion of the material sector in which the equivalent space is less than unity, ls/nt, and all variability is in time.

The space region is that portion of the cosmic sector in which the equivalent time is less than unity, lt/ns, and all variability is in space.

n denotes an integral number of time units in the time region and an integral number of space units in the space units.

The physical significance of the time region is that stable aggregates of ordinary matter can be formed in it, namely solids. Similarly, stable aggregates of cosmic matter can be formed in the space region.

The space region at present remains a virtually unexplored region of the physical universe.

The time region has been well explored by advocates of the Reciprocal System. The exploration has achieved two fruitful results. (1) It has led to the overthrow

of the Rutherford-Bohr nuclear atom model of the atom of matter. (2) It has led to the identification of both the attractive force and the repulsive force which together cause solid cohesion.

1. The atoms of matter have been found to lack nuclei that the Rutherford-Bohr nuclear atom model alleges them to have. The atom of matter has also been found to lack a second feature, attributed to it by the Rutherford-Bohr model: it is not constituted from "elementary particles," specifically neutrons, protons, electrons, etc. This theoretical finding confirms the empirical investigation of K. Schrader-Frechette (7), which concludes "that there is no more reason to say that matter is made of elementary particles than to say that it is not."

An atom of matter actually is a compound of discrete motions: space vibrations rotating in time. A quantitative description of atoms of the chemical elements and binary compounds is provided by the works of D. B. Larson (2, 4).

2. From the postulates of the Reciprocal System entirely (2, 4), solid cohesion has been disclosed to be a stable equilibrium between the space-time progression and the gravitational motion of the atoms of matter. Their cohesion in solids is effected by these two powerful and antagonistic forces which control the destinies of the physical universe as a whole.

The force of the space-time progression behaves always away from unity and the force of gravitation behaves always toward unity.

Away from unit space outside the unit means outward, while inside the unit, wherein all solid cohesion takes place, away from unit means the reverse: inward. Thus, the space-time progression plays the role of attractive force in solid cohesion, while in the physical universe as a whole, it is the cause of the expansion of the universe.

Similarly, toward unit space outside the unit means inward, while inside the unit, wherein all solid cohesion takes place, toward unity means the reverse: outward. Thus, gravitational force plays the role of repulsive force in solid cohesion, while in the physical universe as a whole it is the cause of the attraction holding together planets, stars and galaxy.

Much evidence that this new and unfamiliar solid cohesion theory of the Reciprocal System provides a valid and true account of crystal formation is available. First, exclusively from the postulates of the Reciprocal System Larson (2, 4) has calculated the possible equilibrium interatomic distances for the known crystals of the chemical elements and binary compounds in good agreement with such distances measured with the aid of x-ray diffraction technique. Secondly, Satz and Meyer (8) have succeeded in calculating entirely from the postulates of the Reciprocal System. the preferred cohesive energies of elemental crystals, the overall calculated values comparing within 8% of the experimental values tabulated in the latest edition of Kittel's (9) Introduction to Solid State Physics.

Identification of Some Cosmic Atoms

The cosmic sector of the physical universe makes its existence evident to the curious inquirer principally by way of cosmic rays and cosmic ray decay.

A secondary way to learn more about cosmic atoms and particles is to produce them in the laboratory much as x-rays first were discovered coming from a Crookes

tube by Roentgen in 1895 and now it is evident that x-rays also come naturally from the world of stars and galaxies.

Around November, 1974 the existence of two new particles was discovered at the Brookhaven National Laboratory by a team whose leader was Samuel Ting and at the Lawrence-Berkeley Laboratory by a team whose leader was Burton Richter. For this discovery Drs. Ting and Richter have been awarded a Nobel Prize in physics. The Brookhaven experiment was conducted at its Alternating Gradient Synchroton, while the LBL/UC experiment was conducted at SLAC's storage rings, SPEAR.

In spite of the availability of adequate quantitative experimental information about both particles, conventional physics has had no good answer to the question: What can these particles be? What are they?

In particular, the leading conventional hypothesis of particle theory, the quark hypothesis, has been sterile in proposing answers to such questions. Can these questions be answered without invoking the ground state of a charmed quark-antiquark pair or Professor Steve Weinberg's neutral vector boson? They apparently have not been answered with these invocations.

Is not Werner Heisenberg's objection voiced before his death to the quark hypothesis worth taking seriously (3): "Do we not find behind the quark hypothesis the old idea--refuted long ago by experiment--that simple and compound particles can be distinguished?"?

Conventional physicists seem to think that if they can't answer the questions before us, no one can and/or should even try. However, if conventional physics is failing, why not try another approach? What can be lost by at least examining the claim of New Science Advocates, Inc. that the Reciprocal System can and does correctly answer the questions:

What is the psi 3695 MeV resonance?

What is the psi 3105 MeV resonance, also sometimes called the J particle?

These particles are not something other than two particular cosmic atoms.

Identification of the 3695 MeV particle as c-H^2, a "cosmic deuteron with two material isotopic charges" by Ronald W. Satz (10) has been the crucial theoretical advance that has opened the door to a clarification of the status of cosmic hydrogen, according to D. B. Larson (4).

The observed 3695 MeV particle decays to another psi particle with a reported mass of 3105 MeV and a lifetime of about 10^{-20} second. This second particle can be clearly identified with the cosmic helium atom with three material isotope charges, c-He^3 (4).

Evidence for the claim that the two recently discovered psi particles are the two specified atoms of cosmic matter now will be presented.

Cosmic Sector

In the theoretical universe of the Reciprocal System the dividing line between the cosmic sector and the material sector is unit speed c. No particle is posited as being actually elementary. The fundamental entity of the physical universe is

not a set of matter particles (quarks). Rather, motion existing in discrete units is the essence of this world. Quantitatively, the motion may be above or below unit speed. In the cosmic sector the motion is above unit speed and in time. In the material sector the motion is below unit speed and in space.

The two sectors, the material and the cosmic, are the reciprocals of each other. They are identical in structure except that the roles of space and time are exchanged.

In the material sector exists a sequence of chemical elements and incomplete atoms. Likewise the cosmic sector has its sequence of chemical elements and incomplete atoms.

In the material sector there occur from time to time gigantic galactic explosions, resulting in radio galaxies and also in quasars. The quasars pass from the material sector to the cosmic sector, because they are accelerated to speeds in excess of that of light. Consequently, quasar motion cannot be represented in a spatial coordinate frame. The position of an object of the material sector, because it moves at a speed less than that of light, can be represented in a spatial coordinate frame. But this is possible only because at these speeds time progresses uniformly, and the reference frame is not called upon to provide for non-uniform changes of time position. At a speed above unity, space progresses uniformly, in the same manner that time progresses at the lower speeds, and the non-uniform changes of position are in time. They can, however, be represented in a temporal coordinate frame in which space progresses uniformly as time does in the spatial frame. It can, therefore, be said that the material sector is the half of the universe in which change of position can be represented in a spatial coordinate frame and the cosmic sector is the half of the universe in which change of position cannot be so represented. The quasar leaves the material sector when it leaves the spatial coordinate frame. Our observations cannot follow the quasar into the cosmic sector, because we are material objects, and as such we are limited to the linear path of the time progression through the three-dimensional totality of time. Likewise, in the cosmic sector cosmic galactic explosions occur, in which some inverse matter from the cosmic sector is dispersed into the material sector. This dispersed, very energetic and fast inverse matter is identified by the Reciprocal System as cosmic rays.

In the material sector the most common element is hydrogen.

Cosmic hydrogen should therefore be much more abundant than other cosmic elements in the cosmic ray stream.

As elements constructed of motion above unit speed, the cosmic elements should have properties the inverse of those ordinarily associated with corresponding chemical elements in the material sector. In particular, the mass of a cosmic element is the reciprocal of the mass of the corresponding chemical element.

Let Z = atomic number of a chemical element and of its corresponding cosmic element. If the atom of a chemical element has a mass of Z units on the atomic number scale, the corresponding cosmic atom has an inverse mass of Z units, which is observed in the material sector as a mass of 1/Z units.

Now 1 atomic mass unit = 1.66×10^{-27} kg

$$c = 2.99 \times 10^{8} \frac{m}{s}$$

$$c^2 = 8.94 \times 10^{16} \frac{m^2}{s^2}$$

The equivalent energy of 1 amu = mc^2

$$1 \text{ amu} = (1.66 \times 10^{-27} \text{ kg})\ (8.94 \times 10^{16} \frac{m^2}{s^2}) = 14.9 \times 10^{-11} \text{ J}$$

$$1 \text{ e.V.} = 1.6 \times 10^{-19} \text{ J}$$

$$\text{The equivalent energy of 1 amu} = \frac{14.9 \times 10^{-11} \text{ J}}{1.6 \times 10^{-19} \text{ J}}$$

$$1 \text{ amu} = 931 \text{ MeV}/c^2$$

The atomic number equivalent is twice this amount = 1862 MeV/c^2.

Hence for a cosmic element

$$m_{\text{c-element}} = \frac{1862.3}{m} \text{ MeV}/c^2 \qquad (1)$$

When m is expressed in terms of atomic weight, this becomes

$$m_{\text{c-element}} = \frac{3724.6}{Z} \text{ MeV}/c^2$$

In addition to the primary mass (2Z amu), each element has a secondary mass. According to Larson (3), as matters now stand, neither the theoretical calculations nor the observations of the cosmic elements above hydrogen in the cosmic atomic series are sufficiently accurate to justify taking the secondary mass into consideration. An exception can be made in the case of hydrogen, because the secondary mass of this element under normal conditions is relatively large, and the probability that it will be altered by changes in environmental conditions is relatively small. Since the rotational mass of a material H^2 atom is 1.007405 on the atomic number scale, the mass of a cosmic H^2 atom is the reciprocal of this number, or 0.99265 units. On the atomic number scale, since Z = 1, the rotational mass of cosmic H^2 is equal to 1848 MeV.

Furthermore, the Reciprocal System recognizes that the combinations of motions that constitute the atoms of the elements, both material and cosmic, can acquire additional motion components of a different kind, each unit of which alters the mass of the atom by one atomic mass unit. The procedure for computing the added contribution to the mass of a cosmic atom from this new type of motion, called gravitational charge (4) is:

In atomic mass units each material element of atomic number Z exists in a number of different isotopes, each of which has an atomic mass 2Z + G, where G is the number of gravitational charges. The normal mass of the corresponding cosmic isotopes is the reciprocal of 2Z + G, but when the cosmic atoms enter the material environment they are able to add gravitational charges of the material (positive) type to the cosmic combinations of motions (including the gravitational charges of cosmic [negative] type, if any). Each material type charge adds one atomic mass unit equal to 931 MeV/c^2 to the isotopic mass of the cosmic atom.

The derivation of the above procedure for calculating mass of atoms of both cosmic and material chemical elements can be found in both the forthcoming (4) and previous (2) work of Larson.

In the previous work (2) published in 1959 it was recognized that the incoming cosmic rays would consist primarily of c-hydrogen, but at that time there were no observational indications of any cosmic ray particles in the cosmic hydrogen mass range. Meanwhile, however, the investigators have been able to extend their observations to earlier portions of cosmic ray decay path, and in 1974 discovered a short-lived particle with a mass that is reported as 3,695 MeV/c^2. (This is the previously mentioned discovery of Drs. Ting and Richter and their associates.)

The two gravitational charges that the c-H^2 atom acquires add 2 (931 MeV/c^2) to the 1848 MeV/c^2 mass equivalent of the cosmic hydrogen rotational mass, bringing the total mass of this, the first of the theoretical cosmic ray particles, to 3710 MeV/c^2. The mass of the newly discovered psi particle is reported as 3695 MeV/c^2. In view of the many uncertainties involved in the observations, this is consistent with the theoretical value. More details of this important theoretical achievement will be found in the forthcoming Larson publication (4).

The reported lifetime of the 3695 psi particle is in the neighborhood of 10^{-20} seconds, which is likewise in agreement with the Reciprocal System theory. For details of this calculation, see Reference 4.

c-H^2 ejects a neutral material particle, increasing the cosmic mass of the residual c-atom, and converting it to c-He^3.

The material He^3 isotope is an He atom (mass = 4 atomic mass units) with a one-unit negative gravitational charge (one negative atomic mass unit). The net mass of the isotope is then 3 atomic mass units.

The cosmic He^3 isotope is a similar, but inverse, structure, with a net mass of 3 cosmic atomic mass units. A cosmic mass of Z units is observed in the material sector as if it were a mass of 1/Z units. One atomic mass unit = 931 MeV/c^2. The primary rotational mass of an element of atomic number Z is 1862.3 Z MeV/c^2 and the observed mass of a cosmic element of atomic number Z is 1862.3/Z MeV/c^2. When m is expressed in units of atomic weight, this becomes 3724.6/Z MeV/c^2.

Since the c-He^3 isotope has a mass of 3 cosmic atomic weight units, its mass as observed in the material sector is 3724.6/3 = 1242 MeV. But the cosmic isotope, which is rotating with displacement in space, and has a rotational vibration in time (a cosmic gravitational charge) is able to add rotational vibration in space (a material gravitational charge) when it enters the material sector. The c-He^3 isotope adds two such charges, mass 931 MeV/c^2 each. Thus the total mass of c-He^3 is 3104 MeV/c^2.

The observed 3695 MeV/c^2 particle decays to another particle with a reported mass of 3105 MeV/c^2, and a lifetime of 10^{-20} seconds. This second particle can clearly be identified with the c-He^3 atom.

"Thus the observed masses, the lifetime, and the decay pattern all confirm the basis identification of the c-hydrogen particle by Satz." (4)

Other Cosmic Atoms Identified

This report will conclude with a brief mention of more other so-called elementary particles previously identified through the new Reciprocal System of physics and chemistry by Larson (2, 4) and his associates, organized in New Science Advocates, Inc. (11).

All of the recently discovered short-lived particles, known as mesons, are cosmic element isotopes. See the Table below.

The theoretical development indicates that the cosmic ray decay consists of a succession of events similar to the decay of c-H^2 and c-He^3; that is, in each case a neutral material particle is ejected, increasing the cosmic mass of the residual cosmic atom. This process continues until the residual atom reaches a stage where it has a material equivalent to which it can convert. The successive cosmic elements in the decay sequence are listed in the following table, together with their conventional designations as particles. The masses of all particles earlier than the pion include one gravitational charge (931 MeV) each. The (relatively) stable forms of the pion and muon are uncharged, for reasons explained in Reference 4.

	Particle	Mass Calculated MeV/c^2	Mass Observed MeV/c^2	c-Element Isotope
Ω	Omega	1676	1673	c-Li^5
	Xi	1304	1321	c-B^{10}
Σ	Sigma	1197	1197	c-N^{14}
Λ	Lambda	1117	1116	c-Ne^{20}
π	Pion	138	140	c-Si^{27}
μ	Muon	106	106	c-A^{35}

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NUCLEAR FUSION IN HEAVEN AND ON EARTH??

Some private enterprisers, government administrators and high-energy physicists are pushing remorselessly to make fusion work on earth as the only practical substitute for our diminishing oil and coal. Expectation of success in this expensive venture for the taxpayer probably derives mainly from faith in the hypothesis that fusing four nuclear hydrogen atoms to one nuclear helium atom is how the sun generates energy.

Since in the 1930's a few theoretical nuclear physicists began to speculate that this could be the way the sun creates its enormous energy, many more now think they know without any further examination of other rival explanations (1), including fission, that nuclear fusion must be the way the sun does its thing.

Do experiments like the hydrogen bomb, for example, prove that Professor Bethe's solar nuclear fusion hypothesis is correct? Not necessarily. No more than Professor Rutherford's scattering experiments have firmly and finally established that the Rutherford-Bohr nuclear atom model accurately and truthfully represents the essential features of an atom of matter, so that no need to inquire whether this is so now exists. To the many who have learned from the physics and chemistry textbooks of the United States, Europe, the Soviet Union, etc. that every atom of matter has a nucleus and is made from elementary particles (protons, electrons, neutrons, etc.), it probably will come as a surprise that this ain't necessarily so (2, 3).

Now some doubt belatedly is being expressed about the necessary existence of nuclear fusion in the heavens. See, for example, the February 17, 1979, issue of Science News ("Something wrong under the sun," Vol. 115, No. 7, page 103).

We have requested and received permission to reprint the following straightforward and plain expression of the science involved in such doubting from Peter Kor (4).

Reprint from Kor's Kosmos, Issue Number One, January, 1979:

Lost Neutrinos Show Up, But Puzzle Remains

For about ten years, Ray Davis and his associates from Brookhaven have been trying to trap Argon-37 in a specially-constructed tank at the bottom of the Homestake Gold Mine in South Dakota. The argon atoms should have been showing up at the rate of five or six per day if the physical model used to explain how the sun radiates is correct. Until about a year ago, no neutrinos were detected. Now, the tank is detecting argon-37 atoms at a rate that is somewhat below what was expected.

The new results have been greeted with a sigh of relief from solar physicists because the lack of neutrinos was calling into question the fusion process that is thought to be the cause of solar radiation. The euphoria might be short-lived, however. For the fact that there now are neutrinos where just a short time ago there were none implies quite a change in solar behavior. Accounting for this change might require a revision of solar theory as drastic as that required to explain the missing neutrinos.

Researchers have tried to find the answer to the suddenly-appearing neutrinos in unnoticed changes in their detection technique or apparatus, but to no avail. If the search for such a change continues to be fruitless, the following possibilities arise!

1. The recently-detected neutrinos might actually be coming from the sun, in which case physicists would have to account for the sudden change in solar behavior. Does the sun abruptly shift into "high gear" now and then? Why? How do such changes in solar output affect the natural environment and life on earth?

2. The neutrinos might be coming from a source other than the sun, in which case a revision of basic solar physics would be necessary. Is there a flaw in the fusion theory that predicts the production of neutrinos? Or does the lack of neutrinos mean that the sun is not a fusion furnace? If fusion is not the source of solar heat and light, what other processes are possible?

Whatever the answer, the sun is likely to turn out to be a radically-different place than present understanding allows. Readers who were interested in flying saucers in 1950's might remember that the "space brothers" were telling certain "contactees" in those days that the sun was not a super-hot body. According to the "aliens," magnetic and electrical phenomena play a far greater role in solar and terrestrial physics than present scientists think is possible. While the eventual adoption of such ideas would not argue for belief in flying saucers or space beings, it would indicate--once again--how important unfettered thinking is when inquiring into the mysteries of the kosmos.

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RESPONSE TO G. WINDOLPH (See p. 3)

I appreciate what George Windolph is saying but I can't accept his conclusion. It appears to me that G is arbitary--in fact the conventional units used by present day physicists are completely arbitrary, but the fundamental units in the Reciprocal System are not--they are absolute! The main point of my paper was to derive a constant to be used when computations are being made with multiples of natural units. Surely no one disagrees with this.

--R. Satz