

Paper 42 — Energy — Mind and Matter

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Sources for Paper 42, in the order in which they first appear

- (1) Sir James Jeans, M.A., D.Sc., L.L.D., F.R.S., *The Universe Around Us* (New York: The Macmillan Company, 1934)

Note: This source is coded **Jeans1**.

- (2) A. S. **Eddington**, M.A., D.Sc., LL.D., F.R.S., *Stars and Atoms* (Oxford: Clarendon Press, 1927)
- (3) W. F. G. **Swann**, A.R.C.S., M.A., D.Sc., *The Architecture of the Universe* (New York: The Macmillan Company, 1934)
- (4) Ernest William **Barnes**, *Scientific Theory and Religion: The World described by Science and its Spiritual interpretation* (Cambridge: At the University Press, 1933)
- (5) Sir James Jeans, M.A., D.Sc., Sc.D., LL.D., F.R.S., *Through Space and Time* (New York: The Macmillan Company, 1934)

Note: This source is coded **Jeans2**.

- (6) C. W. **Sheppard**, “The Evanescent Mesotron,” *Scientific American* (October 1940)
- (7) J. E. **Turner**, M.A., Ph.D., *Personality and Reality: A Proof of the Real Existence of a Supreme Self in the Universe* (New York: The Macmillan Company, 1926)

Key

- (a) **Green** indicates where a source author first appears, or where he/she reappears.
- (b) **Yellow** highlights most parallelisms.
- (c) **Tan** highlights parallelisms not occurring on the same row, or parallelisms separated by yellowed parallelisms.

- (d) An underlined word or words indicates where the source and the UB writer pointedly differ from each other.
- (e) **Blue** indicates original (or “revealed”) information, or UB-specific terminology and concepts. (What to highlight in this regard is debatable; the highlights are tentative.)
- (f) **Light green** indicates Bible passages or fragments thereof, which are not paralleled in the source text.
- (g) **Red** indicates where Sadler apparently misread or misinterpreted the source text, usually resulting in a statement whose erroneousness would have been recognized at the time the paper was written as well as now.
- (h) **Gold** highlights a word or theme which will be discussed in a later analysis of the chapter.

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PAPER 42 — ENERGY — MIND AND MATTER

42:0.1 The foundation of the universe is material in the sense that energy is the basis of all existence, and pure energy is controlled by the Universal Father. Force, energy, is the one thing which stands as an everlasting monument demonstrating and proving the existence and presence of the Universal Absolute. This vast stream of energy proceeding from the Paradise Presences has never lapsed, never failed; there has never been a break in the infinite upholding.

42:0.2 The manipulation of universe energy is ever in accordance with the personal will and the all-wise mandates of the Universal Father. This personal control of manifested power and circulating energy is modified by the co-ordinate acts and decisions of the Eternal Son, as well as by the united purposes of the Son and the Father executed by the Conjoint Actor. These divine beings act personally and as individuals; they also function in the persons and powers of an almost unlimited number of subordinates, each variously expressive of the eternal and divine purpose in the universe of universes. But these functional and provisional modifications or transmutations of divine power in no way lessen the truth of the statement that all force-energy is under the ultimate control of a personal God resident at the center of all things.

1. PARADISE FORCES AND ENERGIES

42:1.1 The foundation of the universe is material, but the essence of life is spirit. The Father of spirits is also the ancestor of universes; the eternal Father of the Original Son is also the eternity-source of the original pattern, the Isle of Paradise.

42:1.2 Matter—energy—for they are but diverse manifestations of the same cosmic reality, as a universe phenomenon is inherent in the Universal Father.

[And he is before all things, and by him all things consist (Col. 1:17).]

“In him all things consist.”

Matter may appear to manifest inherent energy and to exhibit self-contained powers, but the lines of gravity involved in the energies concerned in all these physical phenomena are derived from, and are dependent on, Paradise. The ultimaton, the first measurable form of energy, has Paradise as its nucleus.¹

42:1.3 There is innate in matter and present in universal space a form of energy not known on Urantia. When this discovery is finally made, then will physicists feel that they have solved, almost at least, the mystery of matter. And so will they have approached one step nearer the Creator; so will they have mastered one more phase of the divine technique; but in no sense will they have found God, neither will they have established the existence of matter or the operation of natural laws apart from the cosmic technique of Paradise and the motivating purpose of the Universal Father.

42:1.4 Subsequent to even still greater progress and further discoveries, after Urantia has advanced immeasurably in comparison with present knowledge, though you should gain control of the energy revolutions of the electrical units of matter to the extent of modifying their physical manifestations—even after all such possible progress,

II: EXPLORING THE ATOM (Jeans1 86)

MOLECULES (Jeans1 88)

In accordance with [the principle known as the “conservation of energy”], energy cannot be created;

all existing energy must have existed from all time, although possibly in some form entirely different from its present form (J1 93).

forever will scientists be powerless to create one atom of matter or to originate one flash of energy

or ever to add to matter that which we call life.

42:1.5 The creation of energy and the bestowal of life are the prerogatives of the Universal Father and his associate Creator personalities. The river of energy and life is a continuous outpouring from the Deities, the universal and united stream of Paradise force going forth to all space. This divine energy pervades all creation. The force organizers initiate those changes and institute those modifications of space-force which eventuate in energy; the power directors transmute energy into matter; thus the material worlds are born. The Life Carriers initiate those processes in dead matter which we call life, material life.

The Morontia Power Supervisors likewise perform throughout the transition realms between the material and the spiritual worlds. The higher spirit Creators inaugurate similar processes in divine forms of energy, and there ensue the higher spirit forms of intelligent life.

42:1.6 Energy proceeds from Paradise, fashioned after the divine order. Energy—pure energy—partakes of the nature of the divine organization; it is fashioned after the similitude of the three Gods embraced in one, as they function at the headquarters of the universe of universes.

[All force-energy originally proceeded from nether Paradise and will eventually return thereto following the completion of its space circuit (11:5.9).]

And all force is circuited in Paradise, comes from the Paradise Presences and returns thereto,

and is in essence a manifestation of the uncaused Cause—the Universal Father;

[All things were made by him; and without him was not any thing made that was made (John 1:3).]

and without the Father would not anything exist that does exist.

42:1.7 Force derived from self-existent Deity is in itself ever existent. Force-energy is imperishable, indestructible;

Energy can exist in a number of forms, and can change about almost endlessly from one form to another,

these manifestations of the Infinite may be subject to unlimited transmutation, endless transformation, and eternal metamorphosis;

but it can never be utterly destroyed (J1 93).

but in no sense or degree, not even to the slightest imaginable extent, could they or ever shall they suffer extinction.

But energy, though springing from the Infinite, is not infinitely manifest; there are outer limits to the presently conceived master universe.

42:1.8 Energy is eternal but not infinite; it ever responds to the all-embracing grasp of Infinity. Forever force and energy go on; having gone out from Paradise, they must return thereto, even if age upon age be required for the completion of the ordained circuit. That which is of Paradise Deity origin can have only a Paradise destination or a Deity destiny.

42:1.9 And all this confirms our belief in a circular, somewhat limited, but orderly and far-flung universe of universes. If this were not true, then evidence of energy depletion at some point would sooner or later appear. All laws, organizations, administration, and the testimony of universe explorers—everything points to the existence of an infinite God but, as yet, a finite universe, a circularity of endless existence, well-nigh limitless but, nevertheless, finite in contrast with infinity.

2. UNIVERSAL NON-SPIRITUAL ENERGY SYSTEMS (Physical Energies)

FOREWORD

VI. ENERGY AND PATTERN (0:6)

42:2.1 It is indeed difficult to find suitable words in the English language whereby to designate and wherewith to describe the various levels of force and energy—

ENERGY we use as an all-inclusive term applied to spiritual, mindal, and material realms (0:6.2).

physical, mindal, or spiritual.

SOURCE OR PARALLEL

We cannot follow your generally accepted definitions of force, energy, and power.

There is such paucity of language that we must assign multiple meanings to these terms (0:6.2).

[contd] *Physical energy* is a term denoting all phases and forms of phenomenal motion, action, and potential (0:6.3).

[contd] In discussing physical-energy manifestations, we generally use the terms *cosmic force, emergent energy, and universe power*. These are often employed as follows:

1. *Cosmic force* embraces all energies deriving from the Unqualified Absolute but which are as yet unresponsive to Paradise gravity (0:6.4-5).

3. *Universe power* includes all forms of energy which, while still responding to Paradise gravity, are directly responsive to linear gravity (0:6.6).

PAPER 11 — THE ETERNAL ISLE OF PARADISE

8. PARADISE GRAVITY (11:8)

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These narratives cannot altogether follow your accepted definitions of force, energy, and power.

There is such paucity of language that we must use these terms in multiple meanings.

In this paper, for example,

the word *energy* is used to denote all phases and forms of phenomenal motion, action, and potential,

while *force* is applied to the pregravity,

and *power* to the postgravity, stages of energy.

42:2.2 I will, however, endeavor to lessen conceptual confusion by suggesting the advisability of adopting the following classification for cosmic force, emergent energy, and universe power—physical energy:

42:2.3 1. *Space potency*.

Space potency ... may be roughly conceived to include all those absolute influences and potentials which emanate from Paradise and constitute the space presence of the Unqualified Absolute (11:8.8).

This is the unquestioned free space presence of the Unqualified Absolute.

The extension of this concept connotes the universe force-space potential inherent in the functional totality of the Unqualified Absolute, while the intension of this concept implies the totality of cosmic reality—universes—which emanated eternitywise from the never-beginning, never-ending, never-moving, never-changing Isle of Paradise.

5. NETHER PARADISE (11:5)

This center consists of three concentric elliptical zones:

42:2.4 The phenomena indigenous to the nether side of Paradise probably embrace three zones of absolute force presence and performance:

the outermost may possibly be identified with the functions of the Unqualified Absolute,

the fulcral zone of the Unqualified Absolute,

The innermost is the focal point of the force-energy activities of Paradise itself;

the zone of the Isle of Paradise itself,

but we are not certain concerning the space functions of the mid-zone.... The function of this mid-area has never been really identified, but it must have to do with reciprocal adjustment between the inner and the outer zones of the force center (11:5.4).

and the intervening zone of certain unidentified equalizing and compensating agencies or functions.

These triconcentric zones are the centrum of the Paradise cycle of cosmic reality.

8. PARADISE GRAVITY (11:8)

Space potency is ... not an actual level of reality, but it is ancestral to all relative functional nonspirit realities—all manifestations of force-energy and the organization of power and matter (11:8.8).

42:2.5 Space potency is a prereality;

it is the domain of the Unqualified Absolute and is responsive only to the personal grasp of the Universal Father, notwithstanding that it is seemingly modifiable by the presence of the Primary Master Force Organizers.

42:2.6 On Uversa, space potency is spoken of as ABSOLUTA.

The numerous forms of cosmic force, physical energy, universe power, and various materializations disclose three general, though not perfectly clear-cut, stages of response to Paradise gravity:

1. *Pregravity Stages (Force)*. This is the first step in the individuation of space potency into the pre-energy forms of cosmic force.

42:2.7 2. *Primordial force*. This represents the first basic change in space potency

and may be one of the nether Paradise functions of the Unqualified Absolute.

We know that the space presence going out from nether Paradise is modified in some manner from that which is incoming. But regardless of any such possible relationships, the openly recognized transmutation of space potency into primordial force is the primary differentiating function of the tension-presence of the living Paradise force organizers.

42:2.8 Passive and potential force becomes active and primordial in response to the resistance afforded by the space presence of the Primary Eventuated Master Force Organizers. Force is now emerging from the exclusive domain of the Unqualified Absolute into the realms of multiple response—response to certain primal motions initiated by the God of Action and thereupon to certain compensating motions emanating from the Universal Absolute.

Primordial force is seemingly reactive to transcendental causation in proportion to absoluteness.

This state is analogous to the concept of the primordial force-charge of space, sometimes called *pure energy*

or *segregata* (11:8.5).

42:2.9 Primordial force is sometimes spoken of as *pure energy*;

on Uversa we refer to it as SEGREGATA.

42:2.10 3. *Emergent energies*. The passive presence of the primary force organizers is sufficient to transform space potency into primordial force, and it is upon such an activated space field that these same force organizers begin their initial and active operations. Primordial force is destined to pass through two distinct phases of transmutation in the realms of energy manifestation before appearing as universe power. These two levels of emerging energy are:

[These force organizers transmute *primordial force* (pre-energy not responsive to direct Paradise gravity) into primary or *puissant energy*,

42:2.11 a. *Puissant energy*. This is the powerful-directional, mass-movemented, mighty-tensioned, and forcible-reacting energy—gigantic energy systems set in motion by the activities of the primary force organizers.

This primary or *puissant energy* is not at first definitely responsive to the Paradise-gravity pull though probably yielding an aggregate-mass or space-directional response to the collective group of absolute influences operative from the nether side of Paradise.

energy transmuting from the exclusive grasp of the Unqualified Absolute to the gravity grasp of the Isle of Paradise

When energy emerges to the level of initial response to the circular and absolute-gravity grasp of Paradise,

SOURCE OR PARALLEL

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They are thereupon succeeded by the associate force organizers,

the primary force organizers give way to the functioning of their secondary associates.

who continue the process of energy transmutation from the primary through the secondary or gravity-energy stage (29:5.5).]

[contd] 2. *Gravity Stages* (Energy).

42:2.12 b. *Gravity energy*.

This modification of the force-charge of space is produced by the action of the Paradise force organizers.

The now-appearing gravity-responding energy carries the potential of universe power and becomes the active ancestor of all universe matter.

This secondary or gravity energy is the product of the energy elaboration resulting from the pressure-presence and the tension-trends set up by the Associate Transcendental Master Force Organizers.

In response to the work of these force manipulators, space-energy rapidly passes from the puissant to the gravity stage,

It signals the appearance of energy systems responsive to the pull of Paradise gravity (11:8.6).

thus becoming directly responsive to the circular grasp of Paradise (absolute) gravity

while disclosing a certain potential for sensitivity to the linear-gravity pull inherent in the soon-appearing material mass of the electronic and the postelectronic stages of energy and matter. Upon the appearance of gravity response, the Associate Master Force Organizers may retire from the energy cyclones of space provided the Universe Power Directors are assignable to that field of action.

We designate these stages *ultimata* (11:8.6).

[contd] 3. *Postgravity Stages (Universe Power)*.

In this stage, energy-matter discloses response to the control of linear gravity (11:8.7).

[The mechanical *controllers* are ... expert in the manipulation of twenty-one of the thirty physical energies of space, constituting the power charge of a superuniverse (29:4.20).]

The physical systems of the superuniverses are mobilized by the Universe Power Directors and their associates. These material organizations are dual in constitution and are known as *gravita* (11:8.7).

42:2.13 We are quite uncertain regarding the exact causes of the early stages of force evolution, but we recognize the intelligent action of the Ultimate in both levels of emergent-energy manifestation.

Puissant and gravity energies, when regarded collectively, are spoken of on Uversa as *ULTIMATA*.

42:2.14 4. *Universe power*.

Space-force has been changed into space-energy and thence into the energy of gravity control.

Thus has physical energy been ripened to that point where it can be directed into channels of power and made to serve the manifold purposes of the universe Creators. This work is carried on by the versatile directors, centers, and controllers of physical energy in the grand universe—the organized and inhabited creations.

These Universe Power Directors assume the more or less complete control of twenty-one of the thirty phases of energy constituting the present energy system of the seven superuniverses.

This domain of power-energy-matter is the realm of the intelligent activities of the Sevenfold, functioning under the time-space overcontrol of the Supreme.

42:2.15 On Uversa we refer to the realm of universe power as *GRAVITA*.

42:2.16 5. *Havona energy*. In concept this narrative has been moving Paradiseward as transmuting space-force has been followed, level by level, to the working level of the energy-power of the universes of time and space. Continuing Paradiseward, there is next encountered a pre-existent phase of energy which is characteristic of the central universe. Here the evolutionary cycle seems to turn back upon itself; energy-power now seems to begin to swing back towards force, but force of a nature very unlike that of space potency and primordial force.

In the central universe these physical systems are threefold organizations

Havona energy systems are not dual; they are triune.

This is the existential energy domain of the Conjoint Actor, functioning in behalf of the Paradise Trinity.

known as *triata* (11:8.7).

42:2.17 On Uversa these energies of Havona are known as TRIATA.

42:2.18 6. *Transcendental energy*. This energy system operates on and from the upper level of Paradise and only in connection with the absonite peoples. On Uversa it is denominated TRANOSTA.

42:2.19 7. *Monota*. Energy is close of kin to divinity when it is Paradise energy. We incline to the belief that monota is the living, nonspirit energy of Paradise—an eternity counterpart of the living, spirit energy of the Original Son—hence the nonspiritual energy system of the Universal Father.

On Paradise, monota and spirit are as one—indistinguishable except by name (116:6.7).

42:2.20 We cannot differentiate the nature of Paradise spirit and Paradise monota; they are apparently alike. They have different names, but you can hardly be told very much about a reality whose spiritual and whose nonspiritual manifestations are distinguishable only by name.

42:2.21 We know that finite creatures can attain the worship experience of the Universal Father through the ministry of God the Sevenfold and the Thought Adjusters, but we doubt that any sub-absolute personality, even power directors, can comprehend the energy infinity of the First Great Source and Center. One thing is certain: If the power directors are conversant with the technique of the metamorphosis of space-force, they do not reveal the secret to the rest of us.

[T]he living power directors, though they are competent to deal with space-energy, do not have the least conception of the origin of the energies they so skillfully and intelligently manipulate (15:4.3).

It is my opinion that they do not fully comprehend the function of the force organizers.

5. *Primary Associators.* ... These beings simply act by their presence. They are in no way exhausted or depleted by this function; they act like living catalytic agents (29:4.32).

42:2.22 These power directors themselves are energy catalyzers; that is, they cause energy to segment, organize, or assemble in unit formation by their presence.

And all this implies that there must be something inherent in energy which causes it thus to function in the presence of these power entities.

The Nebadon Melchizedeks long since denominated the phenomenon of the transmutation of cosmic force into universe power as one of the seven “infinities of divinity.” And that is as far as you will advance on this point during your local universe ascension.

42:2.23 Notwithstanding our inability fully to comprehend the origin, nature, and transmutations of cosmic force, we are fully conversant with all phases of emergent-energy behavior from the times of its direct and unmistakable response to the action of Paradise gravity—about the time of the beginning of the function of the superuniverse power directors.

3. CLASSIFICATION OF MATTER

[The material composition of all suns, dark islands, planets, and satellites, even meteors, is quite identical (41:3.2).]

42:3.1 Matter in all universes, excepting in the central universe, is identical.

Matter in its physical properties depends on the revolutionary rates of its component members, the number and size of the revolving members, their distance from the nuclear body or the space content of matter, as well as on the presence of certain forces as yet undiscovered on Urantia.

42:3.2 In the varied suns, planets, and space bodies there are ten grand divisions of matter:

42:3.3 1. Ultimatic matter—the prime physical units of material existence, the energy particles which go to make up electrons.

[?]

42:3.4 2. Subelectronic matter—the explosive and repellent stage of the solar supergases.

[Note: See 41:4.3, for ‘supergases’.]

42:3.5 3. Electronic matter—the electrical stage of material differentiation—electrons, protons, and various other units entering into the varied constitution of the electronic groups.

[?]

42:3.6 4. Subatomic matter—matter existing extensively in the interior of the hot suns.

[?]

42:3.7 5. Shattered atoms—found in the cooling suns and throughout space.

[Source?]

42:3.8 6. Ionized matter—individual atoms stripped of their outer (chemically active) electrons by electrical, thermal, or X-ray activities and by solvents.

42:3.9 7. Atomic matter—the chemical stage of elemental organization, the component units of molecular or visible matter.

42:3.10 8. The molecular stage of matter—matter as it exists on Urantia in a state of relatively stable materialization under ordinary conditions.

42:3.11 9. Radioactive matter—the disorganizing tendency and activity of the heavier elements under conditions of moderate heat and diminished gravity pressure.

42:3.12 10. Collapsed matter—the relatively stationary matter found in the interior of the cold or dead suns. This form of matter is not really stationary; there is still some ultimatic even electronic activity, but these units are in very close proximity, and their rates of revolution are greatly diminished.

42:3.13 The foregoing classification of matter pertains to its organization rather than to the forms of its appearance to created beings. Neither does it take into account the pre-emergent stages of energy nor the eternal materializations on Paradise and in the central universe.

4. ENERGY AND MATTER TRANSMUTATIONS

[See 42:1.2, above.]

42:4.1 Light, heat, electricity, magnetism, chemism, energy, and matter are—in origin, nature, and destiny—one and the same thing, together with other material realities as yet undiscovered on Urantia.

42:4.2 We do not fully comprehend the almost endless changes to which physical energy may be subject. In one universe it appears as light,² in another as light plus heat, in another as forms of energy unknown on Urantia; in untold millions of years it may reappear as some form of restless, surging electrical energy or magnetic power; and still later on it may again appear in a subsequent universe as some form of variable matter going through a series of metamorphoses, to be followed by its outward physical disappearance in some great cataclysm of the realms. And then, after countless ages and almost endless wandering through numberless universes, again may this same energy re-emerge and many times change its form and potential; and so do these transformations continue through successive ages and throughout countless realms. Thus matter sweeps on, undergoing the transmutations of time but swinging ever true to the circle of eternity;

even if long prevented from returning to its source, it is ever responsive thereto, and it ever proceeds in the path ordained by the Infinite Personality who sent it forth.

42:4.3 The power centers and their associates are much concerned in the work of transmuting the ultimatons into the circuits and revolutions of the electron. These unique beings control and compound power by their skillful manipulation of the basic units of materialized energy, the ultimatons. They are masters of energy as it circulates in this primitive state. In liaison with the physical controllers they are able to effectively control and direct energy even after it has transmuted to the electrical level, the so-called electronic stage. But their range of action is enormously curtailed when electronically organized energy swings into the whirls of the atomic systems. Upon such materialization, these energies fall under the complete grasp of the drawing power of linear gravity.

42:4.4 Gravity acts positively on the power lanes and energy channels of the power centers and the physical controllers,

The directors, centers, and controllers of power have nothing to do with ... physical gravity except to resist its drawing power. Their relation to gravity is wholly negative (29:3.6).

but these beings have only a negative relation to gravity—the exercise of their antigravity endowments.

42:4.5 Throughout all space, cold and other influences are at work creatively organizing ultimatons into electrons.

II: EXPLORING THE ATOM (Jeans186)

MOLECULES (Jeans188)

Heat, whether of a gas, a liquid or a solid, is merely the energy of motion of individual molecules (J1 94).

[See 42:4.7, below.]

II: SOME RECENT INVESTIGATIONS
(Eddington 42)

The Cloud in Space (Eddington 63)

[!]

We generally think of interstellar space as excessively cold. It is quite true that any thermometer placed there would show a temperature only about 3° above the absolute zero—if it were capable of registering so low a reading (E 69).

It is a placid ocean without much relative motion; currents probably exist, but they are of a minor character and do not attain the high speeds commonly possessed by the stars (E 67).

Heat is the measurement of electronic activity,

while cold merely signifies absence of heat—comparative energy rest—

the status of the universal force-charge of space provided neither emergent energy nor organized matter were present and responding to gravity.

42:4.6 Gravity presence and action is what prevents the appearance of the theoretical absolute zero,

for interstellar space does not have the temperature of absolute zero.

Throughout all organized space there are gravity-responding energy currents,

power circuits, and ultimatonic activities, as well as organizing electronic energies.

Practically speaking, space is not empty.

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[*Contrast*: The height of the earth's atmosphere is indicated by the highest auroral streamers—about four hundred miles (58:2.6).]

Even the atmosphere of **Urantia** thins out increasingly until at about three thousand miles it begins to shade off into the average space matter in this section of the universe.

An ordinary region where there is no observable nebulosity is the highest vacuum existing—within the limits of the stellar system at least—but there still remains about **one atom in every cubic inch**.

The most nearly empty space known in **Nebadon** would yield about one hundred ultimatons—the equivalent of **one electron—in each cubic inch**.

It depends on our point of view whether we regard this as an amazing fullness or an amazing emptiness of space.

Such scarcity of matter is regarded as practically empty space.

Perhaps it is the fullness that impresses us most. The atom can find no place of real solitude within the system of stars; wherever it goes it can nod to a colleague not more than an inch away (E 64-65).

42:4.7 Temperature—heat and cold—is secondary only to gravity in the realms of energy and matter evolution. **Ultimatons are humbly obedient to temperature extremes**.

[Gravity and absence of heat (cold) organize and hold matter together;

Low temperatures favor certain forms of electronic construction and atomic assembly,

heat and antigravity disrupt matter and dissipate energy (15:8.10).]

while high temperatures facilitate all sorts of atomic breakup and material disintegration.

42:4.8 When subjected to the heat and pressure of certain internal solar states, all but the most primitive associations of matter may be broken up. Heat can thus largely overcome gravity stability. **But no known solar heat or pressure can convert ultimatons back into puissant energy**.

[*Compare:* Spectroscopic evidence has led to the belief that there are, on the average, in interstellar space about one or two atoms per cubic inch. However, Millikan supposes that, in addition to these atoms, there are also free electrons and protons, and that occasionally a few of these come together and build up an atom (Swann 244).]

[The living power directors and force organizers are the secret of the special control and intelligent direction of the endless metamorphoses of universe making, unmaking, and remaking (15:8.10).]

III: THE NATURE OF MATTER. DEVELOPMENT OF ATOMIC THEORY (Swann 44)

In fact, the increase of mass is equal to the increase of energy divided by the square of the velocity of light.

We have come to extrapolate this idea beyond the region which gave it birth, and to think even of the mass which a body possesses when at rest as symbolic of and proportional to the amount of work, in the dynamical sense, which has to be done

42:4.9 The blazing suns can transform matter into various forms of energy, but the dark worlds and all outer space can slow down electronic and ultimatic activity to the point of converting these energies into the matter of the realms.

Certain electronic associations of a close nature, as well as many of the basic associations of nuclear matter, are formed in the exceedingly low temperatures of open space, being later augmented by association with larger accretions of materializing energy.

42:4.10 Throughout all of this never-ending metamorphosis of energy and matter we must reckon with the influence of gravity pressure and with the antigravity behavior of the ultimatic energies under certain conditions of temperature, velocity, and revolution. Temperature, energy currents, distance,

and the presence of the living force organizers and the power directors also have a bearing on all transmutation phenomena of energy and matter.

42:4.11 The increase of mass in matter is equal to the increase of energy divided by the square of the velocity of light.

In a dynamic sense the work which resting matter can perform

in bringing its parts together from an infinite distance

against the forces

which they exert on one another (S 90-91).

III: EXPLORING IN TIME (Jeans1 141)

THE AGE OF THE EARTH (Jeans1 142)

[?]

But, by a fortunate chance, lead which has been formed by the disintegration of uranium is just a bit different from ordinary lead; the latter has an atomic weight of 207.2, while the former is of atomic weight only 206.0 (J1 145).

II: EXPLORING THE ATOM (Jeans1 86)

QUANTUM THEORY (Jeans1 115)

is equal to the energy expended

in bringing its parts together from Paradise

minus the resistance of the forces

overcome in transit

and the attraction exerted by the parts of matter on one another.

42:4.12 The existence of pre-electronic forms of matter is indicated by the two atomic weights of lead.

The lead of original formation weighs slightly more than that produced through uranium disintegration by way of radium emanations;

and this difference in atomic weight represents the actual loss of energy in the atomic breakup.

42:4.13 The relative integrity of matter is assured by the fact that

If we know all the orbits which are possible for an atom of any type, it is easy to calculate the changes of energy involved in the various transitions between them. As each transition **absorbs or releases exactly** one quantum of energy,

we can immediately deduce the frequencies of the light emitted or absorbed in these transitions (J1 123).

By prohibiting any emission of radiation except by complete **quanta**, and by prohibiting any emission at all when there are no quanta available for dissipation, the quantum theory succeeds in **keeping the universe in existence as a going concern** (J1 127-28).

THE MECHANICAL EFFECTS OF RADIATION
(Jeans1 129)

[?]

When an atom discharges its reservoir of stored energy, the light it emits has necessarily the same wave-length as the light which it absorbed in originally storing up this energy; the two quanta of energy being equal, their wave-lengths are the same. It follows that the light emitted by any electrical structure will also have a wave-length of

energy can be **absorbed or released** only in those **exact** amounts which Urantia scientists have designated **quanta**.

This wise provision in the material realms serves to **maintain the universes as going concerns**.

42:4.14 The quantity of energy taken in or given out when electronic or other positions are shifted is always a "quantum" or some multiple thereof, but the vibratory or wavelike behavior of such units of energy is wholly determined by the **dimensions of the material structures** concerned.

Such wavelike energy ripples are

about 860 times the dimensions of the structure (J1 130).

860 times the diameters of the ultimatons, electrons, atoms, or other units thus performing.

IX: THE QUANTUM THEORY AND RÖNTGEN RAYS (Barnes 261)

§216. *The interference of light.* (Barnes 290)

Interference rests upon the fact that waves of water (and therefore of light, if light be a wave phenomenon) may be superposed one on another: it was first clearly enunciated by Thomas Young (1773-1829) in the year 1801 (B 290).

If two crests come together we shall get a wave of double the maximum height of the original waves (B 290).

When a crest and a trough coincide the surface of the water is undisturbed (B 290).

The never-ending confusion attending the observation of the wave mechanics of quantum behavior is due to

the super-imposition of energy waves:

Two crests can combine to make a double-height crest,

while a crest and a trough may combine, thus producing mutual cancellation.

5 . W A V E - E N E R G Y MANIFESTATIONS

II: THE AIR (Jeans2 48)

[?]

42:5.1 In the superuniverse of Orvonton there are one hundred octaves of wave energy.

Of these one hundred groups of energy manifestations,

Although we can only see one octave of radiation with our eyes, scientists have found the means of studying as many as sixty-four octaves (J2 55).

sixty-four are wholly or partially recognized on Urantia.

VII: THE STARS (Jeans2 173)

We have already seen that the sun gives out light of all wave-lengths, although only about four octaves of light are given out in large amounts, and only one octave reaches us in abundance (J2 185).

II: THE AIR (Jeans2 48)

[contd from two rows above] Their scale of radiation is like a vast piano with sixty-four octaves, to all of which we are deaf except for the one octave of visible light (cf. fig. 29)

Immediately above this one octave, going treblewards, we come to ultra-violet radiation (J2 55).

Then, about ten octaves above the octave of visible light, we come to X-rays (J2 56).

Above all these—very high indeed in the treble—come the γ -rays which are emitted by radium;

and finally, thirty-two octaves above the octave of visible light, come certain of the constituents of cosmic rays, which can pass through many yards of lead (J2 56).

The sun's rays constitute four octaves in the superuniverse scale,

the visible rays embracing a single octave,

number forty-six in this series.

The ultraviolet group comes next,

while ten octaves up are the X rays,

followed by the Y rays of radium.

[Note: Changed to 'gamma rays' in the second edition.]

Thirty-two octaves above the visible light of the sun are the outer-space energy rays

so frequently commingled with their associated highly energized minute particles of matter.

[contd] In the other direction—down towards the bass—we come first to the **infra-red radiation** we have already described; the heat radiated from a hot flat-iron is about three octaves down, and that from a kettle of boiling water about four (J2 56).

Far below these—about **thirty octaves** below visible light—we come to waves which are more than a thousand million times as long as the waves of visible light. These are of special interest and importance, being nothing other than the waves used for **radio transmission** (J2 56).

I: THE INTERIOR OF A STAR (**Eddington** 9)

Temperature in the Interior (Eddington 11)

Besides the atoms rushing to and fro in all directions we have in the interior of a star great quantities of ether waves also rushing in all directions. **Ether waves** are called by different names according to their wave-length (E 15).

Next downward from visible sunlight appear the **infrared rays**,

and **thirty octaves** below are the **radio transmission** group.

42:5.2 Wavelike energy manifestations—from the standpoint of twentieth-century Urantia scientific enlightenment—may be classified into the following ten groups:

42:5.3 1. *Infraultimatonic rays*—the borderland revolutions of ultimatons as they begin to assume definite form. This is the first stage of emergent energy in which wavelike phenomena can be detected and measured.

42:5.4 2. *Ultimatonic rays*. The assembly of energy into the minute spheres of the ultimatons occasions vibrations in the content of space which are discernible and measurable.

And long before physicists ever discover the ultimatons, they will undoubtedly detect the phenomena of these rays as they shower in upon Urantia. These short and powerful rays represent the initial activity of the ultimatons as they are slowed down to that point where they veer towards the electronic organization of matter. As the ultimatons aggregate into electrons, condensation occurs with a consequent storage of energy.

42:5.5 3. *The short space rays.*

Probably the **shortest of all** are the rays constituting the very penetrating radiation found in our atmosphere, which according to the investigations of Kohlhörster and Millikan are believed to reach us from interstellar space (E 15).

These are the **shortest of all** purely electronic vibrations and represent the preatomic stage of this form of matter.

These rays require extraordinarily high or low temperatures for their production.

II: THE DAWN AND DEVELOPMENT OF THE MODERN ERA (Swann 27)

In the opinion of some, these [cosmic] rays are flashes of energy emitted in the **birth of atoms** in interstellar space. In the words of Dr. Millikan they are the birth cries of the atoms (S 41).

There are two sorts of these space rays:

one attendant upon the **birth of atoms**

VI: THE FATE OF THE UNIVERSE (Swann 232)

[I]t has been suggested by Jeans that the cosmic rays are actually produced by the mutual annihilation of protons and electrons ... (S 243).

and the other indicative of atomic disruption.

III: THE AGE OF THE STARS
(Eddington 85)

There is some evidence that [the cosmic radiation] varies according to the position of the Milky Way, most radiation being received when the greatest extension of the stellar system is overhead (E 104).

[?]

III: THE NATURE OF MATTER. THE DEVELOPMENT OF ATOMIC THEORY (Swann 44)

In the process of passing from any one orbit to an orbit of lower energy,

the surplus energy is given up in the form of what is called a "Quantum" of radiation of a perfectly definite wavelength characteristic of the energy change which has taken place (S 97).

[?]

[Source?]

They emanate in the largest quantities from the densest plane of the super-universe, the Milky Way,

which is also the densest plane of the outer universes.

42:5.6 4. *The electronic stage.* This stage of energy is the basis of all materialization in the seven super-universes.

When electrons pass from higher to lower energy levels of orbital revolution,

quanta are always given off.

Orbital shifting of electrons results in the ejection or the absorption of very definite and uniform measurable particles of light-energy,

while the individual electron always gives up a particle of light-energy when subjected to collision.

Wavelike energy manifestations also attend upon the performances of the positive bodies and the other members of the electronic stage.

I: THE INTERIOR OF A STAR
(Eddington 9)

Temperature in the Interior (Eddington 11)

The longest are the Hertzian waves used in broadcasting; then come the infra-red heat waves; next come waves of ordinary visible light; then ultra-violet photographic or chemical rays; then X-rays; then Gamma rays emitted by radio-active substances (E 15).

The ether waves inside a star belong to the division called X-rays.

They are the same as the X-rays produced artificially in an X-ray tube.

[An electrically charged body has position in space and is surrounded by an electrical field... Electric charges in motion constitute an electric current which excites a magnetic field (Richard Edwin Lee, *Man, the Universe-Builder: Backgrounds and Foundations of the Scientific Technique* [1935], p. 400).]

[Whenever a moving electron is stopped, we believe that an electromagnetic disturbance [*i.e.* an impulse X-ray] arises which travels through space with the velocity of light (Barnes 285).]

On the average they are 'softer' (*i.e.* longer) than the X-rays used in hospitals,

but not softer than some of those used in laboratory experiments (E 16).

42:5.7 5. Gamma rays—those emanations which characterize the spontaneous dissociation of atomic matter.

The best illustration of this form of electronic activity is in the phenomena associated with radium disintegration.

42:5.8 6. The X-ray group. The next step in the slowing down of the electron yields the various forms of solar X rays

together with artificially generated X rays.

The electronic charge creates an electric field; movement gives rise to an electric current; the current produces a magnetic field.

When an electron is suddenly stopped, the resultant electromagnetic commotion produces the X ray; the X ray is that disturbance.

The solar X rays are identical with those which are mechanically generated for exploring the interior of the human body except that they are a trifle longer.

42:5.9 7. *The ultraviolet* or chemical rays of sunlight and the various mechanical productions.

42:5.10 8. *The white light*—the whole visible light of the suns.

42:5.11 9. *Infrared rays*—the slowing down of electronic activity still nearer the stage of appreciable heat.

42:5.12 10. *Hertzian waves*—those energies utilized on Urantia for broadcasting.

42:5.13 Of all these ten phases of wavelike energy activity,

These are all fundamentally the same but correspond to different octaves. The eye is attuned to only one octave, so that most of them are invisible; but essentially they are of the same nature as visible light (E 15-16).

the human eye can react to just one octave, the whole light of ordinary sunlight.

42:5.14 The so-called ether is merely a collective name to designate a group of force and energy activities occurring in space.

Ultimatons, electrons, and other mass aggregations of energy are uniform particles of matter, and in their transit through space they really proceed in direct lines. Light and all other forms of recognizable energy manifestations consist of a succession of definite energy particles which proceed in direct lines except as modified by gravity and other intervening forces. That these processions of energy particles appear as wave phenomena when subjected to certain observations is due to the resistance of the undifferentiated force blanket of all space,

[See 41:5.6-7.]

the hypothetical ether, and to the intergravity tension of the associated aggregations of matter. The spacing of the particle-intervals of matter, together with the initial velocity of the energy beams, establishes the undulatory appearance of many forms of energy-matter.

42:5.15 The excitation of the content of space produces a wavelike reaction to the passage of rapidly moving particles of matter, just as the passage of a ship through water initiates waves of varying amplitude and interval.

42:5.16 Primordial-force behavior does give rise to phenomena which are in many ways analogous to your postulated ether. Space is not empty; the spheres of all space whirl and plunge on through a vast ocean of outspread force-energy; neither is the space content of an atom empty.

III: THE NATURE OF MATTER. DEVELOPMENT OF ATOMIC THOERY (Swann 44)

The ordinary laws of electricity and magnetism demand that an electron revolving around a nucleus in this way should rapidly radiate away energy into space, should approach the nucleus, and eventually fall right into it. The situation would be exactly analogous to that which we should have in the solar system if the planets had some way of losing their energy of motion as they traversed their orbits. [*contd next pg.*]

Nevertheless there is no ether,

For example, if the hypothetical aether presented a viscous resistance to the passage of the planets through it, we should have a situation of this kind. Our earth would gradually approach the sun as it moved around it, and it would only be a matter of time before it fell right into it (S 74).

and the very absence of this hypothetical ether enables the inhabited planet to escape falling into the sun

and the encircling electron to resist falling into the nucleus.

6 . U L T I M A T O N S , ELECTRONS, AND ATOMS

42:6.1 While the space charge of universal force is homogeneous and undifferentiated, the organization of evolved energy into matter entails the concentration of energy into discrete masses of definite dimensions and established weight—precise gravity reaction.

42:6.2 Local or linear gravity becomes fully operative with the appearance of the atomic organization of matter. Preatomic matter becomes slightly gravity responsive when activated by X ray and other similar energies, but no measurable linear-gravity pull is exerted on free, unattached, and uncharged electronic-energy particles or on unassociated ultimatons.

42:6.3 Ultimatons function by mutual attraction, responding only to the circular Paradise-gravity pull. Without linear-gravity response they are thus held in the universal space drift.

Ultimatons are capable of accelerating revolutionary velocity to the point of partial antigravity behavior, but they cannot, independent of force organizers or power directors, attain the critical escape velocity of deindividuation, return to the puissant-energy stage.

[See 15:8.6, 41:7.15, and 42:4.8, above.]

In nature, ultimatons escape the status of physical existence only when participating in the terminal disruption of a cooled-off and dying sun.

42:6.4 The ultimatons, unknown on Urantia, slow down through many phases of physical activity before they attain the revolutionary-energy prerequisites to electronic organization. Ultimatons have three varieties of motion: mutual resistance to cosmic force, individual revolutions of antigravity potential, and the intraelectronic positions of the one hundred mutually interassociated ultimatons.

42:6.5 Mutual attraction holds one hundred ultimatons together in the constitution of the electron; and there are never more nor less than one hundred ultimatons in a typical electron. The loss of one or more ultimatons destroys typical electronic identity, thus bringing into existence one of the ten modified forms of the electron.

42:6.6 Ultimatons do not describe orbits or whirl about in circuits within the electrons, but they do spread or cluster in accordance with their axial revolutionary velocities, thus determining the differential electronic dimensions. This same ultimatic velocity of axial revolution also determines the negative or positive reactions of the several types of electronic units.

The entire segregation and grouping of electronic matter, together with the electric differentiation of negative and positive bodies of energy-matter, result from these various functions of the component ultimatonic interassociation.

I: THE INTERIOR OF A STAR
(Eddington 9)

Each atom is about one hundred-millionth of an inch in diameter (E 9).

The electron is the lightest thing known, weighing no more than 1/1,840 of the lightest atom (E 16).

II: EXPLORING THE ATOM (Jeans1 86)

ATOMIC NUCLEI (Jeans1 110)

Each proton carries a positive charge of electricity exactly equal in amount to the negative charge carried by an electron,

[The 'nucleus,' although it generally weighs 3000 or 4000 times as much as all the electrons in the atom together, is at most comparable in size with, and may be even smaller than, a single electron (J1 102).]

but has about 1840 times the weight of the electron. Protons are supposed to be identical with the nucleus of the hydrogen atom, all other nuclei being composite structures in which both protons and electrons are closely packed together (J1 112).

42:6.7 Each atom is a trifle over 1/100,000,000th of an inch in diameter,

while an electron

weighs a little less than 1/2,000th of the smallest atom, hydrogen. [Note: Changed in second edition to 'a little more'.]

The positive proton,

characteristic of the atomic nucleus,

while it may be no larger than a negative electron,

weighs from two to three thousand times more. [Note: Changed in second edition to 'almost two thousand times more'.]

III: THE NATURE OF MATTER.
DEVELOPMENT OF ATOMIC
THEORY (Swann 44)

The mass of the electron is so small that if you should magnify all masses so that the electron attains a mass of one tenth of an ounce,

that one tenth of an ounce would, on the same scale of magnification,

become as heavy as the earth (S 44).

[contd] Then, we have the proton—the fundamental unit of positive charge—

a thing 1800 times as heavy as the electron,

but 1800 times smaller in size,

so that if you should magnify it to the size of a pin's head,

that pin's head would, on the same scale of magnification, attain a diameter equal to the diameter of the earth's orbit around the sun (S 44-45).

One of the earliest and most alluring temptations was to think of the atom as a little solar system,

with a central nucleus,

42:6.8 If the mass of matter should be magnified until that of an electron equaled one tenth of an ounce,

then were size to be proportionately magnified,

the volume of such an electron would become as large as that of the earth.

If the volume of a proton—

eighteen hundred times as heavy as an electron—

should be magnified to the size of the head of a pin,

then, in comparison, a pin's head would attain a diameter equal to that of the earth's orbit around the sun.

7. ATOMIC MATTER

42:7.1 The formation of all matter is on the order of the solar system.

There is at the center of every minute universe of energy a relatively stable, comparatively stationary, nuclear portion of material existence.

This central unit is endowed with a threefold possibility of manifestation.

SOURCE OR PARALLEL

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and with electrons revolving around that nucleus

Surrounding this energy center there whirl, in endless profusion but in fluctuating circuits, the energy units

as the planets revolve around the sun (S 73-74).

which are faintly comparable to the planets encircling the sun of some starry group like your own solar system.

I: THE INTERIOR OF A STAR (Eddington 9)

Within the atom are the much smaller electrons pursuing orbits, like planets round the sun,

42:7.2 Within the atom the electrons revolve

about the central proton³

in a space which relatively to their size is no less roomy than the solar system (E 9).

with about the same comparative room the planets have as they revolve about the sun in the space of the solar system.

[?]

There is the same relative distance, in comparison with actual size, between the atomic nucleus and the inner electronic circuit as exists between the inner planet, Mercury, and your sun.

II: EXPLORING THE ATOM (Jeans1 86)

ATOMS (Jeans1 97)

[?]

42:7.3 The electronic axial revolutions

The speeds with which these electrons fly round their tiny orbits are terrific (J1 102).

and their orbital velocities about the atomic nucleus are both beyond the human imagination,

not to mention the velocities of their component ultimatons.

III: THE NATURE OF MATTER. THE DEVELOPMENT OF ATOMIC THEORY (Swann 44)

Now, when one of these [radium] atoms dies and gives rise to the next in succession, one or all of three types of radiation may be emitted. First, we have the alpha particle, a positively charged atom of helium moving with a velocity of about 12,000 miles per second.

Then we have the beta particle, which is an ordinary electron travelling with the speed comparable with that of light, a speed of 186,000 miles per second; and, finally we have the gamma rays ... (S 67-68).

[Note: An element is distinguished from other elements by the number of protons in its nucleus. Normally, the number of protons equals the number of electrons, but an atom may lose electrons by ionization and remain the same element.]

The positive particles of radium fly off into space at the rate of ten thousand miles a second,

while the negative particles attain a velocity approximating that of light.

42:7.4 The local universes are of decimal construction. There are just one hundred distinguishable atomic materializations of space-energy in a dual universe; that is the maximum possible organization of matter in Nebadon.

These one hundred forms of matter consist of a regular series in which from one to one hundred electrons revolve around a central and relatively compact nucleus.

It is this orderly and dependable association of various energies that constitutes matter.

42:7.5 Not every world will show one hundred recognizable elements at the surface, but they are somewhere present, have been present, or are in process of evolution. Conditions surrounding the origin and subsequent evolution of a planet determine how many of the one hundred atomic types will be observable. The heavier atoms are not found on the surface of many worlds.

Even on Urantia the known heavier elements manifest a tendency to fly to pieces, as is illustrated by radium behavior.

[*Note:* The stability of an atomic nucleus is determined not by the number of neutrons but by the neutron-proton ratio. “The neutron–proton ratio (N/Z ratio or nuclear ratio) of an atomic nucleus is the ratio of its number of neutrons to its number of protons. Among stable nuclei and naturally occurring nuclei, this ratio generally increases with increasing atomic number” (“Neutron-proton ratio,” Wikipedia).] [*Note:* A hydrogen atom has no neutrons.]

42:7.6 Stability of the atom depends on the number of electrically inactive neutrons in the central body.⁴

VII: THE ELECTRICAL THEORY OF MATTER (Barnes 193)

§163. *Chemical combination.* (Barnes 219)

[contd] Bohr’s theory is, in part, built upon the assumption, confirmed by much experimental evidence, that the chemical properties of an element depend almost entirely on its outer shell of electrons (B 219).

Chemical behavior is wholly dependent on the activity of the freely revolving electrons.

42:7.7 In Orvonton it has never been possible naturally to assemble over one hundred orbital electrons in one atomic system.

[*Contrast:* In chemistry, a synthetic element is a[n] element that does not occur naturally on Earth, and can only be created artificially. So far, 24 synthetic elements have been created (those with atomic numbers 95–118). All are unstable, decaying with half-lives ranging from 15.6 million years to a few hundred microseconds (“Chemical Element,” Wikipedia).]

When one hundred and one have been artificially introduced into the orbital field, the result has always been the instantaneous disruption [*Note:* Changed to ‘well-nigh instaneous disruption’ in the second edition.] of the central proton with the wild dispersion of the electrons and other liberated energies.⁵

II: EXPLORING THE ATOM (Jeans1 86)

QUANTUM THEORY (Jeans1 115)

[*Note:* In 42:7.8-9 Sadler ignores Jeans' information on pp. 126-27 about electron shells (K-ring, L-ring, M-ring, etc.). "The outer ten electrons of the larger atoms" makes no sense in terms of electron shells, as an electron shell never contains ten or a multiple of ten electrons.]

Without understanding the underlying principle, we can accept the fact that two electrons not only cannot occupy the same space, but cannot even occupy the same orbit. It is as though in some way the electron spread itself out so as to occupy the whole of its orbit, thus leaving room for no other (J1 125).

As we pass to orbits of higher energy, and so of greater diameter, the indeterminateness gradually assumes a different form, and finally becomes of but little importance. Whatever form the electron may assume while it is describing a little orbit near the nucleus, by the time it is describing a very big orbit far out it has become a plain material particle charged with electricity (J1 125-26).

42:7.8 While atoms may contain from one to one hundred orbital electrons, only the outer ten electrons of the larger atoms revolve about the central nucleus as distinct and discrete bodies, intactly and compactly swinging around on precise and definite orbits. The thirty electrons nearest the center are difficult of observation or detection as separate and organized bodies.

This same comparative ratio of electronic behavior in relation to nuclear proximity obtains in all atoms regardless of the number of electrons embraced. The nearer the nucleus, the less there is of electronic individuality.

The wavelike energy extension of an electron may so spread out as to occupy the whole of the lesser atomic orbits;

especially is this true of the electrons nearest the atomic nucleus.

SOURCE OR PARALLEL

[*Note:* As explained above, electron shells have nothing in common with the UB's decimally constituted "energy zones". See "Electron shell" in Wikipedia.]

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42:7.9 The thirty innermost orbital electrons have individuality, but their energy systems tend to intermingle, extending from electron to electron and well-nigh from orbit to orbit. The next thirty electrons constitute the second family, or energy zone, and are of advancing individuality, bodies of matter exerting a more complete control over their attendant energy systems. The next thirty electrons, the third energy zone, are still more individualized and circulate in more distinct and definite orbits. The last ten electrons, present in only the ten heaviest elements, are possessed of the dignity of independence and are, therefore, able to escape more or less freely from the control of the mother nucleus. With a minimum variation in temperature and pressure, the members of this fourth and outermost group of electrons will escape from the grasp of the central nucleus, as is illustrated by the spontaneous disruption of uranium and kindred elements.

III: THE NATURE OF MATTER.
DEVELOPMENT OF ATOMIC
THEORY (Swann 44)

[!]

42:7.10 The first twenty-seven atoms, those containing from one to twenty-seven orbital electrons, are more easy of comprehension than the rest.

The problem of what takes place when two bodies are thrown into space and allowed to move under their mutual influence according to the law of gravitation, or to any other law following the inverse square form was solved by Newton; but, the problem of what happens when even three bodies are left to their mutual influence has never received a complete solution in the ordinary sense of the word. You can well imagine, therefore, the difficulties besetting the mathematician when he is confronted with the problem of the motion of an electron in an **iron** atom, where there are **twenty-eight**⁶ electrons, all having a say in each other's doings (S 98).

From **twenty-eight** upward we encounter more and more of the unpredictability of the supposed presence of the Unqualified Absolute.

But some of this electronic unpredictability is due to differential ultimatic axial revolutionary velocities and to the unexplained "huddling" proclivity of ultimats.

Other influences—physical, electrical, magnetic, and gravitational—also operate to produce variable electronic behavior.

IV: MODERN ATOMIC THEORIES (Swann 117)

Atoms therefore are similar to persons as to predictability.

The radical departure in our system of thought ... consists in our replacing the *certainty* of law prediction by a prediction of mere chance. It is the kind of prediction that insurance companies make on your life. When they calculate that your expectancy of life at the age of forty is, say, twenty-eight years, that does not mean that if you live to seventy-five all their calculations are wrong. It simply means that in the case of a large number of people forty years old, the average life expectancy is twenty-eight years more.

The insurance company tells you nothing about your own particular life other than to give you a warning (S 161-62).

Statisticians may announce laws governing a large number of either atoms or persons

but not for a single individual atom or person.

8. ATOMIC COHESION

42:8.1 While gravity is one of several factors concerned in holding together a tiny atomic energy system, there is also present in and among these basic physical units a powerful and unknown energy, the secret of their basic constitution and ultimate behavior, a force which remains to be discovered on Urantia. This universal influence permeates all the space embraced within this tiny energy organization.

42:8.2 The interelectronic space of an atom is not empty. Throughout an atom this interelectronic space is activated by wavelike manifestations which are perfectly synchronized with electronic velocity and ultimatonic revolutions. This force is not wholly dominated by your recognized laws of positive and negative attraction; its behavior is therefore sometimes unpredictable. This unnamed influence seems to be a space-force reaction of the Unqualified Absolute.

“THE EVANESCENT MESOTRON”
(Sheppard 202)

[contd] One day in 1937 physicists studying the cosmic rays discovered another new sub-atomic particle. This new physical specimen they named the mesotron, sometimes meson.

It was about 180 times as heavy as an electron and carried the same charge (SA 202).

The thing which had to be explained [by theoretical physicists, before the mid 1930s] was the nature of these sticking forces which caused the nucleus to be held so powerfully against the natural electrical repulsion of the positively, and, therefore, like-charged, protons. This glue-like force behaves in such a strange manner that it cannot be an electrical or a gravitational attraction but must be something new (SA 202).

42:8.3 The charged protons and the uncharged neutrons of the nucleus of the atom are held together by the reciprocating function of

the mesotron,

a particle of matter 180 times as heavy as the electron.

Without this arrangement the electric charge carried by the protons would be disruptive of the atomic nucleus.

42:8.4 As atoms are constituted,

neither electric nor gravitational forces could hold the nucleus together.

The integrity of the nucleus is maintained by the reciprocal cohering function of the mesotron, which is able to hold charged and uncharged particles together because of superior force-mass power

and by the further function of causing

It soon become evident from theory that the force which a neutron and proton exerted on one another could be explained only if the two particles were constantly exchanging places (SA 202).

In 1935, this idea [of photons acting as energy conveyors between two electric charges] suggested to the Japanese physicist, Yukawa, that nuclear forces also possessed “carriers.” But, unlike electrical forces, the nuclear forces require the proton and neutron to change places, as stated before. Yukawa explained this by saying that, in this case, the carrier was a charged particle.... This assumption of a continual stream of carriers going back and forth between protons and neutrons would account for the interchange forces (SA 202).

If [the carrier] were positively charged it could leave a proton, changing it to a neutron; and arriving at a neutron, it would change it to a proton (Figure 1, left). If the carrier particle were negative, it would do the opposite (Figure 1, right) (SA 202).

The new particle soon showed itself to be important for a second reason.

protons and neutrons constantly to change places.

The mesotron causes the electric charge of the nuclear particles to be incessantly tossed back and forth between protons and neutrons.

At one infinitesimal part of a second a given nuclear particle is

a charged proton and the next an uncharged neutron.

And these alternations of energy status are so unbelievably rapid that the electric charge is deprived of all opportunity to function as a disruptive influence. Thus does the mesotron function as an “energy-carrier” particle which mightily contributes to the nuclear stability of the atom.

42:8.5 The presence and function of the mesotron also explains another atomic riddle.

There are certain **radio-active** substances, either in nature or artificially made in the laboratory by nuclear transmutations, which eject electrons, either positive or negative. It is known that, when a nucleus shoots such a particle out, a certain definite amount of energy is let loose. Unfortunately, however, if one examines the electron after it is emitted, one finds that it usually doesn't have the correct amount of energy, but a good deal less.

[See three rows down.]

Scientists therefore have been forced to say that the missing part of the energy has been carried away by a phantom **particle which has no charge and practically no mass**—the one marked ? in Figure 2. This particle has been named the neutrino, but it has never been detected (SA 202).

The suggestion soon was made that the mesotron is not a stable particle but that it disintegrates into an **electron** and a neutrino. Its extra mass would then be converted into energy, in accordance with the theory of relativity, and carried away by the neutrino (SA 203).

All the foregoing work has shown that the mesotron is just about what physicists have been crying for. It casts new light on the nature of the nuclear forces, explains the emission of electrons from radioactive nuclei, and strengthens one's belief in the existence of that phantom particle, the neutrino (SA 203).

When atoms perform **radioactively**, they emit far more energy than would be expected.

This excess of radiation is derived from the breaking up of the mesotron "energy carrier," which thereby becomes a mere **electron**.

The mesotronic disintegration is also accompanied by the emission of

certain **small uncharged particles**.

42:8.6 The mesotron explains certain cohesive properties of the atomic nucleus,

[contd] But there still are a few unanswered questions. It is known that forces between **neutrons and neutrons**, and between **protons and protons**, are almost as strong as those between protons and neutrons. This indicates that there must be neutral mesotrons as well as the charged ones already discovered. Certain meager evidence which has been brought forward to prove the existence of such particles has been felt to be entirely inconclusive (SA 203).

but it does not account for the cohesion of **proton to proton** nor for the adhesion of **neutron to neutron**.

The paradoxical and powerful force of atomic cohesive integrity is a form of energy as yet undiscovered on Urantia.

[contd] Why are mesotrons not found in the laboratory? It is known that it takes about 100,000,000 volts to make a free mesotron. The only place where such energies now exist is in the **cosmic rays** (SA 203).

42:8.7 These mesotrons are found abundantly in the **space rays** which so incessantly impinge upon your planet.

9. NATURAL PHILOSOPHY

I: MEDIAEVAL AND MODERN DOGMAS IN NATURAL PHILOSOPHY (Swann 1)

But the theological doctrines of ancient philosophy were not the sole offenders in the matter of participation in the drama of nature without the possession of working content.

42:9.1 Religion is not alone dogmatic;

natural philosophy equally tends to **dogmatize**.

Thus, in arguing against Galileo's discovery of the satellites of Jupiter, a Florentine astronomer of eminence, Francesco Sizzi, expressed himself thus:

When a renowned **religious teacher** reasoned that

“There are seven windows in the head, two nostrils, two eyes, two ears, and a mouth; so, in the heavens there are two favorable stars, two unpropitious, two luminaries, and Mercury alone undecided and indifferent. From which, and many other similar phenomena of nature, such as the seven metals, etc., which it were tedious to enumerate, we gather that the number of planets is necessarily seven...” (S 3).

As a matter of fact, he might have carried the story of his sevens a little further: and, if he had known that there were chemical elements and had predicted something about the reoccurrence of their properties after periods of seven, when arranged in order of their atomic weights,

he might have hit upon a truth there also (S 4).

[The number ten — the decimal system — is inherent in the physical universe but not in the spiritual. The domain of life is characterized by three, seven, and twelve or by multiples and combinations of these basic numbers (36:2.11).]

the number seven was fundamental to nature because there are seven openings in the human head,

if he had known more of chemistry,

he might have advocated such a belief founded on a true phenomenon of the physical world.

There is in all the physical universes of time and space, notwithstanding the universal manifestation of the decimal constitution of energy, the ever-present reminder of the reality of the sevenfold electronic organization of pre-matter.

42:9.2 The number seven is basic to the central universe and the spiritual system of inherent transmissions of character,

but the number ten, the decimal system, is inherent in energy, matter, and the material creation.

Nevertheless the atomic world does display a certain periodic characterization which recurs in groups of seven—a birthmark carried by this material world indicative of its far-distant spiritual origin.

III: THE NATURE OF MATTER.
DEVELOPMENT OF ATOMIC
THEORY (Swann 44)

42:9.3 This sevenfold persistence of creative constitution is exhibited in the chemical domains as a recurrence of similar physical and chemical properties in segregated periods of seven when the basic elements are arranged in the order of their atomic weights.

And then, it had long been known by chemists that if the elements were arranged in a row in the order of the weights of their atoms, their properties showed a periodic change.

When the Urantia chemical elements are thus arranged in a row,

any given quality or property tends to recur by sevens.

This periodic change by sevens recurs diminishingly and with variations throughout the entire chemical table, being most markedly observable in the earlier or lighter atomic groupings.

Starting from any one of them, and noting some property such as the melting point, for example,

Starting from any one element, after noting some one property,

the property would change as we went along the row,

such a quality will change for six consecutive elements,

but as we continued it would gradually come back to a condition very similar to that from which we started; and, as we continued our journey along the row, the same story would be repeated again and again.

The eighth element was in many respects like the first, the ninth like the second, the tenth like the third, and so on.

Such a state of affairs pointed not only to

a varied internal structure, but also to a certain harmony in that variation suggestive of some organized plan in building the atom.

And then, there was another set of phenomena, which, ever since the time of Newton, had presented an increasingly alluring spectacle to the student of natural philosophy. I refer to the phenomena attending the emission of light. If a beam of light from a glowing solid be passed through a triangular block of glass, it becomes spread out into a band of color, a spectrum as we call it, red at one end and violet at the other, with all the colors of the rainbow between (S 64-65).

I: MEDIAEVAL AND MODERN DOGMAS IN NATURAL PHILOSOPHY (Swann 1)

You see, all that even a successful appeal to the elastic idea about gravitation could do would be to show that this thing "gravitation" which we do not understand, acts in the same sort of way as that other thing [*i.e.* the hypothetical aether]

but on reaching the eighth, it tends to reappear,

that is, the eighth chemically active element resembles the first, the ninth the second, and so on.

Such a fact of the physical world unmistakably points to

the sevenfold constitution of ancestral energy and is indicative of the fundamental reality of the sevenfold diversity of the creations of time and space.

Man should also note that there are seven colors in the natural spectrum.

42:9.4 But not all the suppositions of natural philosophy are valid; for example,

the hypothetical ether,

which we also do not understand, but think we do. There is a sort of **unification of ignorance** in the matter (S 9).

which represents an ingenious attempt of man to **unify his ignorance** of space phenomena.

The philosophy of the universe cannot be predicated on the observations of so-called science. If such a metamorphosis could not be seen, a scientist would be inclined to deny the possibility of developing a butterfly out of a caterpillar.

III: THE NATURE OF MATTER. DEVELOPMENT OF ATOMIC THEORY (Swann 44)

42:9.5 **Physical stability associated with biologic elasticity is present in nature only because of the well-nigh infinite wisdom possessed by the Master Architects of creation.**

I think, were I to preach a sermon designed to emphasize the power of a creator, I should not be concerned so much with the truth of the first chapter of Genesis. The bald statement that the earth was made in seven days does not impress me very much. However, I am greatly impressed by the fact that the laws of nature seem to have been designed in such a way as to produce, on the whole, the most **efficient** and effective results. Had a man set out to **design an atom**, he would have had the very greatest difficulty in designing something which was **stable**, something which did not fall to pieces, and yet something which possessed all those potentialities of activity exhibited an atom, for example, in its emission of light....

Nothing less than transcendental wisdom could ever design units of matter which are at the same time so stable and so efficiently flexible.

Even had the human architect been successful in these matters, he would have had to regard himself as very lucky if the laws which he had designed for his atom possessed the potentialities inherent in biological phenomena. [Etc.] (S 74-75)

10. UNIVERSAL NON- SPIRITUAL ENERGY SYSTEMS (Material Mind Systems)

42:10.1 The endless sweep of relative cosmic reality, from the absoluteness of Paradise monota to the absoluteness of space potency, is suggestive of certain evolutions of relationship in the nonspiritual realities of the First Source and Center—those realities which are concealed in space potency, revealed in monota, and provisionally disclosed on intervening cosmic levels. This eternal cycle of energy, being circuited in the Father of universes, is absolute and, being absolute, is expansile in neither fact nor value; nevertheless the Primal Father is even now—as always—self-realizing of an ever-expanding arena of time-space, and of time-space-transcended, meanings, an arena of changing relationships wherein energy-matter is being progressively subjected to the overcontrol of living and divine spirit through the experiential striving of living and personal mind.

42:10.2 The universal nonspiritual energies are reassociated in the living systems of non-Creator minds on various levels, certain of which may be depicted as follows:

[These mind-adjutants of a local universe Mother Spirit are ... effective collaborators with the Master Physical Controllers, who also serve as controllers and directors of the preadjutant mind levels, the levels of nonteachable or mechanical mind (36:5.14).]

42:10.3 1. *Preadjutant-spirit minds.*

This level of mind is nonexperiencing and on the inhabited worlds is ministered by the Master Physical Controllers. This is mechanical mind, the nonteachable intellect of the most primitive forms of material life, but the nonteachable mind functions on many levels beside that of primitive planetary life.

42:10.4 2. *Adjutant-spirit minds.*

This is the ministry of a local universe Mother Spirit functioning through her seven adjutant mind-spirits on the teachable (nonmechanical) level of material mind. On this level material mind is experiencing: as subhuman (animal) intellect in the first five adjutants; as human (moral) intellect in the seven adjutants; as superhuman (midwayer) intellect in the last two adjutants.

[See 38:9.6.]

42:10.5 3. *Evolving morontia minds—*

the expanding consciousness of evolving personalities in the local universe ascending careers. This is the bestowal of the local universe Mother Spirit in liaison with the Creator Son. This mind level connotes the organization of the morontia type of life vehicle, a synthesis of the material and the spiritual which is effected by the Morontia Power Supervisors of a local universe. Morontia mind functions differentially in response to the 570 levels of morontia life, disclosing increasing associative capacity with the cosmic mind on the higher levels of attainment. This is the evolutionary course of mortal creatures, but mind of a nonmorontia order is also bestowed by a Universe Son and a Universe Spirit upon the nonmorontia children of the local creations.

[See 48:1.]

[The Master Spirits are the sevenfold source of the cosmic mind, the intellectual potential of the grand universe.

This cosmic mind is a subabsolute manifestation of the mind of the Third Source and Center and, in certain ways, is functionally related to the mind of the evolving Supreme Being (16:6.1).]

[Mind is a phenomenon connoting the presence-activity of living ministry in addition to varied energy systems; and this is true on all levels of intelligence (0:6.8).]

42:10.6 *The cosmic mind.* This is the sevenfold diversified mind of time and space, one phase of which is ministered by each of the Seven Master Spirits to one of the seven superuniverses.

The cosmic mind encompasses all finite-mind levels and co-ordinates experientially with the evolutionary-deity levels of the Supreme Mind and transcendently with the existential levels of absolute mind—the direct circuits of the Conjoint Actor.

42:10.7 On Paradise, mind is absolute; in Havona, absonite; in Orvonton, finite.

Mind always connotes the presence-activity of living ministry plus varied energy systems, and this is true of all levels and of all kinds of mind.

But beyond the cosmic mind it becomes increasingly difficult to portray the relationships of mind to nonspiritual energy. Havona mind is subabsolute but super-evolutionary; being existential-experiential, it is nearer the absonite than any other concept revealed to you. Paradise mind is beyond human understanding; it is existential, non-spatial, and nontemporal. Nevertheless, all of these levels of mind are overshadowed by the universal presence of the Conjoint Actor—by the mind-gravity grasp of the God of mind on Paradise.

11. UNIVERSE MECHANISMS

42:11.1 In the evaluation and recognition of mind it should be remembered that the universe is neither mechanical nor magical; it is a creation of mind and a mechanism of law. But while in practical application the laws of nature operate in what seems to be the dual realms of the physical and the spiritual, in reality they are one. The First Source and Center is the primal cause of all materialization and at the same time the first and final Father of all spirits.

[The Universal Father is one, but to time-space he is revealed in the dual phenomena of pure energy and pure spirit (56:3.1).]

The Paradise Father appears personally in the extra-Havona universes only as pure energy and pure spirit—as the Thought Adjusters and other similar fragmentations.

X: THE SUPREME SELF AND THE ABSOLUTE (Turner 161)

42:11.2 Mechanisms do not absolutely dominate the total creation; the universe of universes in toto is mind planned, mind made, and mind administered.

[contd] 1. The conclusions of the preceding chapter may now be considered in their bearing upon transcendence and immanence. We found in the first place that the complex automatism of the physical universe—regarded of course in its true character as a mechanism—

But the divine mechanism of the universe of universes

is so perfect that it is altogether impossible for purely scientific investigation

is altogether too perfect for the scientific methods of the finite mind of man

to discern therein the immediate influence of any dominant mind (T 161).

to discern even a trace of the dominance of the infinite mind.

IX: MECHANISM AND THE SUPREME SELF (Turner 146)

[T]he final **discovery**—the successful running to earth, as it were—of the **controlling mind**

must depend on the native **capacity of the investigating intellect**,

not, however, in the sense that such an intellect is ignorant or inefficient, but rather that it will inevitably regard the material mechanism as being purely self-directive and self-maintaining quite independently of any mind; for this mind, although actually operative, will nevertheless remain under the given conditions completely indiscernible (T 148).

For this creating, **controlling**, and upholding mind is neither material mind nor creature mind; **it is spirit-mind functioning on and from creator levels of divine reality.**

42:11.3 The ability to discern and **discover mind** in universe mechanisms

depends entirely on the ability, scope, and **capacity of the investigating mind** engaged in such a task of observation.

Time-space minds, organized out of the energies of time and space, are subject to the mechanisms of time and space.

42:11.4 Motion and universe gravitation are twin facets of the impersonal time-space mechanism of the universe of universes. **The levels of gravity response for spirit, mind, and matter are quite independent of time, but only true spirit levels of reality are independent of space (nonspatial). The higher mind levels of the universe—the spirit-mind levels—may also be nonspatial, but the levels of material mind, such as human mind, are responsive to the interactions of universe gravitation, losing this response only in proportion to spirit identification.**

Spirit-reality levels are recognized by their spirit content, and spirituality in time and space is measured inversely to the linear-gravity response.

42:11.5 Linear-gravity response is a quantitative measure of nonspirit energy. All mass—organized energy—is subject to this grasp except as motion and mind act upon it. Linear gravity is the short-range cohesive force of the macrocosmos somewhat as the forces of intra-atomic cohesion are the short-range forces of the microcosmos. Physical materialized energy, organized as so-called matter, cannot traverse space without affecting linear-gravity response.

[?]

Although such gravity response is directly proportional to mass, it is so modified by intervening space that the final result is no more than roughly approximated when expressed as

[[Observation of the moon's orbit] led Newton to put forward his famous law of gravitation according to which the gravitational pull of any body, such as the earth, falls off inversely as the square of the distance from the body (Sir James Jeans, *The Universe Around Us* [1929],) p. 42.]

inversely according to the square of the distance.

[Pervaded space also exerts an antigravity influence upon physical or linear gravity; space can actually neutralize such gravity action even though it cannot delay it (11:8.3).]

Space eventually conquers linear gravitation because of the presence therein of the antigravity influences of numerous supermaterial forces which operate to neutralize gravity action and all responses thereto.

[E]very mechanism that is characterized by extreme complexity and automatism, combined with a far-reaching range and unity,

42:11.6 Extremely complex and highly automatic-appearing cosmic mechanisms

must inevitably conceal the originative mind

always tend to conceal the presence of the originative or creative indwelling mind

from every intelligence that is far below its own capacity,

and must therefore appear to such an intelligence as wholly “mindless”, although its real nature may be quite the reverse (T 146-47).

[To lower types of mind] all complex autonomous mechanism must appear to be finally self-explanatory and self-maintaining,

not because it really is so however, but simply because the task of tracing the actually dominant mind is far beyond their ability (T 148).

X: THE SUPREME SELF AND THE ABSOLUTE (Turner 161)

Still further, we saw that the essential character of all mechanism is “an inherent and indispensable fixity of organization”, without which it could act only inadequately as the instrument of the dominant self. This fixity of mechanical construction, again absolutely precludes all possibility of its own spontaneous evolution,

nevertheless the physical universe actually exhibits an uninterrupted evolution which appears, so far as its highest products are concerned, to have no conceivable limits (T 162).

from any and all intelligences very far below the universe levels of the nature and capacity of the mechanism itself.

Therefore is it inevitable that the higher universe mechanisms must appear to be mindless to the lower orders of creatures.

The only possible exception to such a conclusion would be the implication of *mindedness* in the amazing phenomenon of

an apparently self-maintaining universe—

but that is a matter of philosophy rather than one of actual experience.

42:11.7 Since mind co-ordinates the universe,

fixity of mechanisms is nonexistent.

The phenomenon of progressive evolution associated with cosmic self-maintenance is universal.

The dominance of the supreme self is in the first place obviously an actual and real dominance, not merely abstract and nominal; it is the control of an autocrat, not of a monarch who reigns but does not govern; for it expresses itself in the **inexhaustible evolutionary capacity** of the physical world; and this universal manifestation constitutes immanence—again real and actual (T 162).

[Compare: Paradise is the material fulcrum of infinity; the agencies of the Third Source and Center are the levers of intelligence which motivate the material level and inject **spontaneity** into the mechanism of the physical creation (9:3.8).]

VIII: AUTOMATIC MECHANISM AND DESIGN (Turner 131)

[T]he **higher** the level of the dominant **mind**,

the more must it tend to become veiled and concealed by its own mechanical constructions from both the observation and the comprehension of every mind that is much **lower** than itself in the scale of psychic evolution ... (T 142).

The **evolutionary capacity** of the universe is **inexhaustible**

in the infinity of **spontaneity**.

Progress towards harmonious unity, a growing experiential synthesis superimposed on an ever-increasing complexity of relationships, could be effected only by a purposive and dominant mind.

42:11.8 The **higher** the universe **mind** associated with any universe phenomenon,

the more difficult it is for the **lower** types of mind to discover it.

And since the mind of the universe mechanism is creative spirit-mind (even the mindedness of the Infinite), it can never be discovered or discerned by the lower-level minds of the universe, much less by the lowest mind of all, the human.

The evolving animal mind, while naturally God-seeking, is not alone and of itself inherently God-knowing.

12. PATTERN AND FORM— MIND DOMINANCE

IX: MECHANISM AND THE SUPREME SELF (Turner 146)

The actual *evolution of mechanism*, in short, does not merely suggest, but *necessarily implies*, as its ultimate cause, the evolution of ideas in an adequately *dominant mind* (T 157).

42:12.1 The *evolution of mechanisms implies* and indicates the concealed presence and *dominance of creative mind*.

The ability of the mortal intellect to conceive, design, and create automatic mechanisms demonstrates the superior, creative, and purposive qualities of man's mind as the dominant influence on the planet.

VIII: AUTOMATIC DESIGN AND MECHANISM (Turner 131)

[T]he inherent dominance of mind, when operating upon matter, must manifest itself always in the *construction of material mechanisms* ... (T 142).

Mind always reaches out towards:

42:12.2 1. *Creation of material mechanisms*.

42:12.3 2. Discovery of hidden mysteries.

42:12.4 3. Exploration of remote situations.

42:12.5 4. Formulation of mental systems.

42:12.6 5. Attainment of wisdom goals.

42:12.7 6. Achievement of spirit levels.

42:12.8 7. The accomplishment of divine destinies—supreme, ultimate, and absolute.

42:12.9 Mind is always creative. The mind endowment of an individual animal, mortal, morontian, spirit ascender, or finality attainer is always competent to produce a suitable and serviceable body for the living creature identity.

Personality or identity forms are patterns resultant from energy (physical, spiritual, or mindal) but are not inherent therein (0:6.12).

But the presence phenomenon of a personality or the pattern of an identity, as such, is not a manifestation of energy, either physical, mindal, or spiritual. The personality form is the *pattern* aspect of a living being; it connotes the *arrangement* of energies, and this, plus life and motion, is the *mechanism* of creature existence.

42:12.10 Even spirit beings have form, and these spirit forms (patterns) are real. Even the highest type of spirit personalities have forms—personality presences in every sense analogous to Urantia mortal bodies. Nearly all beings encountered in the seven superuniverses are possessed of forms. But there are a few exceptions to this general rule: Thought Adjusters appear to be without form until after fusion with the surviving souls of their mortal associates. Solitary Messengers, Inspired Trinity Spirits, Personal Aids of the Infinite Spirit, Gravity Messengers, Transcendental Recorders, and certain others are also without discoverable form. But these are typical of the exceptional few; the great majority have bona fide personality forms, forms which are individually characteristic, and which are recognizable and personally distinguishable.

42:12.11 The liaison of the cosmic mind and the ministry of the adjutant mind-spirits evolve a suitable physical tabernacle for the evolving human being. Likewise does the morontia mind individualize the morontia form for all mortal survivors. As the mortal body is personal and characteristic for every human being, so will the morontia form be highly individual and adequately characteristic of the creative mind which dominates it. No two morontia forms are any more alike than any two human bodies. The Morontia Power Supervisors sponsor, and the attending seraphim provide, the undifferentiated morontia material wherewith the morontia life can begin to work. And after the morontia life it will be found that spirit forms are equally diverse, personal, and characteristic of their respective spirit-mind indwellers.

I: MIND AND MATTER (*Physiology of Faith and Fear* 3)

THE SUPREMACY OF MIND (*Physiology of Faith and Fear* 10)

Does the mind have a body, or does the body have a mind? The physician and the physiologist, from the very nature of their studies, are frequently inclined to the position that the **body has a mind**—that man is essentially a material being, an animal organism ... (*PF&F* 10).

On the other hand, psychologists are quite apt to regard man as a **“mind having a body”** (*PF&F* 10).

[“The eyes are the window to the soul” (unknown origin).]

42:12.12 On a material world you think of a **body as having a spirit,**

but we regard the **spirit as having a body.**

The material eyes are truly the windows of the spirit-born soul.

The spirit is the architect, the mind is the builder, the body is the material building.

42:12.13 Physical, spiritual, and mindal energies, as such and in their pure states, do not fully interact as actuals of the phenomenal universes. On Paradise the three energies are co-ordinate, in Havona co-ordinated, while in the universe levels of finite activities there must be encountered all ranges of material, mindal, and spiritual dominance. In nonpersonal situations of time and space, physical energy seems to predominate, but it also appears that the more nearly spirit-mind function approaches divinity of purpose and supremacy of action, the more nearly does the spirit phase become dominant; that on the ultimate level spirit-mind may become all but completely dominant. On the absolute level spirit certainly is dominant. And from there on out through the realms of time and space, wherever a divine spirit reality is present, whenever a real spirit-mind is functioning, there always tends to be produced a material or physical counterpart of that spirit reality.

42:12.14 The spirit is the creative reality; the physical counterpart is the time-space reflection of the spirit reality, the physical repercussion of the creative action of spirit-mind.

42:12.15 Mind universally dominates matter, even as it is in turn responsive to the ultimate overcontrol of spirit. And with mortal man, only that mind which freely submits itself to the spirit direction can hope to survive the mortal time-space existence as an immortal child of the eternal spirit world of the Supreme, the Ultimate, and the Absolute: the Infinite.

42:12.16 [Presented by a Mighty Messenger on duty in Nebadon and by the request of Gabriel.]

1. Meaning that Paradise is the center of the ultimatons's gravity.
2. Light, that is, light without heat, is another of the nonspiritual manifestations of the Deities (3:2.3).

You are familiar with suns that emit light accompanied by heat; but there are also suns which shine without heat (15:6.8).

3. A hydrogen atom, having only one electron, is the only element that has a "central proton." All other elements have multiple electrons revolving around a nucleus containing more than one proton.

4. From the 1947 edition of Robert Andrews Millikan's *Electrons (+ and -), Protons, Photons, Neutrons, Mesotrons, and Cosmic Rays* (p. 422):

A glance at Appendix I shows that all the most abundant and the most stable atoms—nearly all contained in the first three rows of the periodic table—have their atomic weights close to double their atomic numbers, which means that these nuclei contain the same number of neutrons as of protons, thus showing that this is the relation of greatest atomic stability; but from $Z=50$ to $Z=92$ a rapidly increasing excess of neutrons is required to hold in check the repulsive forces brought into play by the increasing positive charge on the nucleus as the atomic number Z increases; for the electrical forces between protons are coulomb forces, not short-range forces like those between protons and neutrons. A result of the increasing repulsions between the protons as Z increases is that all of the atoms of atomic number above 83 are so unstable as to be radioactive. These relations thus illuminate, and to a degree explain, radioactivity.

5. Mendelevium 258, atomic number 101, has a half-life of 51.5 days.
6. Swann is incorrect; an iron atom has twenty-six electrons; a nickel atom has twenty-eight.