WORK-IN-PROGRESS (JANUARY 13, 2018) PARALLEL CHART FOR

42:4-5 (partial), 42:6, 42:7, 42:8, 42:9, 42:11 ("Energy and Matter Transmutations," "Wave-Energy Manifestations," "Ultimatons, Electrons, and Atoms," "Atomic Matter," "Atomic Cohesion," "Natural Philosophy," "Universe Mechanisms")

Sources for 42:4-5 (partial), 42:6, 42:7, 42:8, 42:9, 42:11

(1) W. F. G. Swann, A.R.C.S., M.A., D.Sc., *The Architecture of the Universe* (New York: The Macmillan Company, 1934)

(2) Sir James Jeans, M.A., D.Sc., LL.D., F.R.S., *The Universe Around Us* (New York: The Macmillan Company, 1929)

Note: This source is coded Jeans1.

(3) Ernest William Barnes, *Scientific Theory and Religion: The World described by Science and its Spiritual interpretation* (New York: The Macmillan Company, 1933)

(4) 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.

(5) A. S. Eddington, M.A., D.Sc., LL.D., F.R.S., *Stars and Atoms* (Oxford: Clarendon Press, 1927)

(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.)

Matthew Block
13 January 2018

SOURCE OR PARALLEL

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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

in bringing its parts together from an infinite distance

against the forces

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

PAPER 42 — ENERGY — MIND AND MATTER

4. ENERGY AND MATTER TRANSMUTATIONS

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

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.

SOURCE OR PARALLEL	URANTIA PAPER 42
III: EXPLORING IN TIME (Jeans1 141)	
THE AGE OF THE EARTH (Jeans1 142)	
[?]	42:4.12 The existence of pre-electronic forms of matter is indicated by the two atomic weights of lead.
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).	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.
II: EXPLORING THE ATOM (Jeans1 86)	
QUANTUM THEORY (Jeans1 115)	
	42:4.13 The relative integrity of matter is assured by the fact that energy can be absorbed or released only in those exact amounts which Urantia scientists have designated quanta.
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).	This wise provision in the material realms serves to maintain the universes as going concerns.

SOURCE OR PARALLEL	URANTIA PAPER 42
THE MECHANICAL EFFECTS OF RADIATION (Jeans 129)	
	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.
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	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)	
	The never-ending confusion attending the observation of the wave mechanics of quantum behavior is due to
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).	the super-imposition of energy waves:
If two crests come together we shall get a wave of double the maximum height of the original waves (B 290).	Two crests can combine to make a double-height crest,

SOURCE OR PARALLEL	URANTIA PAPER 42
When a crest and a trough coincide the surface of the water is undisturbed (B 290).	while a crest and a trough may combine, thus producing mutual cancellation.
	5. WAVE-ENERGY 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).	The sun's rays constitute four octaves in the superuniverse scale,
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)	the visible rays embracing a single octave,
	number forty-six in this series.
Immediately above this one octave, going treblewards, we come to ultra-violet radiation (J2 55).	The ultraviolet group comes next,

SOURCE OR PARALLEL	URANTIA PAPER 42
Then, about ten octaves above the octave of visible light, we come to X-rays (J2 56).	while ten octaves up are the X rays,
Above all these—very high indeed in the treble—come the γ-rays which are emitted by radium;	followed by the Y rays of radium. [*Note:* Changed to 'gamma rays' in the second edition.]
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).	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).	Next downward from visible sunlight appear the infrared rays,
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).	and thirty octaves below are the radio transmission group.

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

[See 42:4.8.]
[See 15:8.6 and 41:7.8.]

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 ultimatonic 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.

SOURCE OR PARALLEL	URANTIA PAPER 42
I: THE INTERIOR OF A STAR (Eddington 9)	
Each atom is about one hundred-millionth of an inch in diameter (E 9).	42:6.7 Each atom is a trifle over 1/100,000,000th of an inch in diameter,
The electron is the lightest thing known,	while an electron
weighing no more than 1/1,840 of the lightest atom (E 16).	weighs a little less than 1/2,000th of the smallest atom, hydrogen. [*Note:* Changed in second edition to 'a little more'.]
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 change carried by an electron,	The positive proton,
	characteristic of the atomic nucleus,
[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).]	while it may be no larger than a negative electron,
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).	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,	42:6.8 If the mass of matter should be magnified until that of an electron equaled one tenth of an ounce,

SOURCE OR PARALLEL	URANTIA PAPER 42
that one tenth of an ounce would, on the same scale of magnification,	then were size to be proportionately magnified,
become as heavy as the earth (S 44).	the volume of such an electron would become as large as that of the earth.
[contd] Then, we have the proton—the fundamental unit of positive charge—	If the volume of a proton—
a thing 1800 times as heavy as the electron,	eighteen hundred times as heavy as an electron—
but 1800 times smaller in size,	
so that if you should magnify it to the size of a pin's head,	should be magnified to the size of the head of a pin,
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).	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
III: THE NATURE OF MATTER. THE DEVELOPMENT OF ATOMIC THEORY (Swann 44)	
One of the earliest and most alluring temptations was to think of the atom as a little solar system,	42:7.1 The formation of all matter is on the order of the solar system.
with a central nucleus,	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.
and with electrons revolving around that nucleus	Surrounding this energy center there whirl, in endless profusion but in fluctuating circuits, the energy units

SOURCE OR PARALLEL	URANTIA PAPER 42
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 proton[1]
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.

SOURCE OR PARALLEL

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.]

URANTIA PAPER 42

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.

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

42:7.6 Stability of the atom depends on the number of electrically inactive neutrons in the central body.[2]

[*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.]

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 chemical 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 instanteous disruption' in the second edition.] of the central proton with the wild dispersion of the electrons and other liberated energies.[3]

SOURCE OR PARALLEL

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II: EXPLORING THE ATOM (Jeans1 86)

QUANTUM THEORY (Jeans1 115)

[*Note:* In 42:7.8-9 the UB writer ignores Jeans's 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.]

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.

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).

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

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).

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.]

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

[!]

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;

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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.

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.

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[4] 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 ultimatonic axial revolutionary velocities and to the unexplained "huddling" proclivity of ultimatons.

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.

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

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

but not for a single individual atom or person.

SOURCE OR PARALLEL

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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)

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

[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.

the mesotron,

SOURCE OR PARALLEL	URANTIA PAPER 42
It was about 180 times as heavy as an electron and carried the same charge (SA 202).	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,
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).	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).	protons and neutrons constantly to change places.

SOURCE OR PARALLEL

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. By a simple calculation, Yukawa was at once able to show that this carrier would weigh about 180 times as much as an electron (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.

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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.

SOURCE OR PARALLEL	URANTIA PAPER 42
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.	When atoms perform radioactively, they emit far more energy than would be expected.
[See three rows down.]	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
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).	certain small uncharged particles.
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).	42:8.6 The mesotron explains certain cohesive properties of the atomic nucleus,

SOURCE OR PARALLEL

[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).

[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).

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

URANTIA PAPER 42

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.

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

9. NATURAL PHILOSOPHY

42:9.1 Religion is not alone dogmatic;

natural philosophy equally tends to dogmatize.

SOURCE OR PARALLEL	URANTIA PAPER 42
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. 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 the number seven was fundamental to nature because
"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).	there are seven openings in the human head,
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,	if he had known more of chemistry,
he might have hit upon a truth there also (S 4).	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 prematter.

SOURCE OR PARALLEL	URANTIA PAPER 42
	42:9.2 The number seven is basic to the central universe and the spiritual system of inherent transmissions of character,
[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).]	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.

SOURCE OR PARALLEL	URANTIA PAPER 42
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.	but on reaching the eighth, it tends to reappear,
The eighth element was in many respects like the first, the ninth like the second, the tenth like the third, and so on.	that is, the eighth chemically active element resembles the first, the ninth the second, 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.	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.
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).	Man should also note that there are seven colors in the natural spectrum.

SOURCE OR PARALLEL	URANTIA PAPER 42
I: MEDIAEVAL AND MODERN DOGMAS IN NATURAL PHILOSOPHY (Swann 1)	
	42:9.4 But not all the suppositions of natural philosophy are valid; for example, the hypothetical ether,
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] 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. Nothing less than transcendental wisdom could ever

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.... 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)

design units of matter which are at the same time so stable and so efficiently flexible.

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.

SOURCE OR PARALLEL	URANTIA PAPER 42
	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.
	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.
IX: MECHANISM AND THE SUPREME SELF (Turner 146)	
[T]he final discovery—the successful running to earth, as it were—of the controlling mind	42:11.3 The ability to discern and discover mind in universe mechanisms
must depend on the native capacity of the investigating intellect,	depends entirely on the ability, scope, and capacity of the investigating mind engaged in such a task of observation.

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).

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.

SOURCE OR PARALLEL	URANTIA PAPER 42
	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
[This 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. 121.]	inversely according to the square of the distance.
	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,	from any and all intelligences very far below the universe levels of the nature and capacity of the mechanism itself.
and must therefore appear to such an intelligence as wholly "mindless", although its real nature may be quite the reverse (T 146-47).	Therefore is it inevitable that the higher universe mechanisms must appear to be mindless to the lower orders of creatures.

SOURCE OR PARALLEL	URANTIA PAPER 42
	The only possible exception to such a conclusion would be the implication of *mindedness* in the amazing phenomenon of
[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).	an apparently self-maintaining universe—
	but that is a matter of philosophy rather than one of actual experience.
X: THE SUPREME SELF AND THE ABSOLUTE (Turner 161)	
	42:11.7 Since mind co-ordinates the universe,
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).	fixity of mechanisms is nonexistent.
	The phenomenon of progressive evolution associated with cosmic self-maintenance is universal.

SOURCE OR PARALLEL	URANTIA PAPER 42
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 evolutional capacity of the physical world; and this universal manifestation constitutes immanence—again real and actual (T 162).	The evolutionary capacity of the universe is inexhaustible
[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).]	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.
VIII: AUTOMATIC MECHANISM AND DESIGN (Turner 131)	
[T]he higher the level of the dominant mind,	42:11.8 The higher the universe mind associated with any universe phenomenon,
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 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.

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

2. 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.

3. Mendelevium 258, atomic number 101, has a half-life of 51.5 days.

4. Swann is incorrect; an iron atom has twenty-six electrons; a nickle atom has twenty-eight.