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Extrasensory Perception of Subatomic Particles I. Historical Evidence

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Abstract — A century-old claim by two early leaders of the Theosophical Society to have used a form of ESP to observe subatomic particles is evaluated. Their observations are found to be consistent with facts of nuclear physics and with the quark model of particle physics provided that their assumption that they saw atoms is rejected. Their account of the force binding together the fundamental constituents of matter is shown to agree with the string model. Their description of these basic particles bears striking similarity to basic ideas of superstring theory. The implication of this remarkable correlation between ostensible paranormal observations of subatomic particles and facts of nuclear and particle physics is that quarks are neither fundamental nor hadronic states of superstrings, as many physicists currently assume, but, instead, are composed of three subquark states of a superstring.

Introduction

What can constitute universally acceptable, scientific proof of paranormal phenomena? Scientists insist that repeatable, double-blind tests performed under controlled laboratory conditions are prerequisite for an objective demonstration of the existence of a new, natural phenomenon. But such are the perceived revolutionary implications for science of ***psi*** faculties like ESP and telepathy that even highly significant statistical evidence of these abilities obtained under stringent, computer-controlled conditions may not satisfy some critics of parapsychology. If they cannot fault the experimental protocols eliminating cheating or unconscious use of sensory clues by the psychic, skeptics can as a last resort dismiss impressive findings either by suggesting that the researcher fabricated his data — a charge not easy to rebut — or by revealing scandal about his life in order to discredit his character and — by implication — his research. Indeed, a skeptic may ask: "How can ephemeral, often unrepeatable, paranormal phenomena ever receive scientific proof if it always has to be presupposed without possibility of proof that the researcher did not concoct or alter his evidence?" For this reason — however unreasonable it may seem to parapsychologists — even highly evidential reports of ***psi*** phenomena will remain inconclusive to anyone who — rather than accept their genuineness — prefers to doubt the honesty of the reporter even though he may have no evidence to support his suspicion.

What, however, if a psychic claimed to see objects so microscopic that science at the time neither knew anything about them nor possessed the technological capability to study them? Suppose science later verified too many of his observations to make it plausible that his success in describing these objects was due only to chance? Whether sufficiently rigorous protocols were applied or whether the psychic or researcher could have cheated would no longer be pertinent issues for believers and skeptics to argue about because the absence of scientific information about the things the psychic claimed to see would obviously have made cheating impossible in principle. The fact that his observations may not have been made under blind or double-blind conditions would be irrelevant. Acquiring information about the world paranormally that is confirmed by advances in science many years later is, arguably, the most convincing type of ESP because such circumstances permit the skeptic no room for doubt or rational explanations if the correlations between scientific facts and psychic observations are so numerous as to make lucky guessing extremely implausible. This paper will examine such a rare case in which ostensible paranormal descriptions of subatomic particles published nearly 100 years ago have turned out to be both confirmed by facts of nuclear physics and particle physics and consistent with some as yet untested scientific ideas or theories.

Micro-Psi

Eight psychic powers, or "siddhis," are often referred to in the literature on yoga. One of them is "minuteness — the power to be as small as an atom, at will" (Wood, 1965). In his *Yoga Sutras,* the great authority on yoga, Patanjali (c. 400 B.C.), states that a yogi can acquire "knowledge of the small, the hidden, or the distant by directing the light of a superphysical faculty" (Taimni, 1965). This siddhi has the Sanskrit name of "anima." In parapsychological terms (Puthoff and Targ, 1979) the ability to acquire "knowledge of the hidden or the distant" is "remote viewing" of the world at large. The ability to obtain "knowledge of the small" can, likewise, be interpreted as remote viewing of the microscopic world. This form of clairvoyance has been given the name "micro-psi" (Phillips, 1980). It has received little study in the West, although Lyness (1959) carried out exploratory investigations with the well-known Theosophical writer and clairvoyant, Geoffrey Hodson. Micro-psi is an altered state of consciousness which can be induced and terminated at will by certain meditative exercises, although its acquisition, which may appear either spontaneously or through deliberate training, may require years of meditative practice. The intensely interactive, micro-psi state is akin to experiencing a computer-generated, "virtual reality" simulation of a landscape in the sense that, having focussed on the interior of some physical object, a micro-psi observer has the sensation of being suspended in a dark space amidst a profusion of rapidly moving, geometrical patterns of points of light, which he can zoom down into and lock on to, shifting his perspective, varying his distance and steadying the gyrations of the particles, which he keeps in his field of vision as long as he wishes. He can increase the power of magnification of his vision by "flying" towards ever smaller features of an object as they become discernible; remarkably, this power of resolution seems to be limited only by the prowess of the observer. High magnification seems automatically to retard the motion of images but requires more mental effort to sustain. Micro-psi images superimpose themselves upon the optic visual field and so the psychic does not need to close his eyes, although this helps his concentration by eliminating sources of distraction. Although in a altered state of consciousness, the micro-psi observer retains the use of his senses and his cognitive skills, being able to count, remember things and hold a conversation. Unlike the fleeting images encountered in clairvoyance and telepathy, micro-psi images persist and have a dynamic life of their own; ***they cannot be willed to vanish.*** The length of time they can be observed is limited only by the amount of mental effort the psychic expends in holding them in his field of vision, for his exertion can eventually prove exhausting.

Micro-psi Investigations

Among the few known by the author to have claimed micro-psi ability were Annie Besant (1847-1933) and Charles W. Leadbeater (1847-1934), two early leaders of the Theosophical Society who, after a short period of intensive yoga training, collaborated between 1895 and 1933 in a series of systematic investigations (Besant and Leadbeater; 1908, 1919, 1951) of the microscopic structure of matter, using micro-psi to study the atoms of all the elements. Leadbeater looked first at gold, but, finding its structure too complicated, examined hydrogen and atmospheric nitrogen and oxygen. During a summer vacation, Leadbeater visited a museum in Dresden, Germany, where he was said to have used his micro-psi powers to study many minerals on display there. They asked Sir William Crookes, the famous chemist, to provide specimens of some elements difficult to obtain in a pure state. By 1907 they had examined 59 more elements, noticing variations in the supposed atoms of neon, argon, krypton, xenon and platinum even though scientists did not suspect at the time that an element could have more than one kind of atom. For example, Besant and Leadbeater reported in 1908 in the journal ***The Theosophist*** their discovery of a variation of neon — five years before the English chemist Frederick Soddy gave the name of "isotopes" to atoms of an element differing in mass. Their colleague, C. Jinarajadasa, who made sketches and notes during their investigative sessions, wrote in 1943 to Professor F. W. Aston, inventor of the mass spectrograph, at Cambridge University, England, informing him that Besant and Leadbeater had discovered in 1907 the neon-22 isotope by psychic means five years before scientists found it. (How the two Theosophists identified isotopes will be explained later). The distinguished scientist replied that he was not interested in Theosophy!

Besant's and Leadbeater's book ***Occult Chemistry*** summarizing their research was published in 1908. The next year they studied 20 more elements, notably so-called "illinium." They noted that it was the 61st element, indicating that it was the element promethium, found by science in 1945. A second edition of ***Occult Chemistry*** appeared in 1919, but it included no new material. Purported descriptions of the molecules of benzene, methane and other chemical compounds were published in 1924. A year later Leadbeater published a model of the atomic structure of diamond in ***The Theosophist.*** In 1926 the hexagonal arrangement of carbon atoms in graphite was correctly described. More material was published in 1932, including descriptions of the supposed atoms of so-called "element 85" (named "astatine" by science in 1940), "elements 87" (called "francium" by science in 1939) and "element 91" (isolated by chemists in 1921 and called "protactinium"). Besant and Leadbeater had recorded in 1909 an element they called "masurium" and had placed it correctly in the periodic table. Leadbeater described it again in 1932, five years before it was detected and called "technetium" by science. In the same year Leadbeater reported (1951) finding atoms of an element with an atomic weight of 2. The Theosophists assumed (mistakenly, as it turned out) that is was an element unknown to science, and they did not correctly identify it as deuterium, which Harold Urey and his colleagues had discovered in the previous year.

Finally, Jinarajadasa compiled all the research material that had accumulated over 38 years and published it in 1951 in a third, enlarged edition of ***Occult Chemistry.*** It contained purported descriptions of 111 atoms, including 14 isotopes, and the molecules of 29 inorganic compounds and 22 organic compounds.

It is unfortunate that the publications of the two Theosophists never gave details about the nature of the chemical samples they examined, for this might have shed light on the question of how they could have detected prior to science supposed atoms of promethium, astatine, francium and technetium — unstable elements which occur in nature only as very dilute trace contaminants. To argue, however, that the paucity of their abundance would have made this task of detection ***impossible*** begs the question of how micro-psi functions. For example, instead of ***single*** atoms always being chosen, perhaps thousands or millions of atoms can come simultaneously under the focus of micro-psi vision, with the final selection of atoms from this sample being nonrandom. Alternatively, perhaps the descriptions of these short-lived elements were based not on single, chance observations but on many sample observations of the same mineral, in which differences due to radioactive decay of atoms were occasionally noticed. According to Jinarajadasa's introduction to the third edition of ***Occult Chemistry,*** Leadbeater often went to the Dresden Museum during a holiday in Germany in 1907 and recorded pictures of the atoms in minerals displayed there, later examining his recorded images in more detail. Perhaps he used this play-back facility to spot short-lived atoms. In the absence of any information about the ***modus operandi*** of micro-psi (apart from that it can apparently permit recording and play-back of images), it would be wrong to prejudge its capacity to detect atoms of very rare elements, however unlikely it may seem that such atoms could have come under micro-psi observation.

Given that the gaps in the periodic table represented by these anticipated unstable elements were known to Besant & Leadbeater, how can we be sure that their descriptions were based upon real objects and were not fabricated according to their expectations? Knowing which groups of the periodic table these undiscovered elements belong to could have enabled them to deduce what shape their atoms ought to have, having decided upon a rule to link atomic shapes to groups. But the values of the atomic weights of these elements were unknown to science at the time when Besant and Leadbeater published observations of them and yet the "number weights" (defined shortly) that they calculated for these elements agree with their chemical atomic weights to within one unit. It is highly implausible that this measure of agreement could have come about by chance in every case. Furthermore, analysis (Phillips, 1994) of the particles reported to have been observed in the supposed atoms of these elements undiscovered by science at the time reveals such a high degree of agreement with the theory presented in this paper to explain micro-psi observations of atoms that neither deliberate fabrication nor hallucinations influenced by knowledge of the gaps in the periodic table are realistic explanations of these elements being examined before their scientific discovery. These two considerations strongly suggest that the descriptions by Besant and Leadbeater of the supposed atoms of these elements must have been based upon physical objects, for there is simply no more plausible alternative that can explain such a measure of agreement.

Micro-psi Atoms

Besant and Leadbeater found different specimens of an element to be made up of similar objects. Assuming them to be atoms, they classified these structural units according to their shape into seven groups: spike, dumb-bell, tetrahedron, cube, octahedron, bars and star (Figure 1). They found that the form of a "micro-psi atom" (MPA) correlated with the position of its corresponding element in the periodic table, i.e. all elements in the same group of the table (and therefore having similar chemical properties) had MPAs with similar shapes (Table 1). For example, all the inert gases had star-shaped MPAs, plating them in the star group, while the divalent elements other than oxygen had MPAs consisting of a tetrahedral array of four funnels centered on a central globe, placing them in the tetrahedral group (see Phillips, 1980). This correlation enabled the two Theosophists to check their identification of MPAs. It is, of course, not itself evidence of the physical reality of MPAs because the skeptic might argue that they could have known sufficient chemistry to either fabricate the correlation or influence the form of what were purely hallucinatory images of MPAs. If, however, prior expectations by Besant and Leadbeater based upon their knowledge of the periodic table had *alone* determined the shapes of MPAs, all group IIA elements would be in Tetrahedron Group A,

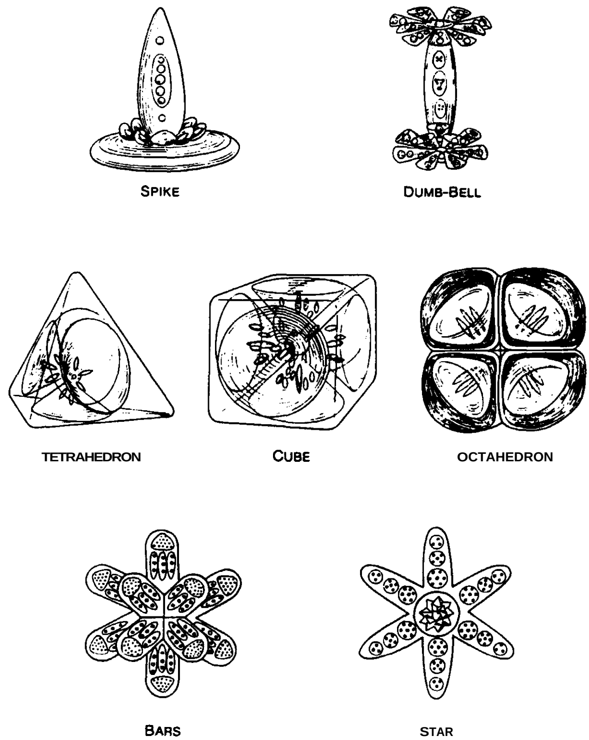

Fig. 1. The seven classes of MPAs.

whereas one of these elements — magnesium — is actually in Tetrahedron Group B, which contains MPAs whose structures are slightly different from those in Tetrahedron Group A. Moreover, all group IIIB elements would be in Cube Group B, whereas one — boron — is in Cube Group A, while all group IVB elements would have been in Octahedron Group B, whereas they appear in ***both*** subgroups. The fact that elements in the ***same*** subgroup of the chemical periodic table do ***not*** always occur in the ***same*** subgroup of the micro-psi version of this table is not what one would expect if the two Theosophists had been influenced by their knowledge of chemistry, which could not have provided any reason for spreading their assignments in this way. The notion of hallucinations is, anyway, untenable in this context because — as will be explained later — hallucinations could not have generated a linear relationship between the numbers of fundamental constituents of MPAs and the ***mass numbers of their corresponding atomic nuclei*** — information which scientists began to acquire only in the 1930s, more than twenty years after descriptions of the MPAs of most elements had been published.

Hydrogen, helium, nitrogen and oxygen did not fit the micro-psi classification. The hydrogen MPA (Figure 2) was "seen to consist of six small bodies, contained in an egglike form.... It rotated with great rapidity on its own axis, vibrating at the same time, the internal bodies performing similar gyrations.

SPIKE GROUP	DUMB-BELL GROUP	TETRAHEDRON GROUP		CURE GROUP		OCTAHEDRON GROUP		BARS GROUP	STAR GROUP
		A	B	A	B	A	B		
IA Lithium	IA Sodium	**IIA** Beryllium	IIA Magnesium	IIIB Boron	IIIR Aluminium	**IVB** Carbon	IVB Silicon	VIII Iron	0 Neon
VIIB Fluorine	VIIB Chlorine	VIB (Oxygen)	VIB Sulphur	VB (Nitrogen)	VB Phosphorus	IVB Titanium	IVB Germanium	**VIII** Cobalt	0 Argon
IA Potassium	**IB** Copper	IIA Calcium	IIB Zinc	IIIA Scandium	IIIB Gallium	IVA Zirconium	IVB Tin	VIII Nickel	0 Krypton
VIIA **Manganese**	**VIIB** **Bromine**	VIA Chromium	VIB Selenium	VA Vanadium	VB Arsenic	Ln Cerium	Ln Terbium	**VIII** Ruthenium	0 Xenon
IA Rubidium	**ID** Silver	**IIA** Strontium	IIB Cadmium	IIIA **Yttrium**	IIIB Indium	IVB Hafnium	**IVB** Lead	VIII Rhodium	**"Kalon"**
VIIA. Technetium **("Masurium")**	VIIB Iodine	VIA Molybdenum	VIB Tellurium	VA Niobium	VB Antimony	IV**A** Thorium		VIII Palladium	0 Radon
IA Caesium	**Ln** Samarium	IIA Barium	Ln Europium	IIIA Lanthanum	Ln Gadolinium			Elements "X," "Y," and "Z"	
Ln Promethium **("Illinium")**	Ln Erbium	Ln Neodymium	Ln Holmium	Ln Praseodymium	Ln Dysprosium			VIII Osmium	
Ln Thulium	IB Gold	**Ln** Ytterbium	IIB **Mercury**	Ln **Lutecium**	IIIB Thallium			VIII . Iridium	
VIIA Rhenium	VIIB Astatine **("85")**	VIA Tungsten	VIB Polonium	VA Tantalum	VB Bismuth			**VIII** **Platinum**	
IA Francium **("87")**		**IIA** Radium		IIIA Actinium					
		VIA **Uranium**		V Protactinium					

TABLE 1
Micro-psi classification of the elements

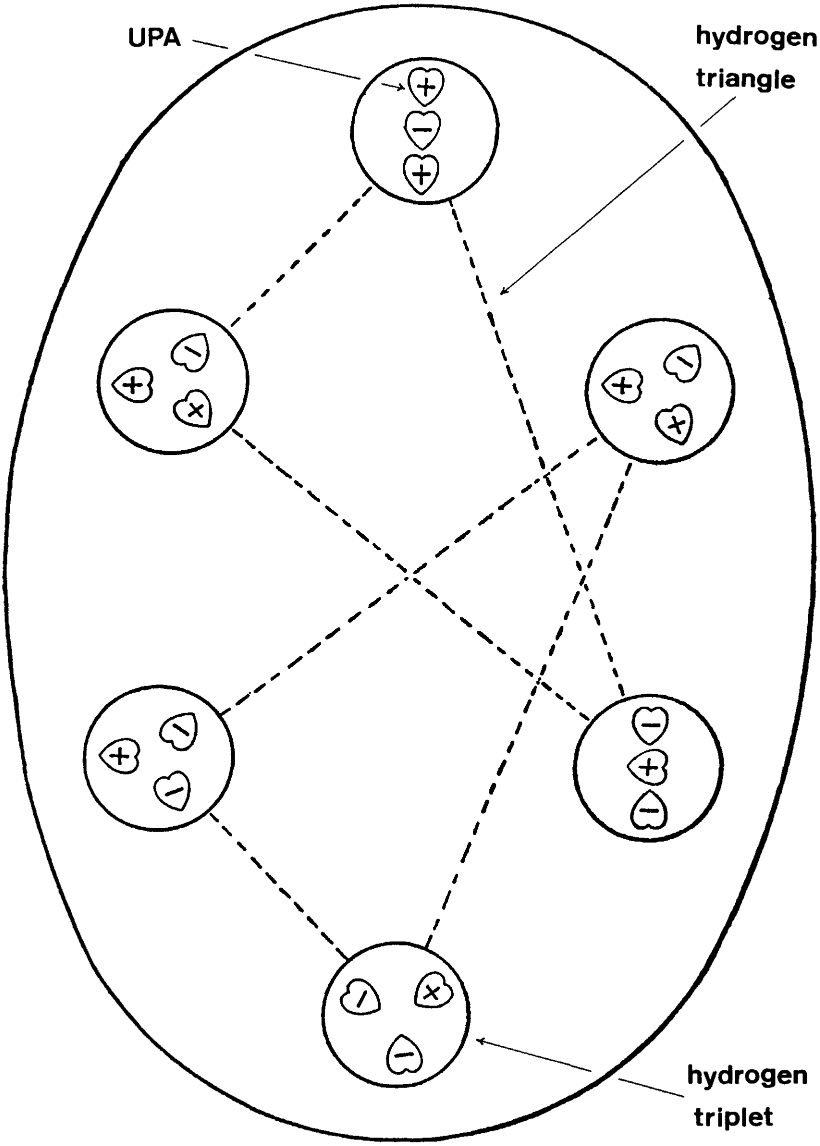

Fig. 2. The hydrogen MPA (from Occult Chemistry (3rd ed.)).

The whole atom spins and quivers and has to be steadied before exact observation is possible. The six little bodies are arranged in two sets of three, forming two triangles that are not interchangeable" (Besant and Leadbeater, 1951). Each body (called a "hydrogen triplet") contained three "points of light," arranged in a triangle in four of the bodies and in a straight line in the two others. Higher magnification revealed these points to be three-dimensional images of particles (Figure **3).** As they were the basic constituents of all MPAs, Besant and Leadbeater called them "ultimate physical atoms" (UPAs), claiming that they were the fundamental, indivisible constituents of matter. The UPA consists of 10 separate, non-touching, closed curves, or "whorls," three of which ("major whorls") appear brighter and thicker than the other seven "minor whorls." The whorls spiral side by side 2 $^1/_2$ times around the surface of a sphere, the major and minor ones separating at the lower end of the UPA and spiralling upwards towards the broader end while revolving 2 $^1/_2$ times around the central axis and crossing over one another like the double-helix of the DNA molecule. Each whorl thus makes five revolutions, the ten whorls of the UPA twisting around its axis fifty times. The heart-shaped particle pulsates and spins rapidly about its axis, which also precesses in a spinning top motion. As it does so, one of the minor whorls may vibrate more actively than the others and radiate — according to the micro-psi vision — "shades of color," which change as one whorl after another becomes active. Besant and Leadbeater noticed two chiral forms of the UPA, one the mirror image of the other: a "positive" variety in which all its whorls spiral clockwise (looking down from the wider end) and a "negative" type with its whorls spiralling anticlockwise.

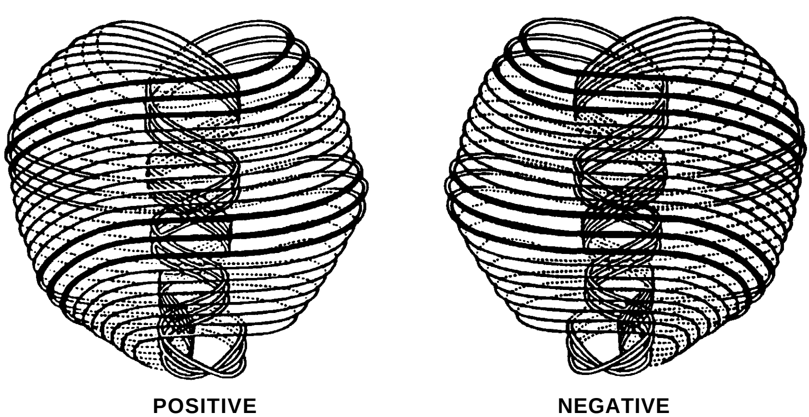

Fig. 3. The two chiral types of UPAs (from Occult Chemistry (3rd ed.)).

As Figure 1 indicates, MPAs are ***symmetrically*** arranged aggregates of different types of particles which, according to Besant and Leadbeater, are made up of many clusters of UPAs. In general the same number of UPAs making up the same set of particles are present within, say, each one of the six funnels of an MPA belonging to the cube group or each of the six arms of an MPA in the star group. Although an MPA may contain many different types of particles, with at least one of them being characteristic of the element in question, they appear in many other MPAs. These two traits of MPAs simplified Besant's and Leadbeater's task of finding how many UPAs an MPA contained because it meant that they did not have to count every one; they had merely to identify what types of particles containing previously determined numbers of UPAs were present in, say, a funnel, count how many particles of each type it contained and then multiply the number of funnels by the calculated number of UPAs inside a funnel. When they compared the UPA populations of elements, they found that the numbers were proportional approximately to the chemical atomic weights of the appropriate element (they normally knew beforehand what element they were examining). For example, noting that the hydrogen MPA contains 18 UPAs, the MPA of helium (with an atomic weight of 4) has 72 UPAs, four times that for hydrogen, the MPA of carbon (with an atomic weight of 12) has 216 UPAs, twelve times that for hydrogen and the MPA of oxygen (with an atomic weight of 16) has 290 UPAs, almost sixteen times that of hydrogen. 39 of the 111 MPAs that they recorded were found to have populations that were exact, integer multiples of 18. This relationship between UPA populations and atomic weights was accurate enough to enable Besant and Leadbeater to check the identity of the element corresponding to an MPA by comparing its "number weight", defined as

$$\text{number weight} = \text{UPA population118},$$

with scientific tables of atomic weights and by picking out the element whose atomic weight best agreed with this number weight. The fact that the agreement is only ***approximate*** is very significant because it is evidence that Besant and Leadbeater did not invent this rule in order to concoct an impressive correlation with chemistry. The population data published for the 57 elements both known to science and examined by Besant and Leadbeater up to 1908 do not support the hypothesis of fraud because, if one assumes that they used a made-up formula $N = 18X$ to fabricate populations (N) with the aid of a certain list of atomic weights (X) given in the first edition of their book ***Occult Chemistry,*** one finds that the best fit is

$$N = (18.055 \pm 0.014)X.$$

Their data, therefore, are fitted very poorly by the formula $N = 18X$ and the hypothesis that they were fabricated must be rejected because it is highly unlikely @ $< 10^{-4}$).

Problems With Science

Besant and Leadbeater established two correlations between their micro-psi observations and chemistry, namely, that MPAs in the same group of the chemists' periodic table have the ***same*** shape, and that the number of UPAs belonging to an MPA is approximately proportional to the atomic weight of the corresponding element, the proportionality constant — 18 — being the ***same*** for every element. But these were about the only discoveries Besant and Leadbeater made which did not seem to conflict with science. Some of the most serious problems are:

1) Although, when chemical compounds were examined, different MPAs combined into larger units in the same numbers as the corresponding atoms are known to do in their molecules, MPAs were often seen to be ***broken*** up and their constituents mixed with those of other MPAs — in total disagreement with what is known in chemistry. Leadbeater realized that such observations conflicted with atomic theory when he studied chemical compounds with his micro-psi faculty in the mid-1920s. But this did not stop him from claiming that MPAs were atoms, a persistence which makes evaluation of the Theosophists' work seem all the more perplexing because it is, of course, not the expected behavior of a psychic fraudster, who would have made sure his observations agreed with what was scientifically known at the time;
2) MPAs do not resemble the Rutherford-Bohr model of the atom. While Besant and Leadbeater might be forgiven for not noticing the much smaller atomic electrons — either as discrete particles or as waves — if their micro-psi vision automatically focussed upon atomic nuclei, the large variety of particles they reported inside MPAs is inconsistent with the fact established in 1932 that atomic nuclei are aggregates of just two types of particles — protons and neutrons;
3) Leadbeater described (1951) the molecule of benzene as octahedral in shape, whereas chemists already knew that it is flat and hexagonal. Worse still, instead of seeing three ***whole*** MPAs of oxygen in the ozone molecule, Leadbeater reported that the unit of ozone consisted of three objects each of which was one of the two dissimilar halves of an MPA of oxygen — that is, $1\,^1/_2$ MPAs in total!;
4) Situated in the periodic table between the two sets of transition elements ruthenium, rhodium & palladium and osmium, iridium & platinum and belonging — like these elements — to the bars group are elements Besant and Leadbeater called “X,” “Y,” and “Z,” while lying between xenon and radon is another inert gas belonging to the star group, an element they called “kalon,” describing it in 1907 as being very rare com-

pared with the other inert gases. These four MPAs have number weights of 147.00, 148.55, 150.11 and 169.67, which differ too much from the mass numbers of isotopes of their neighbors in the bars group for it to be possible to identify them as such. But the periodic tables has no room for three unknown transition elements and an unknown inert gas; according to atomic theory, the elements X, Y, Z and kalon, which Besant and Leadbeater thought would be eventually discovered by science, simply cannot exist.

Such problems amount to overwhelming, irrefutable arguments against the two Theosophists' interpretation of MPAs as atoms. No amount of special pleading or implausible, ad hoc models of the *modus operandi* of micro-psi can resolve the conflict between established scientific facts and their wrong *assumption* that their micro-psi faculty enabled them to observe atoms in a natural, undisturbed state. Micro-psi is an interactive form of observation on particles requiring, according to Besant and Leadbeater, the exercise of the "special form of will-power" to slow down the motions of particles sufficiently for micro-psi images to become discernible. Such retardation would inevitable alter or destabilize the quantum state of what is selected for observation. But are MPAs, perhaps, excited states of atomic nuclei, highly disturbed by the act of observing their constituents with micro-psi? If so, the hydrogen MPA could be one of the baryons that belong to the two spin-$^{1}/_{2}$ octets or to the spin-$^{3}/_{2}$ decuplet of baryons known to particle physicists, being formed from one of the two protons in a hydrogen molecule that came under observation when the gas was examined. But these baryons have lifetimes of the order of 10^{-10} seconds, whereas Besant and Leadbeater reported the hydrogen MPA to be stable. Furthermore, why should they miss observing the other proton in a hydrogen molecule that is of the same order of size as molecules of compounds they *did* describe? They stated categorically (1951) that "hydrogen atoms were not observed to move in pairs." Admittedly, any energetic process accompanying micro-psi observation might have dissociated the molecule, leaving only one proton to be focussed upon. But why did this not happen when they examined water, the molecule of which they described correctly as composed of two hydrogen MPAs and one oxygen MPA?

A more fundamental problem of the interpretation of the hydrogen MPA as a baryon made up of 18 UPAs is as follows: according to the quantum-mechanical rules of addition of angular momentum, the total angular momentum of a system of even numbers of identical particles — whether fermions or bosons — is an integer multiple of A, the (reduced) Planck's constant. As 18 is an even number, the spin angular momentum of the hydrogen MPA must be an integer multiple of A and so it cannot be one of the known baryons belonging to the two octets and the decuplet, which have half-integral values of spin. If *some* of the UPAs in the hydrogen MPA had spin 0 and some spin $^{1}/_{2}$, it would then be possible for the MPA to contain an even number of UPAs. But the possibility that some UPAs lacked spin angular momentum is inconsistent with the fact that no non-rotating UPAs were ever noticed by Besant and Leadbeater, according to whom every UPA "turns incessantly upon its own axis, spinning like a top." When he re-examined the hydrogen MPA in 1932, Leadbeater must have looked at every one of its UPAs because he specified whether each was positive or negative (see Figure 2). So he would certainly have noticed if some UPAs in the hydrogen MPA were not spinning. The possibility that the UPAs in the hydrogen MPA had different spins is thus untenable — it cannot be a baryon.

Such problems render untenable the idea that MPAs are highly excited states of atomic nuclei. But what else could the two Theosophists have seen? Firstly, if their visions were nothing more than shared hallucinations that extended intermittently over a period of 38 years (an implausible scenario in itself), why should the form of an MPA have correlated with the position of the element in the periodic table if it were *not* an atom? The skeptic may argue that the correlation was fabricated either consciously or unconsciously. But if this had been true, one would expect all group IIA elements to be in Tetrahedron Group A, whereas the MPA of the element magnesium is in fact in Tetrahedron Group B, which contains MPAs with a slightly different structure to those in Tetrahedron Group A. Also, the MPAs of group IVB elements would be expected to have been placed in either Octahedron Group A or Octahedron Group B — they would not have been put into *both* subgroups. The fact that elements in the same subgroup of a group of the periodic table do *not* always occur in the same subgroup of the micro-psi version of this table is inconsistent with what one would expect if Besant and Leadbeater had been merely guided by their knowledge of chemistry to fabricate the correlation. Secondly, how could hallucinations, whose cause was located entirely inside their brains and not outside amongst the trillions of atoms in all the chemicals they examined, generate UPA populations in MPAs that always turned out to be about 18 times the correct atomic weights of their elements? This is true, remarkable, even for elements like francium and astatine, whose atomic weights must have been unknown to Besant and Leadbeater because science discovered them in, respectively, 1939 and 1940, about seven years after the deaths of the two Theosophists. How, if MPAs are *not* atoms, could they have anticipated in 1908 — five years before scientists suspected the existence of isotopes — the fact that an element such as neon could have more than one type of atom, an MPA, moreover, whose calculated number weight of 22.33 is consistent with their having detected with micro-psi the neon-22 nuclide before the physicist J. J. Thomson discovered it in 1913? One must turn to particle physics for answers.

Quark Model

According to the well-established quark model, proposed by Murray Gell-Mann and George Zweig in 1964, strongly interacting subatomic particles are composed of fundamental spin-$^1/_2$ particles called "quarks." The current, so-called "standard model" of particle physics requires six varieties of quarks to exist: the up (u), down (d), charm (c), strange (s), top (t) and bottom (b) quarks. These six types of quarks consist of three sets, or "generations," or pairs of quarks:

$$\begin{pmatrix} u \\ \hline d \end{pmatrix} \begin{pmatrix} c \\ \hline s \end{pmatrix} \begin{pmatrix} t \\ \hline b \end{pmatrix},$$

the upper (lower) number of a pair having, in terms of the unit of electric charge of the electron, an electric charge of $^2/_3$ ($-^1/_3$). The lightest quark is the up quark. Together with its partner, the down quark, it makes up the protons and neutrons inside atomic nuclei. A proton consists of two positively charged up quarks and a negatively charged down quark and a neutron consists of one up quark and two down quarks. Because the standard model provides no reason why experiments should indicate that there are only six types of quarks, some physicists, including the author (Phillips, 1979), have proposed that quarks are not fundamental but are composed of still smaller, indivisible particles. Although called "preons" by physicists, these as yet hypothetical entities will be referred to in this paper as "subquarks," a term which refers to no particular published theory and which does not have the possibly false implication that leptons are also composed to preons, as theories of preons usually require (see Harari, 1984).

If quarks consist of three subquarks, protons and neutrons would each consist of nine subquarks, bound together as three groups of three subquarks (Figure 4). Compare this picture with Figure 2, showing how Leadbeater portrayed the hydrogen MPA in 1932. An egg-shaped ovoid contains two overlapping triangular arrays ("hydrogen triplets"), each enclosing a group of three UPAs.[1]

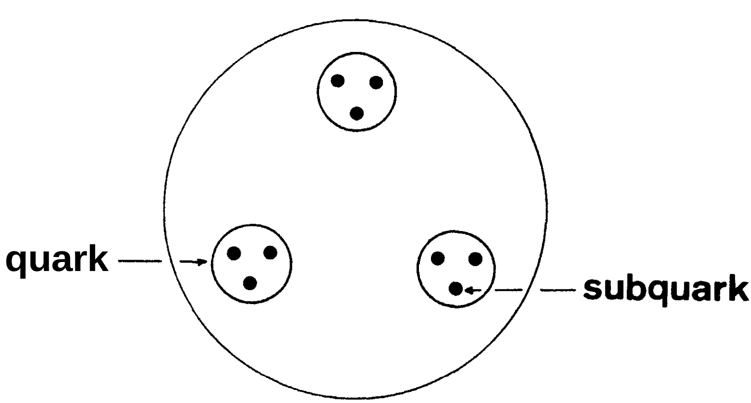

Fig. 4. The subquark model of the proton or neutron.

[1] **This diagram is purely schematic and is not drawn to scale.**

Besant and Leadbeater distinguished between "positive" and "negative" groups of UPAs. Although they never explained what they meant by these terms,[2] they indicated this difference diagrammatically by depicting positive groups of UPAs such as hydrogen triplets with their heart-shaped UPAs pointing outward from the geometrical center of the bound state, while negative triplets were depicted with their UPAs pointing inward towards the center. The lower hydrogen triangle in Figure 2 contains two positive triplets and one negative triplet. Compare this with the fact that a proton contains two positively charged u quarks and one negatively charged d quark. Hydrogen has a diatomic molecule consisting of two protons bound together by their electrical attraction to two shared electrons. Suppose, therefore, that the lower hydrogen triangle is a proton originating from a hydrogen molecule that came under Leadbeater's observation. Then, according to quark theory, each positive triplet would be a positively charged u quark and the negative triplet would be a negatively charged d quark, implying ***that the UPA is a subquark.*** The upper hydrogen triangle contains a positive triplet (u quark), a linear triplet of UPAs that is negative (d quark) because its outer UPAs point inward and a linear triplet whose polarity (and therefore quark type) cannot be inferred because for some unknown reason the diagrammatic convention for depicting triplets was not followed for this triplet.[3] This means that the upper hydrogen triangle could be either a proton or a neutron. According to Besant and Leadbeater, the hydrogen MPA was stable. This rules out the proton because the diproton is known to be unstable, although one cannot exclude the possibility that the hydrogen MPA was not observed in real time, in which case its micro-psi image could have been a "play-back recording" — to be examined at leisure — of a brief moment in the short life of a diproton. The neutron is possible if the intervention of the micro-psi observer induced for some reason an inelastic collision between the two protons in the hydrogen molecule which resulted in one of them changing into a neutron that became bound to the other, creating a deuteron, which is stable:

$$ {}^1_1\mathrm{H} + {}^1_1\mathrm{H} \rightarrow {}^2_1\mathrm{H} + \pi^+ , $$

the pion flying away and thus escaping observation. In view of the process of formation of MPAs to be hypothesized shortly, this possibility is not as ad hoc as it may seem. An observation by Besant and Leadbeater consistent with the hydrogen MPA being a deuteron is that "each of the three groups making one half of Hydrogen are linked to each other across space by lines of attraction."

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[2]These terms cannot simply indicate whether bound states of UPAs consist of more positive UPAs than negative ones or more negative UPAs than positive ones becaue one of the (+) triplets in the lower hydrogen triangle of the hydrogen MPA has two positive UPAs whereas the other (+) triplet has two negative UPAs and one positive UPA.

[3]This triplet is depicted on page 43 of the first edition of *Occult Chemistry* not as a bound state of UPAs but as a set of *free* UPAs — an obvious error which Leadbeater did not correct when he re-examined in 1932 the hydrogen atoms in a water molecule and which reappeared in the third edition edited by his colleague, C. Jinarajadasa, without its recognition by the latter as an error.

This could be simply the nuclear force binding the proton and neutron together in a deuteron. The fact that it bound two triangular arrays of three quarks means that this MPA cannot be the so-called "demon deuteron," a dibaryon made up of three u-d diquarks, which was suggested by Fredriksson and Jandel (1982) to explain anomalies in high-energy collisions of heavy ions and cosmic rays.

Leadbeater could not have observed the deuteron in one end of a diatomic DH or D_2 molecule in hydrogen because their rarity compared with H_2 molecules means that he would usually have seen just one hydrogen triangle whenever he examined hydrogen, and so he would have reported the version of the MPA consisting of ***pairs*** of hydrogen triangles as rare, as he did sometimes when examining isotopic variations of other elements. Similarly, the hydrogen MPA cannot depict one end of an H_2 molecule because Leadbeater would then have observed only one hydrogen triangle/proton. Nor can it depict a whole hydrogen molecule because the two hydrogen triangles were seen to intersect each other, as Figure 2 indicates, whereas the distance between the two protons in a hydrogen molecule is of the order of magnitude of 10^{-8} cm — about 100,000 times the experimentally measured rms radius, 0.81×10^{-13} cm, of the proton's charge distribution.

A Statistical Test

It is possible, therefore, that the micro-psi powers of Besant and Leadbeater allowed them to observe not single hydrogen atoms — as they supposed — but, instead, a deuteron formed by the collision of pairs of these atoms. Suppose this was true for all the MPAs they observed, i.e. the MPA of every element contains the subquarks originally making up the protons and neutrons in two of its nuclei because the MPA is formed prior to micro-psi observation from ***two*** atoms of the element. This generalization makes the following testable prediction: if quarks contain three subquarks, then protons and neutrons, which consist of three quarks, must each contain nine subquarks. The number of protons and neutrons in a nucleus is its mass number **A.** Therefore, the number of subquarks in a nucleus is **9A.** If, as in the case of hydrogen, two atomic nuclei of an element form its MPA, the identification of UPAs as subquarks implies that the number of UPAs in an MPA formed from two similar atoms of a nuclide of mass number A is

$$N(A) = 18A.$$

The number weight is therefore predicted to be

$$N(A)/18 = A.$$

This would explain why Besant and Leadbeater found their calculated number weight for an element to be approximately equal to its atomic weight, most elements having stable nuclides with mass numbers within one or two units range of their atomic weight. In fact, as many as 39 of the **111** MPAs recorded by Besant and Leadbeater have populations of UPAs that are exactly **18** times the mass numbers of (usually) the most abundant nuclide of their corresponding element. The first edition of their book ***Occult Chemistry*** lists atomic weights which were published in the so-called "International List" of 1905 and appeared in a scientific handbook the two Theosophists referred to throughout their collaboration. Except for hydrogen, none of these atomic weights is an integer, let alone one that is a multiple of **18.** This means that they had no reason to make population numbers multiples of **18.** Yet such multiples occur in a significant fraction (33%) of all the MPAs. If, intent on fraud, Besant and Leadbeater had decided for some reason that the hydrogen MPA should have **18** UPAs and — in order to procure the best agreement between atomic weights and their number weights — had concocted population sizes by choosing integers nearest to the fractional value of the product of **18** and the atomic weight, it is highly improbable that such a large proportion would have turned out by chance to be integer multiples of **18.** Indeed, as was pointed out earlier, choosing **18** as the proportionality constant in a relationship of proportionality between population size N and atomic weight X gives a very poor fit to the data, there being less than one chance in 10,000 that the data could have been fabricated in this way.

Even supposing that Besant and Leadbeater knew of Prout's hypothesis, formulated at the beginning of the last century and (by then) long discredited by the discovery of fractional atomic weights, that atoms are made up of hydrogen atoms and they devised populations that were often multiples of **18** in order to support this idea, it would have been far easier, as well as more consistent, to fabricate MPAs made up of pairs of hydrogen triangles — hydrogen MPAs — than to invent ***dozens*** of types of constituents of MPAs in such numbers as to make the total UPA population a multiple of **18.** Anyway, why, if intent on fabricating observations to agree with science, would the two Theosophists have made up numbers that supported an idea which any contemporary chemistry textbook would have told them was no longer believed by chemists? The facts that hydrogen MPAs and hydrogen triangles appear only rarely in the **111** MPAs recorded by Besant and Leadbeater and that the population data are very poorly fitted by the equation above (much less accurately than the prediction $N = 18A$; see below) argue strongly against the suggestion that the linear relationship between population size and atomic weight was concocted. Indeed, the very absence of hydrogen MPAs in the MPAs of nearly every other element and the presence, instead, of so many different ***types*** of particles, is incontrovertible evidence that MPAs are NOT even atoms or nuclei, let alone fabricated representations of atoms.

The difference

$$e = N - N(A)$$

between the UPA population determined by Besant and Leadbeater and the predicted number $N(A)$ of UPAs must represent either the gross error due to one or more random errors of observation or — as more often turns out to be the case — the net error due to undercounting of UPAs in some components of an MPA and overcounting in others. Table 2 shows that discrepancies between observed and predicted populations are very small (usually less than 1%) compared with the former.[4] These criteria determine the choice of nuclide that most probably formed a given MPA:

1) Abundance. The nuclide most likely to have formed the MPA is that which, amongst all the nuclides of the element, has the greatest terrestrial abundance;
2) Stability. Unless the element is naturally radioactive, the nuclide must be stable;
3) Plausibility of observational error. The magnitude of e should be compatible with the geometrical symmetry of the MPA. This is because, as explained earlier, Besant and Leadbeater did not count every UPA in an MPA but, instead, calculated the number in a component of the MPA, using previously established count numbers from individual groups of UPAs, and then multiplied this number by the number of identical components, thereby worsening any actual miscounting of UPAs. For example, a nuclide is not a plausible candidate if it predicts an error $e = 3$ for an MPA consisting of four identical parts,

Figure 5 demonstrates that the population data of Table 2 are best fitted in a graph by the straight line

$$N = (0.48 \pm 3.99) + (18.03 \pm 0.03)A,$$

which confirms the theoretical prediction $N = 18A$ at the 5% confidence level.

In the case of elements having only one stable nuclide there is no uncertainty as to which nuclide formed the MPA. A sample of 23 such elements with single nuclides provides the best fit

$$N = (18.042 \pm 0.044)A,$$

which differs from the model prediction by less than one standard deviation. The population data for MPAs of elements having only one stable isotope strongly supports the hypothesis that MPAs are formed from two atomic nuclei of the corresponding element.

[4] 95 of the 111 MPAs recorded in the 3rd edition of *Occult Chemistry* are listed here. The rest are either MPAs to which no element can be assigned and which could *only* have been formed from nuclides of two *different* elements or MPAs formed from two different nuclides of the same element, for both of which possibilities the formula $N = 18A$ is inappropriate.

TABLE 2
Counted UPA N and Predicted Subquark $N(A)$ Populations of 95 MPAs

Element	Nuclide	N	$N(A)$	Error	Element	Nuclide	N	$N(A)$	Error
Hydrogen	^{1}H	18	18	0	Cadmium	^{112}Cd	2,016	2,016	0
Deuterium	^{2}H	36	36	0	Tin	^{118}Sn	2,124	2,124	0
Helium	^{3}He	54	54	0	Antimony	^{121}Sb	2,169	2,178	-9
	^{4}He	72	72	0	Iodine	^{127}I	2,287	2,286	+1
Lithium	^{7}Li	127	126	+1	Xenon	^{129}Xe	2,298	2,322	-24
Beryllium	^{9}Be	164	162	+2	Xenon (m)	^{130}Xe	2,340	2,340	0
Boron	^{11}B	200	198	+2	Caesium	^{133}Cs	2,376	2,394	-18
Carbon	^{12}C	216	216	0	Barium	^{136}Ba	2,455	2,448	+7
Oxygen	^{16}O	290	288	+2	Lanthanum	^{139}La	2,482	2,502	-20
	^{17}O	310	306	+4	Cerium	^{140}Ce	2,511	2,520	-9
Fluorine	^{19}F	340	342	-2	Praseodymium	^{141}Pr	2,527	2,538	-11
Neon	^{20}Ne	360	360	0	Neodymium	^{143}Nd	2,575	2,574	+1
Neon (m)'	^{22}Ne	402	396	+6	Promethium	^{147}Pm	2,640	2,646	-6
Sodium	^{23}Na	418	414	+4	Promethium (m)	^{151}Pm	2,736	2,718	+18
Magnesium	^{24}Mg	432	432	0	Samarium	^{154}Sm	2,794	2,772	+22
Aluminum	^{27}Al	486	486	0	Europium	^{153}Eu	2,843	2,754	+89
Silicon	^{28}Si	520	504	+16	Gadolinium	^{160}Gd	2,880	2,880	0
Phosphorus	^{31}P	558	558	0	Terbium	^{159}Tb	2,916	2,862	+54
Sulphur	^{32}S	576	576	0	Dysprosium	^{164}Dy	2,979	2,952	+27
Chlorine	^{35}Cl	639	630	+9	Holmium	^{165}Ho	3,004	2,970	+34
	^{37}Cl	667	666	+1	Erbium	^{168}Er	3,029	3,024	+5
Argon	^{40}Ar	714	720	-6	Thulium	^{169}Tm	3,096	3,042	+54
Potassium	^{39}K	701	702	-1	Ytterbium	^{174}Yb	3,131	3.132	-1
Calcium	^{40}Ca	720	720	0	Lutecium	^{178}Lu	3,171	3,150	+21
Scandium	^{45}Sc	792	810	-18	Hafnium	^{178}Hf	3,211	3,204	+7
Titanium	^{48}Ti	864	864	0	Tantalum	^{181}Ta	3,279	3,258	+21
Vanadium	^{51}V	918	918	0	Tungsten	^{183}W	3,299	3,294	+5
Chromium	^{52}Cr	936	936	0	Rhenium	^{187}Re	3,368	3,366	+2
Manganese	^{55}Mn	992	990	+2	Iridium	^{193}Ir	3,458	3,474	-16
Iron	^{56}Fe	1,008	1,008	0	Platinum (A)	^{194}Pt	3,486	3,492	-6
Cobalt	^{59}Co	1,036	1,062	-26	Platinum (B)	^{196}Pt	3,514	3,528	-14
Nickel	^{60}Ni	1,064	1,080	-16	Gold	^{197}Au	3,546	3,546	0
Copper	^{63}Cu	1,139	1,134	+5	Mercury (A)	^{199}Hg	3,576	3,582	-6
Germanium	^{72}Ge	1,300	1,296	+4	Mercury (B)	^{200}Hg	3,600	3,600	0
Arsenic	^{75}As	1,350	1,350	0	Thallium	^{205}Tl	3,678	3,690	-12
Bromine	^{79}Br	1,439	1,422	+17	Lead	^{207}Pb	3,727	3,726	+1
Krypton	^{82}Kr	1,464	1,476	-12	Bismuth	^{209}Bi	3,753	3,762	-9
Krypton (m)	^{84}Kr	1,506	1,512	-6	Polonium	^{210}Po	3,789	3,780	+9
Rubidium	^{85}Rb	1,530	1,530	0	Astatine (85)	^{219}At	3,978	3,942	+36
Strontium	^{88}St	1,568	1,584	-16	Emanation	^{222}Em	3,990	3,996	-6
Yttrium	^{89}Y	1,606	1,602	+4	Emanation (m)	^{220}Em	4,032	3,960	+72
Zirconium	^{90}Zr	1,624	1,620	+4	Francium (87)	^{223}Fr	4,006	4,014	-8
Niobium	^{93}Nb	1,719	1,674	+45	Radium	^{226}Ra	4,087	4,086	+19
Molybdenum	^{97}Mo	1,746	1,746	0	Actinium	^{228}Ac	4,140	4,104	+36
Technetium	^{99}Tc	1,802	1,782	+20	Thorium	^{232}Th	4,187	4,176	+11
Ruthenium	^{102}Ru	1,848	1,836	+12	Protactinium	^{234}Pa	4,227	4,212	+15
Rhodium	^{103}Rh	1,876	1,854	+22	Uranium	^{238}U	4,267	4,284	-17
Palladium	^{106}Pd	1,904	1,908	-4					

'(m) denotes isotopic variation.

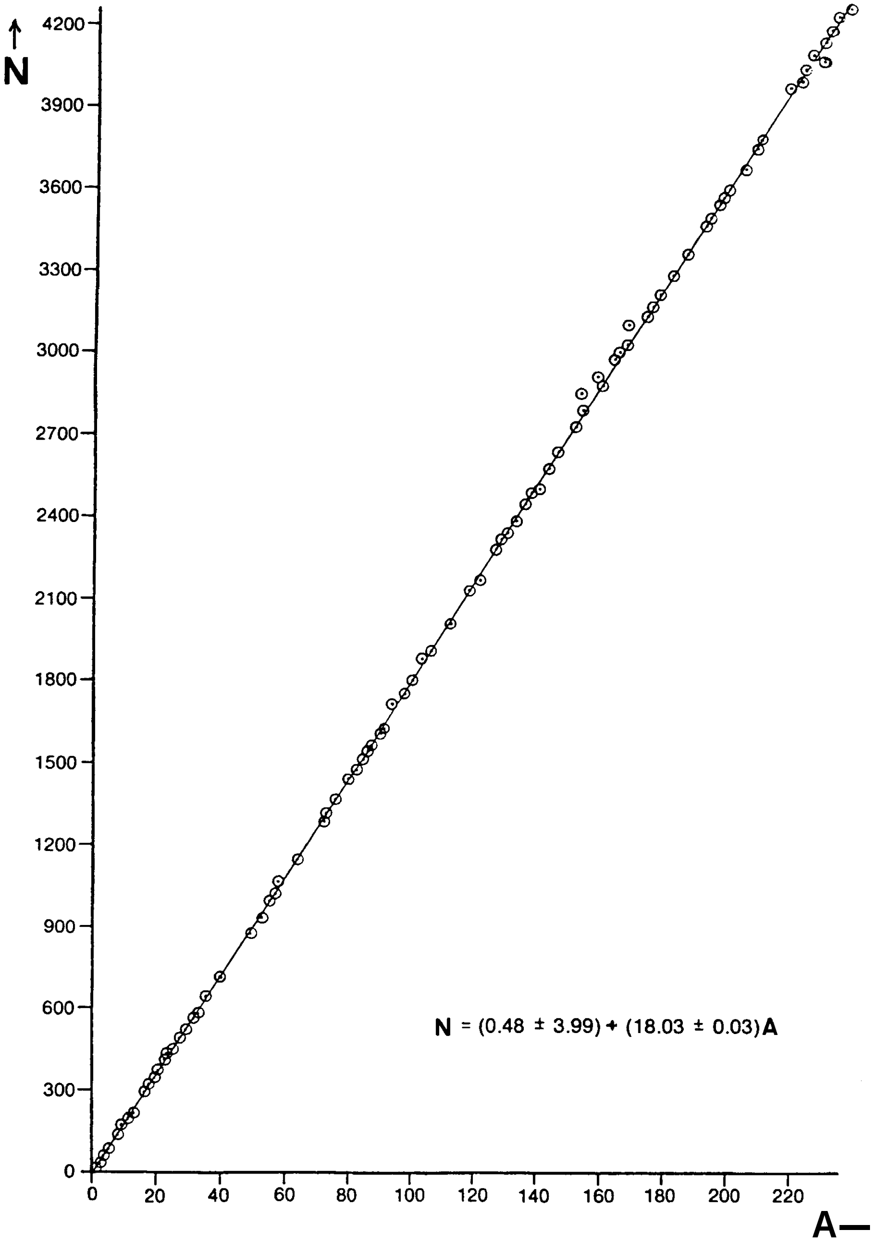


Fig. 5. Graph of UPA population (N) versus mass number (A).

It is only to be expected that errors crept into the micro-psi observations because many MPAs contain several thousand UPAs making up numerous subatomic particles, all bound together in clusters and moving in complex orbitals. It testifies to Besant's and Leadbeater's accuracy that their predicted observational errors are so small. Indeed, *actual* errors of counting UPAs that belong to individual particles must have been even smaller because the method of determining populations (mostly Leadbeater's task) inflated the effect of any miscounting. Moreover, if an error had been made in the counting of UPAs belonging to a particle the first time it was observed, this mistake would have been perpetuated in the determination of UPA populations for *all* elements later examined whose MPAs contained this particle, leading to discrepancies between observation and prediction which could be larger than the actual random errors of observation and prediction which could be larger than the actual random errors of observation or counting. Analysis of 50 MPAs reveals (Phillips, 1982) several examples of this compounding of errors which, when corrected for by taking into account predicted miscounting of UPAs in some of their particles, are found always to have UPA populations which are in *exact* agreement with prediction. In other words, corrections remain consistent with other MPAs containing the same particles. By not counting all the UPAs in every newly found MPA, Besant and Leadbeater introduced a source of systematic error into their work, although this methodological weakness is forgivable in view of the herculean task they would have faced in counting every one of the possibly thousands of UPAs in an MPA. Despite this, overall discrepancies are relatively small in magnitude because of the remarkable accuracy with which Leadbeater described the complex arrangement of particles in MPAs.

Qualitative Tests

The hypothesis that an MPA consists of the subquarks present in two (usually) similar atomic nuclei of an element has been tested qualitatively as well as quantitatively (Phillips, 1980) by analyzing 23 of the 26 MPAs Besant and Leadbeater described for the first 20 elements of the periodic table, including several of their isotopes. For the sake of convenience of discussion, a particular subquark model (Phillips, 1979) was employed. But the only property of this model that was *effectively* used and successfully tested is its prediction of the subquark composition of u and d quarks:

$$u = (X,X,Y), \quad d = (X,Y,Y),$$

where X is a subquark which is positively charged ($+^5/_9$, in the author's model) and Y is a subquark with negative electric charge ($-^4/_9$, according to this model). Using only this model-dependent prediction,[5] a remarkably high level

[5]This prediction of the author's model may remain valid despite the latter's wrong prediction of the number of quark generations and its incompatibility with superstring theory, which is based upon a unified gauge symmetry group of lower rank.

of agreement was found between elementary facts of nuclear physics, the quark model and nearly every one of the thousands of details in this sample of MPAs. Not only did the UPA populations agree exactly with prediction in over 50% of the cases, discrepancies being plausibly explainable in terms of small, observational errors, but — even more significant — the types of particles, their reported "positivity" or "negativity" and even the numbers of each type were found to be consistent with the hypothesis that an MPA is formed from two atomic nuclei of an element. This extremely detailed confirmation was made possible because nearly half of the 111 MPAs published in the third edition of Besant's and Leadbeater's book ***Occult Chemistry*** have diagrams depicting ***every*** particle observed in these MPAs, as well as the triplets and pairs of UPAs composing them. Their convention of representing in these diagrams "positive" and "negative" groups of UPAs proved invaluable because it enabled correlation between the observations and science to be made not only at the quark level but also at the subquark level. Indeed, the diagrams eliminated completely all freedom to interpret particles in MPAs in terms of their X and Y constituents because, once positive and negative hydrogen triplets are interpreted as, respectively, up and down quarks, the subquark composition of these quarks given above can in fact be ***inferred,*** and this fixes the subquark composition of particles because the diagrams display all their constituent triplets and pairs of UPAs, indicating whether they are positive or negative groups. In this way the analysis is entirely deductive — all that has to be assumed in order to analyze MPAs is that a hydrogen triangle can be a proton.

28 more MPAs were later analyzed (Phillips, 1982) in a self-consistent manner. These are the remaining MPAs to have been given diagrams allowing detailed correlations between theory and observation to be made. They provide a more stringent test of the author's hypothesis that two atomic nuclei form an MPA than the 23 MPAs previously analyzed because they contain far more varieties of particles, all of which must be identified in a way that is not only compatible with the hypothesis itself but also consistent with previously established identities for these particles, as well as, of course, with their types of constituents indicated in their individual diagrams. In other words, by having many more UPAs, these 28 MPAs pose a severer test not only of the hypothesis itself but also of self-consistency. Despite the severe restrictions imposed by the hypothesis and the predicted composition of up and down quarks, perfect agreement was discovered between the composition (as indicated by their diagrams) of particles in terms of X and Y subquarks and that found by previous analyses. This remarkably high degree of consistency cannot plausibly be accidental because of the vast number of matchings required in the total sample of 51 MPAs, many of which contained thousands of UPAs. For example, the MPA of gold, which contains 3546 UPAs, is the most populous of the MPAs of the elements having diagrams of their constituents. Yet ***every*** detail of its diagrams — that is, the composition of all the ***hundreds*** of hydrogen triplets and pairs of UPAs making up more complex particles — can be self-consistently

accounted for, this MPA having been shown (Phillips, 1994) to agree exactly with the hypothesis that it was formed from two atomic nuclei of Au-197, the only stable nuclide of this element. If this had been wrong and/or if some of the particles in the gold MPA which appear in the 23 MPAs analyzed in the author's earlier work had been physically misinterpreted, serious discrepancies would have been bound to arise either between theory and observation or between the results of earlier and later analyses. The fact that no such discrepancies emerge between theory and a vast number of observational details of 51 MPAs except what is very plausibly attributable to small, random errors of observation permits only one reasonable conclusion, namely, that Besant and Leadbeater accurately describe by ESP quasi-nuclear, bound systems of subatomic particles created from pairs of atomic nuclei of the element under observation.

Problems Solved

When Besant and Leadbeater focussed their micro-psi vision on atoms of an element (whether in the pure state or in a chemical compound), it is proposed that they caused for some reason a pair of atomic nuclei of that element to collide with sufficiently high energy for either subquarks or quarks inside them to become free momentarily, the particles in each nucleus pooling together as a plasma analogous to the quark-gluon plasma, or "quagma," that may be created soon by experiments at CERN in Switzerland involving high energy collisions of heavy ions (Greiner and Stocker, 1985). As this plasma cooled, new forms of quark matter crystallized and interacted strongly, forming a quasi-nuclear system of many types of ***stable*** constituents, bound together by electromagnetic and strong forces to create the MPA.

Physicists have suggested that stable forms of quark matter containing strange quarks as well as up and down quarks may exist. Perhaps, therefore, strange quarks are formed by the interaction between the constituent quarks released from the two atomic nuclei, their presence stabilizing the multi-quark bound states in the resulting MPA. This would not be inconsistent with the author's conclusion that two types of subquark make up MPAs because these types refer only to their electric charge, not to what particle physicists call the "flavor state" of the quarks.

Such a picture means that the conflicts with science raised by Besant's and Leadbeater's literal interpretation of MPAs — such as those discussed earlier — cease to exist. Consider, firstly, the anomalous feature of their description of molecules of chemical compounds: the scattering over the whole "molecule" of parts of different MPAs. Suppose that, when molecules were examined with micro-psi, the transformations of their atomic nuclei into MPAs happened sequentially rather than simultaneously. Such transformations would not proceed in isolation. For solids and liquids, atoms of one molecule lie close to atoms in other similar molecules. When the destabilizing intervention of the observer induced a change of state of (in turn) pairs of similar nuclei, the successive processes of formation of MPAs from pairs of atoms of neighboring molecules would have interfered with one another, with some parts of an MPA drawn to other, already formed MPAs by forces of attraction that were stronger than those holding the MPA together. Far from being a scientific absurdity, the feature of some MPAs being partially broken up when observed in a chemical compound is what might be expected if the formation of an MPA were disrupted by local forces due to nearby MPAs or atoms not under micro-psi observation. Then consider the problem that MPAs bear no resemblance to the Bohr model of the atom: this becomes irrelevant if MPAs are not atoms. Thirdly, far from being unexplainable, discrepancies between chemistry and Leadbeater's description of benzene, methane and ozone would actually be expected because, as quasi-nuclear systems, MPAs would interact through the nuclear force, which would create bound states of MPAs with quite different configurations to those of atoms bonded together in a molecule by electromagnetic forces. Finally, what about the four "impossible" elements X, Y, Z and kalon which have no place in the periodic table? If MPAs were formed from two nuclei, those that correspond to no known elements could only exist in principle if they had originated from nuclei of two ***different*** elements. (Indeed, no theory of MPAs that identifies them with single atoms or nuclei can explain these anomalous MPAs.) Their UPA populations support this suggestion, as the following examples demonstrate:

1) the MPA of non-existent element X in the bars group of transition elements contains 2,646 UPAs. This is precisely the number it would have if it had been formed from nuclei of the isotopes Ru-102 and Os-192 of, respectively, ruthenium and osmium — transition elements whose compounds might have been simultaneously present in impure samples examined by Besant and Leadbeater;
2) the MPA of the impossible inert gas kalon has 3,054 UPAs. It could have been formed from nuclei of the Xe-124 **and** Em-220 or Em-222 isotopes, which contain, respectively, 3,096 and 3,114 UPAs, implying quite plausibly that either seven or ten too many UPAs were observed when one of the six arms of this star-fish-shaped MPA was examined.

But if MPAs could be formed from nuclei of two *different* elements, it raises the question of why such hybrids were rarely observed. Reasons can be speculated but will not be discussed here.

Quantum Chromodynamics

According to quantum chromodynamics (QCD) — the currently accepted theory of the strong force between quarks — each of the six types of quark exist in three quantum states called "color"; red, blue and green. Each color state is characterized by its "color charge" — a property which is a mathematical generalization of the concept of electric charge. Just as the latter is the source of the electromagnetic field transmitted by the spin-1 photon, so the color charge is the source of the strong force binding quarks together. This "color force" is transmitted by eight spin-1 particles called "gluons." Two quarks in different color states interact strongly by exchanging any one of these gluons, its emission from one quark and its absorption by the other resulting in their switching color states. According to QCD, baryons such as the proton and neutron consist of three quarks in different color states, while mesons consist of a colored quark and an antiquark in the antimatter counterpart of the color state of its partner. QCD permits only such "colorless" bound states of quarks to exist. For example, diquarks — bound states of two quarks in different color states — cannot exist because they would possess a net color.

The color force is thought to grow without limit with increasing separation between quarks, permanently confining them in baryons and mesons. At short distances it becomes so weak that the quarks move almost freely. At sufficiently high energies or at high enough densities due to compression, atomic nuclei are predicted by QCD (Satz, 1986) to undergo a phase transition in which quarks cease to be confined in nucleons but move and interact with one another by exchanging gluons over the entire volume of the nucleus. This quark-gluon plasma, or "quagma," which we referred to earlier, is believed to have existed 10^{-3} seconds after the Big Bang. Little is currently known how, when either the density or the temperature of the quagma falls below the critical value, its quarks would regroup into hadrons. It has been speculated (Greiner and Stocker, 1985) that quark clusters other than the three-quark baryon states of quark-antiquark meson states known to particle physicists might condense out of the quagma. If UPAs are subquarks, MPAs must be such exotic forms of matter. Do MPAs, therefore, represent an excited phase of nuclear matter that is formed prior to micro-psi observation by the very high energy collision of two atomic nuclei? If they are, what local, physical conditions accompanying micro-psi observation could stabilize multi-quark and multi-subquark bound states against decay into the three-quark bound states more familiar to physicists? The problem is to explain how so many different types of particles can co-exist in MPAs. This issue is related to the fundamental problem of the physical nature of the information-gathering interaction between the micro-psi observer and subatomic particles, about which little is known as yet.

Rather than being formed by the high-energy collision of two nuclei, MPAs may result from their constituents becoming extremely delocalized, as the following quantum-mechanical argument suggests: Besant and Leadbeater claimed to have been able to exert some kind of braking force on the motions of particles by exercising "a special form of will-power." If such retardation due to micro-PK forces happened automatically while they focussed their micro-psi vision on atoms, it would mean that they reduced not only the momenta of atoms and the constituents of their nuclei as they prepared atoms for observation but also their range of values. What in effect they did would have been to reduce the uncertainty Δp in the momentum of each particle in a nucleus as this braking force brought every particle to rest, creating in each one a state of known (zero) momentum. In accordance with Heisenberg's uncertainty principle:

$$\Delta x \Delta p \geq {}^{1}/_{2}\hbar,$$

this increased the uncertainty Δx in its position, stretching its wave packet. If the braking force reduced its kinetic energy by a factor of 10^8, ***Ax*** would be amplified by a factor of 10^4 from the nuclear radius scale of 10^{-12} cm to the atomic scale of 10^{-8} cm, i.e. each particle would become so delocalized that there would now be just as much chance of finding it near an adjacent atomic nucleus as there was in finding it in the much smaller space occupied by the nucleus prior to its coming under observation. If all particles in selected pairs of nuclei were slowed down automatically prior to observation, their wave functions would eventually overlap significantly, leading to a non-vanishing probability of their mutual strong interaction. The coupling of highly delocalized particles in neighboring nuclei and their aggregation into larger bound states would lead to the formation of a quasi-nuclear system of multi-subquark and multi-quark bound states — precisely what analysis of MPAs reveals. Such a scenario would explain why there is generally no trace of an intact, recognizable, atomic nucleus in any MPA, apart from a few exceptions, such as the hydrogen MPA and the nitrogen MPA, which analysis reveals (Phillips, 1980) contains a cluster of seven neutrons provided by one of the two parent nitrogen nuclei.

The String Model

The description by Besant and Leadbeater of the force binding UPAs together provides further striking evidence for the objective character of their observations. Hundreds of diagrams published in their book ***Occult Chemistry*** depict groups of UPAs bound by string-like 'lines of force.' This feature supports the string model, a certain formulation of QCD. This model will be reviewed and then compared with some of the numerous diagrams from ***Occult Chemistry*** that are consistent with it (for more examples, see Phillips, 1980).

Many metals show no resistance to the passage of an electric current when cooled to temperatures near absolute zero — the lowest temperature attainable. When a magnetic field is applied to material in this superconducting state, the magnetic flux, instead of penetrating its interior as happens when it shows electrical resistance, is expelled almost completely from inside the material. This "Meissner effect" is caused by the wholesale formation at temperatures below a critical value of large numbers of loosely bound pairs of electrons ("Cooper Pairs"), the motion of which in the external magnetic field produces locally a magnetic field which opposes and effectively cancels the applied field everywhere except near the surface of the material, resulting in little penetration of flux into its interior. In type 1 superconductors there is wholesale expulsion of magnetic flux; in type 2 superconductors the normally conducting regions of the material segregate into an array of filaments, arranged parallel to the external field and surrounded by the remaining superconducting material. These filaments are extended bundles of flux lines which have been expelled from the ambient, superconducting material though the Meissner effect and are trapped inside cylindrical vortices of circulating electrons of variable current density. The amount of flux in a vortex is quantized in integer multiples of the Dirac unit $hc/2e = 2\text{x}10^{-7}$ gauss cm^2. The core of the flux tube contains most of the flux, which extends with exponential decrease into the superconducting region a distance characterized by the "London penetration depth" $\lambda_L = (mc^2/4\pi ne^2)^{1/2}$, where m is the electron mass, e is its electric charge and m is the density of superconducting electrons.

The Meissner effect may be interpreted in terms of photons inside superconductors acquiring mass and is an example of the so-called "Higgs mechanism" of spontaneous symmetry breaking, where massless gauge fields — in this case the electromagnetic field — can acquire mass, resulting in a short-range interaction between the particle sources of these fields. Neilsen and Olesen pointed out in 1973 a remarkable parallelism between, on the one hand, the Higgs model and the London-Ginsberg theory of superconductivity and, on the other hand, the flux lines in type 2 superconductors and the dual string model of strong interactions, which had been developed to explain how the scattering properties of hadrons interacting strongly with other hadrons varied with energy and with the momentum transferred between them. The string model of quark confinement exploits this analogy as follows: the vacuum is regarded as the ground state of the Higgs field, a type 2 superconductor in which quarks are embedded as monopole sources of the color force. The flux lines of an isolated, positively charged monopole in empty space diverge in all directions (Figure 6(a)). In the Higgs vacuum, however, they become squeezed together as quantized bundles within an infinitely long, narrow flux tube (Figure 6(b)), being expelled from the ambient, superconducting vacuum by the

(6a) (6b)

Fig. 6. Flux lines of a magnetic monopole in (a) empty space, and (b) the Higgs vacuum.

Meissner effect. An idealized magnetic monopole is the end-point of the flux tube, which is a vortex in the Higgs field consisting of currents of Higgs bosons of variable density that circulate about the vortex core, into which most of the flux lines are squeezed. Flux lines emanate from the monopole if it is positively charged and converge on it if the monopole is negatively charged. As bound states of a quark and an antiquark, mesons are regarded in the string model as flux tubes, or "strings," of finite length (Figure 7(a)), one end of the string being the quark, the other end being the antiquark. As bound states of three quarks, baryons are pictured by string theorists either as Y-shaped strings terminating on magnetic monopoles or as circular strings, two strings emanating from each monopole (Figure 7(b)). Both types of hadrons are surrounded by a cloud of virtual gluons extending a distance $A = h/m_v c$, where m_v is the mass of the gluon. According to the string model, quarks are permanently

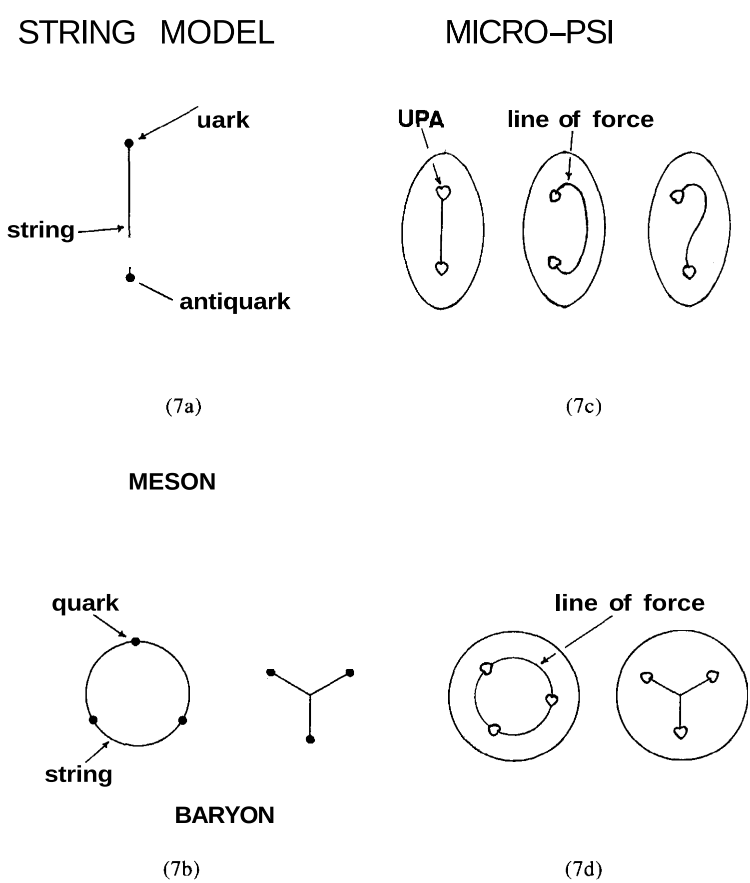


Fig. 7. Diagrams from the first edition of Occult Chemistry showing the lines of force binding two or three UPAs are similar to string model depictions of mesons and baryons.

bound together because longer the string, stronger is the force acting between them.

Micro-psi Confirmation of the String Model

Besant was responsible for reporting how groups of UPAs were bound together, whereas Leadbeater concerned himself with the large-scale structure of MPAs. In hundreds of diagrams published in their book ***Occult Chemistry*** she depicted UPAs bound by "lines of force," which were "magnetic" in character. Amongst these were diagrams showing single lines of force with a UPA at each end (Figure 7(c)), Y-shaped configurations of three lines of force, each terminating on a UPA, and circular configurations linking three UPAs (Figure 7(d)). Notice their resemblance to Figures 7(a) and 7(b). This similarity makes it therefore natural to interpret Besant's lines of force as strings or flux tubes. These duads and triplets of UPAs were recorded over sixty years before similar diagrams appeared (Tze and Ezawa, 1975) in the research literature of particle physics. These and many other diagrams in ***Occult Chemistry*** showing single lines of force terminating on UPAs in ***exactly*** the same way that the string model conceives color flux tubes terminate on quarks constitute remarkable evidence in support of the string model and indicate that UPAs possess a magnetic charge, albeit of a kind similar to that known to be associated with the color force rather than with ordinary magnetism. Indeed, the positive and negative types of UPAs have opposite magnetic polarity (Phillips, 1980). According to Besant and Leadbeater, in the former "force comes out;" in the latter it "disappears." This is consistent with the elementary idea of north and south magnetic poles as sources and sinks of magnetic fields.

Duads, triplets and other groups of UPAs were observed to be surrounded by either spherical or ovoid surfaces. When this "sphere-wall" was investigated, it appeared to be "composed of forces radiating from the center, which after travelling a certain distance, returned to the center." It is proposed that these forces are simply the color flux due to the cloud of virtual gluons, which extends a distance A from the core of a flux tube into the ambient Higgs vacuum. In particular, the micro-psi depiction of the lines of force in a hydrogen triangle (nucleon) indicates that its nine UPAs are bound by Y-shaped strings, the gluons exchanged between subquarks in different quarks passing through the junction of these strings as they propagate along each one. The wave-function of three UPAs bound in a ground state of zero orbital angular momentum is spherically symmetric since the absence of such angular momentum means that no direction in space is preferred. The sphere-wall shown in Figure 7(d) is therefore the envelope of the color flux lines created by the spherical symmetry of the probability wave function of the three UPAs. The ovoid surface often reported to surround duads of UPAs (see Figure 7(c)) is the outer surface of the short-range gluon cloud of size A. Each UPA was also said to be "surrounded by a field." This could be the Higgs field whose quanta (Higgs bosons) circulate around the core of the flux tube emanating from the UPA monopole. Most groups of UPAs were shown linked by lines of force passing into the wide end and leaving the pointed end of the heart-shaped UPA (see Figure 3). Moreover, this force was "changed in character by its passage." This suggests that the UPA is the monopole source of two types of color flux, each squeezed into its own flux tube, indicating that the color force of QCD needs to be generalized to a "hypercolor" gauge field, eight of whose quanta are the gluons mediating the strong interaction between subquarks belonging to *different* quarks, the remaining quanta being hypergluons that transmit the force binding subquarks together *inside* the same quark.

Two important conclusions can be drawn from Besant's depiction of the lines of force linking UPAs in the hydrogen MPA: 1) three subquarks are bound together in a u and d quark by a Y-shaped string, i.e. subquarks are confined inside quarks by the *same* mechanism as that which confines quarks inside baryons; 2) one subquark in each quark in a proton is the end-point of a much larger, Y-shaped string, as is true for the other two subquarks. In other words, the three quarks are held together by three concentric, Y-shaped strings, three flux tubes emanating from each quark. For more details, see Phillips, 1980.

Structure of the UPA

According to Leadbeater, who made a special study of the UPA, each of its ten whorls is a helical coil (Figure 8) that winds 1680 times around the surface of a torus (according to the third edition of *Occult Chemistry,* Leadbeater checked this number by counting turns of whorls in as many as 135 UPAs taken from different MPAs!). Each circular turn, or so-called "1st-order spirilla," is another coil made up of 7 smaller circular turns, or "2nd-order spirilla," winding around a torus (Figure 9). Each of these 2nd-order spirillae is another helical coil with seven turns, or "3rd-order spirillae," and so on. There are 7 orders of spirillae, each finer than the preceding one, and made up of 7 circular turns which form each turn of the next-lower order of spirilla. Each spirilla winds in a circle whose plane is at right angles to the direction in which the preceding order of spirilla winds at that point. The 7th-order spirilla consists of 7 spherical bubbles of equal size spaced evenly along the circumference of a circle. It seemed to Leadbeater's micro-psi vision that space itself is a *plenum* and that the UPA consists ultimately of bubbles or spherical holes in this substance, which he called "koilon," a Greek word, meaning "hollow."

Superstrings

Certain problems with the string model of hadrons led in the mid 1970s to its abandonment. Firstly, to be consistent with quantum mechanics, spinless, or "bosonic," strings had to have 26 dimensions, whereas spinning strings representing fermions necessitated only 10 dimensions. Physicists saw no way of reconciling theories requiring different dimensions of space-time. Secondly,

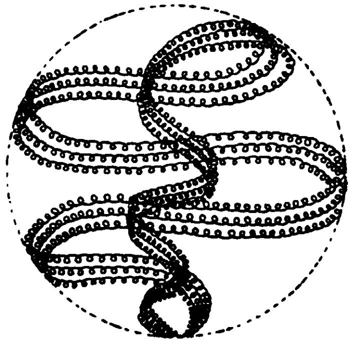


Fig. 8. The three major whorls of the UPA (from *Occult Chemistry* (3rd ed.)).

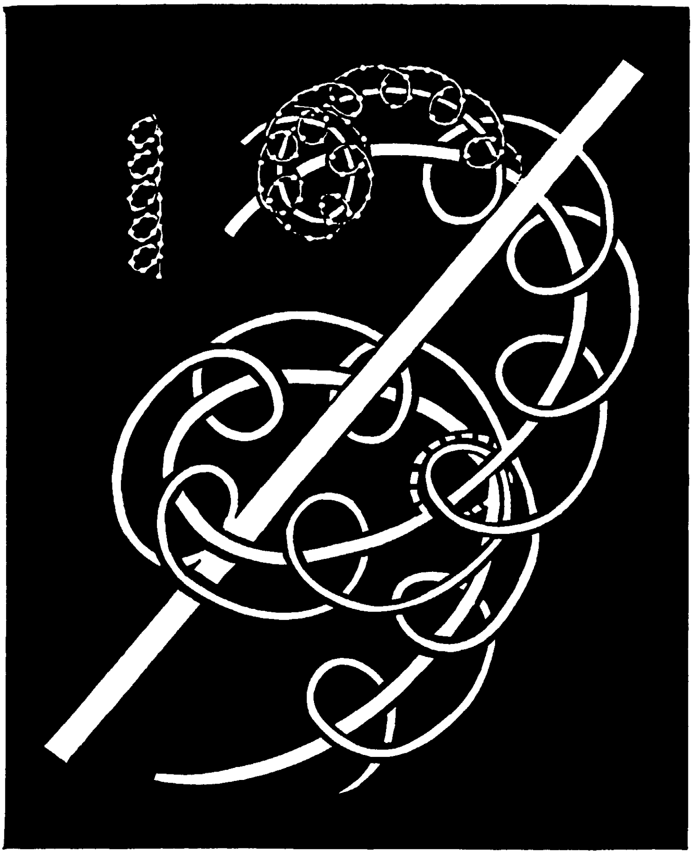
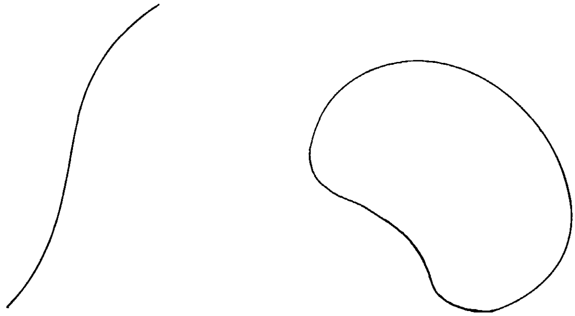


Fig. 9. The toroidal windings of the 5th-, 6th- and 7th-order spirillae (From *Occult Chemistry* (3rd ed.)).

the string model contained massless spin-1 and spin-2 particles, neither of which hadrons had been discovered. Even if the latter were the graviton, the particle transmitting the gravitational force — quite apart from why this particle should manifest in a theory of strong forces — the theory predicted that strings had to be 20 orders of magnitude smaller than the typical size of hadrons, as well as having excited vibrational modes 19 orders of magnitude heavier than the typical masses of hadron resonances. Physicists then began to study field theories of point-like particles that incorporated "supersymmetry," that is, a mathematical symmetry that allowed fermions and bosons to be regarded as members of a single "superfield." Schwarz and Green (1981, 1982) generalized this study by investigating the properties of supersymmetric, string-like particles, or "superstrings." They made (1984) the important discovery that so-called "quantum anomalies" — a longstanding technical problem plaguing field theories of point-like particles — disappeared provided that the unified superstring force was transmitted by 496 spin-1 bosons. However, their work did not explain how all these particles arise. Freund suggested (1985) that a superstring might result from shrinkage to infinitesimally small scales of sixteen of the dimensions of the 26-dimensional string originally predicted by the quantum mechanics of bosonic strings. Symmetries of this higher-dimensional space might then generate these bosons. In the old string model quarks and their charges were identified with the ends of open strings (Figure 10a). In the heterotic string model developed by Gross, Harvey, Martinec and Rohn (1985,1986) the superstring is regarded as a closed string (Figure 10b) with independent left-moving and right-moving modes of vibration, the charge sources of the gauge bosons found by Schwarz and Green being distributed continuously throughout the string.



(10a) (10b)

Fig. 10. Open and closed superstrings.

Compactification

Superstring theory requires that six of the nine spatial dimensions of space-time extend over an infinitesimally small scale. It cannot yet specify the geometry and topology of this "compactified," 6-dimensional space. These properties determine how the original, exact symmetry of the superstring force in 10-dimensional space-time broke down into the known symmetries of the strong and electro-weak forces. Because the unified symmetry is so large compared with the latter, there are many ways it can be broken down. Consequently, many kinds of compactified space may be consistent with the standard model of particle physics. One space which string theorists initially considered because of its simplicity is the 6-dimensional torus, the 6-dimensional generalization of the familiar ring donut, in which each of the six dimensions is a 1-dimensional circle. The superstring is pictured here as winding around each circular dimension, all of which are perpendicular to one another and may or may not have the same radius. The number of times it wraps around a given circular dimension is called a "winding number."

UPA as Subquark State of Superstring

Let us now compare Leadbeater's description of the whorls in the UPA with the picture of closed superstrings or bosonic strings and with the 6-dimensional torus model of the compactified space of superstrings. The following remarkable similarities exist between the micro-psi and string-theoretical accounts of the basic constituents of matter:

Whorl	String
Closed curve;	Closed curve;
Circular (n+1)th-order spirillae wind 7 times around each circular nth-order spirilla (n = 1,2,3,4,5,6);	Winds N_n times around nth circular dimension(n = 1,2,3,4,5,6; N_n is winding number for nth compactified dimension);
(n+1)th-order spirillae wind in circles whose planes are at right angles to plane containing circular nth-order spirillae (n = 1,2,3,4,5,6).	Compactified 6-d torus has six perpendicular circular dimensions.

These correspondences suggest:

1. A whorl is a closed, 26-dimensional, *bosonic* string (the reported presence of *spherical* "bubbles in koilon" in 7th-order spirillae imply that whorls extend *beyond* the sixth, compactified dimension, so that they *must* be 26-, not 10-, dimensional strings);
2. The 2nd-7th orders of spirillae are the winding of a closed, 26-dimensional string about the six circular dimensions of a 6-dimensional torus, the winding number $N_n = 7$ being independent of the compactified dimension n;

3. The UPA is a subquark state of a superstring composed of ten strings, i.e. the superstring is itself a composite object.

It was shown earlier in this paper that the micro-psi description of matter by Besant and Leadbeater is consistent with UPAs being subquarks. The reported string-like nature of the whorls in UPAs and their toroidal winding about six higher orders of spirillae suggest that positive and negative UPAs are subquark states of superstrings of opposite chirality. If this interpretation is correct, a 10-d superstring is the result of the compactification of sixteen dimensions not of a single 26-d string, as is currently conceived by some theoreticians, but of a bundle of ten such strings. For some physicists, this predicted difference may seem too radical to countenance. But it would be premature to dismiss the possibility out of hand, for superstring theory is still in its infancy, having no fundamental formulation as yet, so that the theoretical connection between superstrings and bosonic strings has not been established. Until it has, however, the identification of the UPA as a superstring must remain tentative.

Referring to each whorl of a UPA as a "wire," Leadbeater remarked:

"If one of these wires be taken away from the atom,[6] and as it were untwisted from its peculiar spiral shape and laid out on a flat surface,[7] it will be seen that it is a complete ***circle*** — a tightly twisted endless coil. This coil is itself a spiral containing 1680 turns; it can be unwound, and it will then make a much larger ***circle.*** There are in each wire seven sets of such coils or spirillae, each finer than the preceding coil, to which ***its axis lies at right angles.*** The process of unwinding them in succession may be continued until we have nothing but an enormous ***circle*** of the tiniest imaginable dots lying like pearls upon an invisible ***string.***"

The dots referred to here are the bubbles in koilon. The significance of the words italicized by the author in this quotation from Occult Chemistry is firstly, that, just as closed strings are circles, topologically speaking, so are whorls, secondly, that the axes of successive orders of spirilla are perpendicular, just as the dimensions of a 6-torus are, and thirdly, that Leadbeater aptly used in 1907 the very metaphor "string" that appears frequently in the pages of current research journals of theoretical physics! It is improbable that such correspondences could occur by coincidence if the description of the fundamental unit of matter had been concocted.

Physicists discarded the idea of compactification on the 6-dimensional torus because it gives rise to unrealistic gauge symmetry groups and matter representations in four dimensions. The micro-psi researches of Besant and Leadbeater, however, indicate that quarks are not fundamental, so that what is unrealistic at the quark level need not be so at the subquark level, where the matter representations and gauge symmetry groups governing subquark forces do not have to be compatible with the phenomenological standard model,

[6] A reference to the "ultimate physical atom," or UPA.
[7] Leadbeater is, of course, speaking here metaphorically.

which applies to the forces between quarks. The fact, therefore, that the higher-order spirilla structure of the UPA conforms to a model of compactified space that string theorists regard as unrealistic does not pose a problem because the existence of subquarks would mean that the current standard model and its associated gauge groups are no more fundamental that Gell-Mann's original theory, which was based upon three of the six quarks predicted by this model.

Despite his attempts, Leadbeater did not succeed in examining an electron with his micro-psi powers. The possible reasons for this are firstly, that he could easily have missed detecting electrons if the latter are orders of magnitude smaller than subquarks, and secondly, that even supposing that he ***had*** by chance focussed upon electrons, he might have mistaken them for UPAs if, as different states of a superstring, electrons and subquarks both consist of ten whorls that appear to superficial micro-psi inspection to be similarly arranged.

Conclusion

This paper has presented evidence (summarized in Table 3) of how facts of nuclear and particle physics are consistent with purported psychic descriptions of subatomic particles. It is because Besant and Leadbeater finished their observations many years before pertinent scientific knowledge became available that their work cannot be rejected as fraudulent once this consistency is accepted. Nor can critics plausible interpret their observations as precognitive visions of future ideas and discoveries of physics. If this had been the case,

TABLE 3
Some Micro-Psi Anticipations of Scientific Discoveries and Ideas.

	Micro-Psi		Science
1895:	positive and negative hydrogen triplets observed in MPAs;	1964:	quark model proposes nuclei are made up of positive u quarks and negative d quarks;
1908:	meta neon (number weight = 22.33);	1912:	neon-22 discovered;
	axes of UPAs aligned by electric field;	1933:	magnetic monopoles discussed by Dirac;
	UPAs depicted as joined by "lines of force" of "a magnetic nature";	1970s:	string model of hadrons;
	some UPAs shown as endpoints of single lines of force;		quarks regarded as ends of strings or flux tubes;
	Y-shaped configurations of lines of force ending on UPAs;	1975:	baryons regarded as Y-shaped strings with quarks at their ends;
	UPA consists of closed curves;	1982:	closed superstrings considered;
	1st-order spirillae wind about six successively smaller circles;		6-d torus studied as model of compactified space;
1909:	"illinium" (number weight = 146.66);	1945:	promethium-147 discovered;
	"masurium" (number weight = 100.11);	1937:	technetium-99 discovered;
1924:	precessional motion of "hydrogen triangles" (protons);	1924:	spin of nuclei suggested;
1932:	"element 85" (number weight = 221.00);	1940:	astatine-219 discovered;
	"element 87" (number weight = 222.55);	1939:	francium-223 discovered.

Besant and Leadbeater might reasonably have been expected to describe atoms according to the Rutherford-Bohr model. The nuclear model of the atom was formulated by Rutherford in 1911, two years after they concluded their main investigation of MPAs. Yet none of its features can be found in their publications. Instead of being atoms, as would be expected if micro-psi faculty were actually precognition, MPAs are more exotic objects which, as Figure 5 shows, have compositions and UPA populations indicating that they consist of the constituent quarks and subquarks or two atomic nuclei of an element. This makes them more akin to what nuclear physicists call "compound nuclei," which are formed in high-energy physics laboratories by the collision and brief fusion of two very fast-moving nuclei. Moreover, precognition would not have led Besant and Leadbeater to portray some chemical molecules such as methane and benzene in a way that conflicts with chemistry. If they had used merely precognition, they would never have observed four MPAs for which atomic theory can provide no corresponding element; they would have recorded only MPAs of known elements. The fact that most of their descriptions of MPAs were published several years before physicists even suspected that atoms had nuclei excludes the possibility of their fraudulent use of scientific knowledge about the composition of nuclei in terms of protons, neutrons and mass numbers because no such information existed then, Chadwick discovering the neutron in 1932, twenty-four years after the first edition of *Occult* Chemistry appeared. No normal or alternative paranormal explanation of the correlation between modern physics and their ostensible 100-year old observations of subatomic particles appears to exist other than that Besant and Leadbeater genuinely described aspects of the microscopic world by means of ESP, albeit one disturbed by the act of paranormal observation.

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Report of Referee On "Extrasensory Perception of Subatomic Particles"

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Stephen Phillips opens his paper with a sober and sobering discussion of the difficulties involved in gaining scientific acceptance for so-called "paranormal" phenomena. Unfortunately, while he is evidently attempting to address some of those difficulties in his historical analysis of putative observations by Theosophists **A.** Besant and ***C*.** W. Leadbeater, he appears oblivious both to the generic pitfalls of such ***ex post facto*** analysis, and to the specific flaws of his own argument. On the whole, it seems that Phillips' paper has weakened, rather than strengthened, the public case for the existence of micro-psi.

To depart briefly from the traditional third person of scientific discourse — it should be obvious, if only from my institutional affiliation, that I have no particular axe to grind against micro-psi as a concept. Indeed, I would welcome the publication of strong evidence for the reality of such a phenomenon. It is disappointing to see, in this paper, a few precious nuggets of such evidence obscured by irrelevant detail and speculative theorizing. Phillips could have accomplished a great deal more for his subject by abandoning his insistence on the particular and detailed accuracy of Leadbeater's and Besant's visions.

Observational Evidence and Special Pleading

The worst and most overarching problem with Phillips' presentation is its reliance on what appears to be special pleading. Where Besant and Leadbeater are in accordance with current knowledge, their accuracy is quite rightly declared as evidence for an objective reality behind their subjective visions. But is the same standard of evaluation applied when their reported images are at variance with current knowledge? No. The description of hydrogen as six small bodies, each of which is a group of three smaller bodies (eighteen elementary particles in all); the intermingling of so-called "MPAs" in chemical combination; the identification of nonexistent elements with no proper place in the periodic table at all; the misidentified shapes of, for example, methane and benzene; none of these is admitted as an error or inaccuracy in Besant's and Leadbeater's perceptions. Instead, these and other apparent inaccuracies are rescued by the combination of Phillips' particular model of micro-psi — the notion that micro-psi observation forced two nuclides to fuse into a highly excited state —and the invocation of speculative physics, such as the existence of subquarks.

This is an invalid mode of argument. By accepting apparent successes as given, while explaining away failures by invoking new phenomena ***for which there is no other positive evidence,*** one can support any theory whatever. If micro-psi, or indeed any sort of psi, were a well-established and reliable scientific instrument of proven merit, then Besant's and Leadbeater's observation of three-within-three structures in the "hydrogen triangle" would constitute strong evidence for the existence of subquarks. If there were any positive evidence from other sources for a composite structure to the quark, then the observation would lend credence to the validity of micro-psi as a scientific instrument. Unfortunately, neither of these two conditions obtains. Micro-psi is not an instrument of known reliability, but a speculative notion whose validity has yet to be determined. Experimentally, the quark has remained stubbornly pointlike while subnuclear structure has been probed at steadily increasing energies, and therefore increasing spatial resolution (Cao *et al.,* 1994). No physical theory yet propounded provides grounds for expecting the quark to be anything other than an elementary particle, despite some hypothetical speculation on what the components of quarks would have to be like if they existed (Phillips, 1979; Harari, 1983).

It is hard to overemphasize the importance of this issue. Construction of a viable subquark theory is intrinsically difficult for an assortment of reasons (Harari, 1983; King, 1983). The current experimental evidence for quark compositeness is entirely negative; tests for phenomenological consequences of underlying structure to the quark are frequently proposed, and when performed rule out such structure. Quark compositeness can definitely be rejected on any energy scale less than 1.4 TeV (Rosner and Soper, 1992; Cao ***et al.,*** 1994). Since the mass of a proton is on the order of 1 GeV, this would entail that subquarks are enormously massive particles, bound by a hitherto-unknown force, so intense that the binding energy cancels more than 99.9% of the subquark mass. The subquark model proposed by Phillips himself (Phillips, 1979) is inconsistent with observation, since it predicts five generations of quarks and leptons whereas the measurement of Z_0 decay rates constrains the number of generations to three (2.97±0.05) (ALEPH Collaboration, 1993). In short, subquarks are an extremely dubious notion for which no positive evidence exists. While they remain, strictly speaking, allowed by current knowledge of physics, the niche into which they might fit grows steadily narrower and more implausible as measurements improve. To build a credible case for subquarks, Phillips would first have to present an extremely strong case for the viability and accuracy of micro-psi as an observational tool. This he never does, instead invoking subquarks as an escape hatch to avoid the apparent inaccuracies of the claimed micro-psi observations.

The Destruction of the Straw Men

Phillips furthermore attempts to shore up his thesis by reducing competing explanations to weak and easily refuted shadows of the proper argument, the classic "straw man" fallacy. Throughout, he argues for his preferred model that Besant and Leadbeater were accurate in all particulars of their observations, i.e. that (aside from occasional mistakes in transcription) there was a one-to-one correspondence between visual elements of their descriptions and real microscopic objects.[1] This view does indeed require something akin to the subquark theory, for Besant and Leadbeater simply saw too many particles inside atoms to be accomodated by the standard model of particle physics. The only alternatives that Phillips admits for consideration are "chance," fraud, and purely invented hallucination, the latter two possibly informed by Besant's and Leadbeater's knowledge of then-current chemistry and physics. He refutes these alternatives vigorously (though perhaps not as strongly as he seems to believe, see below), but never considers another hypothesis that seems to be a more parsimonious explanation of the facts: that Besant's and Leadbeater's observations, while containing some genuine information about the microworld they sought to examine, were simply not veridical in all details. (Note that this is somewhat different from Phillips' conclusion that Besant and Leadbeater were mistaken in believing MPAs to be single atoms, which would be an error of interpretation rather than of perception.)

In other words, while Phillips builds a considerable case for Besant and Leadbeater having somehow acquired information about the microworld that was not part of accepted scientific knowledge at the time, the case for the speculative physics of the subquark model and the peculiar two-atom mechanism for micro-psi is actually considerably weaker. The combination of insight and error in the Theosophical data can be explained much more parsimoniously by presuming the visions of *Occult Chemistry* to be hallucinations, informed not only by the practitioners' knowledge of chemistry, but by some information gained through "micro-psi" or other anomalous means as well. The elaboration of subquarks, etc., is required not by Besant's and Leadbeater's track record of successful observations, but only by the artificial and implausible assumption that their visions corresponded exactly to real objects. It is worth noting, in this context, that the elaborate spatial diagrams of *Occult Chemistry* and of Phillips' illustrations are far more plausible as symbolic or schematic representations of some kind than as veridical representations of quantum objects in space.

In another instance of a straw-man argument, Phillips repeatedly insists that the inconsistencies between Besant's and Leadbeater's visions and then-current scientific knowledge (such as the placement of elements from the same group in the periodic table into different MPA structure categories) indicate that the visions were neither fabrications tailored to fit knowledge of chem-

[1]At least, to the extent that a quantum particle can be regarded as a "real object."

istry, nor hallucinations unconsciously informed by the percipients' knowledge of chemistry, with the implied consequence that they must be veridical. In Phillips' own words: "The fact that elements in the same subgroup of a group of the periodic table do *not* always occur in the same subgroup in the micro-psi version of this table is inconsistent with what one would expect if Besant & Leadbeater had been merely guided by their knowledge of chemistry to fabricate the correlation." Now, it seems somewhat peculiar to argue that the *inaccuracies* of a mode of observation somehow make its validity more credible. Leaving aside this feature, Phillips is quite right that such inaccuracies strongly refute deliberate fraud by Besant and Leadbeater. However, he seems to be confining the possibility of subconscious influence on hallucinations to a slavish transcription of conscious knowledge of chemistry. It is, despite Phillips' protestations, quite easy to imagine that such unconscious mental mechanisms would generally produce "MPA" images in rough accord with the percipients' conscious expectations based on chemistry, but would in some cases introduce incompatible variations, just as dreams and schizophrenic or drug-induced hallucinations are generally a mixture of realistic and unrealistic elements.

Statistical Issues

In several places Phillips presents statistical arguments that are dubious. The most questionable appears towards the end of the section "Micro-psi atoms," where Phillips asserts:

...if one assumes that they used a made-up formula $N = 18X$ to fabricate populations (N) with the aid of a certain list of atomic weights (X) given in the first edition of their book *Occult* Chemistry, one finds that the best fit is

$$N = (18.055 \pm 0.014)X$$

Their data, therefore, are fitted very poorly by the formula $N = 18X$ and the hypothesis that they were fabricated must be rejected because it is highly unlikely ($p < 10^{-4}$).

Yet this is actually very weak evidence against fabrication. It must be borne in mind that, although contemporary chemists were ignorant of isotopic variation and of the nature of the atomic nucleus as an assembly of integral numbers of more elementary particles (protons and neutrons), it was nevertheless clear that something peculiar and special with regard to integer or near-integer ratios was going on in the periodic table. Despite the rejection of Prout's hypothesis that heavier elements were literally built up from hydrogen components, very few chemists or physicists of the time regarded it as meaningless coincidence that so many elements, especially lighter ones, had atomic masses that were very close to integer multiples of hydrogen's mass, even though the underlying mechanisms giving rise to this fact were not understood. There would therefore be excellent reasons to provide a special role for integer multiplicity of hydrogen's composition in any theory of atomic structure.

To test the validity of Phillips' statistical argument above, I therefore attempted to re-create the circumstances of the analysis that gave rise to it. Since Phillips never specifies which 57 elements "both known to science and examined by Besant and Leadbeater " were involved in his analysis,[2] I chose 57 elements to examine by taking 54 of the lightest 55 elements (skipping unstable technetium), and filling out the remaining three spaces with gold, mercury, and lead (elements 79, 80, and 82), which having been commonly known since antiquity seemed likely to have been available for inspection. I then constructed N values by rounding the atomic mass given in the periodic table (CRC Handbook, 75th edition) to the nearest integer and multiplying by 18. The resulting set of N values regresses to a best fit function

$$N = (18.0106 \pm 0.0027)X$$

which like Phillips' function above has $p < 10^{-4}$ for the model $N = 18X$. This, of course, is a consequence of the fact that the construction process did *not* use the exact function $N = 18X$, but involved an additional rounding step. The process by which Besant and Leadbeater assigned UPA counts to elements, as described by Phillips in the same section of the paper, would necessarily introduce an integerizing distortion similar to the effects of rounding. Thus, given that Besant's and Leadbeater's procedure for counting UPAs involved counting repeated structural elements each containing multiple UPAs, a deviation of the actual mapping function from the perfect $N= 18X$ case is expected even if the only physical information involved in MPA construction is coming from the percipients' prior knowledge of chemistry, and Phillips' statistical argument is meaningless.

Phillips casts this argument, and most of his related ones, as a defense of Besant and Leadbeater against accusations of fraud. However, the suggestion that some of the information in ***Occult Chemistry*** came from the authors' prior knowledge of matters of chemical fact is not equivalent to a claim that they committed knowing fraud. Even if one rejects the micro-psi hypothesis utterly, it remains entirely credible that the Theosophists were quite honest although self-deluded, and simply failed to recognize the true sources of the information presented by their subconscious minds in the course of their self-induced hallucinatory experiences.

An Instance of Selection Bias?

Detailed scrutiny of Table 2 in the section titled "A Statistical Test" turns up a rather worrisome phenomenon. The initial motive for the examination was to see whether there was a consistent trend of errors in UPA counts in the direc-

[2]Table 2 does not resolve this question, as it enumerates over 80 elements.

tion that would be expected were they informed by knowledge of atomic weights rather than of atomic mass numbers. That is, do Besant and Leadbeater show a tendency to overcount UPAs for nuclides where the elemental atomic weight is greater than the mass number of the species presumably being observed, and undercount when the atomic weight is lower than the mass number? This, if true, would suggest that the UPA counts were at least partly based on atomic weights. Fortunately, this hypothesis proves groundless; the pattern of overcounts vs. undercounts does not correlate with the difference between atomic weight and isotopic mass number.

However, in the course of establishing this fact, one finds several instances where Phillips has made a questionable choice of isotope. In the discussion about Table 2 he speaks of three criteria for selecting a candidate nuclide in elements with several stable isotopes, but he does not specify a mode of resolution when these criteria are in conflict. This is visibly problematic in his choices of isotope for samarium, erbium, and mercury:

- Samarium has seven common isotopes, with mass numbers 144, 147, 148, 149, 150, 152, and 154. The most abundant isotope is ^{152}Sm at 27%; ^{154}Sm accounts for 23% of the natural abundance. This choice of isotope, however, makes the overcount in Table 2 as small as possible.
  Erbium-168 is again not the most common isotope; ^{166}Er, at 33.6%, is the most common of the six naturally occurring isotopes of erbium. Since a change of 1 in the mass number changes the *N(A)* value by 18, it is evident that the choice of ^{168}Er for Table 2 makes the error figure as small as possible.
- Mercury-199, a relatively light isotope with only 16.87% natural abundance, again minimizes the error in Table 2; the next best candidate for "Mercury (A)," ^{198}Hg, would replace an undercount of 6 by an overcount of 12. The chosen candidate for "Mercury (B)," ^{200}Hg, also an error-minimizing choice, is still not the most common isotope. It accounts for only 23.1% of the element in nature, as opposed to 29.86% for ^{202}Hg.

The foregoing cases are not intended to be an exhaustive analysis of isotopic choices in Table 2; they immediately appeared as suspect only because the chosen representative isotope seemed to have a mass number unusally far away from the elemental atomic weight. (Similar concerns for europium and dysprosium seem on examination to be less well founded, since in each case the most massive isotope is also the most abundant, even though the choice of isotope also serves to minimize a rather large UPA overcount.) It does, however, raise questions about the objectivity of isotopic choices in Table 2. The tendency to precondition one's analyses to validate one's preferred hypotheses given the already-known data is a perennial hazard in this sort of ex ***post*** facto analysis, and it is troublesome to see even the faintest suggestion that the isotopic choices might have been tailored to minimize error.

The Mysterious Missing Isotopes

The discussion of isotope selection in Table 2 leads to a further question: Why was it necessary to make such choices at all? If micro-psi allowed Besant and Leadbeater to detect the existence of two isotopic forms of neon, why did it detect only two isotopic variations in mercury? Naturally occurring mercury is a mix of four common isotopes and three relatively rare ones (using a criterion of 10% abundance as the breakpoint between "common" and "rare"). Working as they did prior to the scientific recognition of isotopes, the Theosophists can hardly have been examining isotopically purified samples. Table 2, in its identification of isotopes with "Mercury A" and "Mercury B," implicitly claims that Besant and Leadbeater could distinguish ^{199}Hg from ^{200}Hg; why then did they not note that their mercury samples also contained ^{201}Hg and ^{202}Hg, the latter being the most common form? Similar considerations apply to the many other elements in Table 2 that normally occur in multiple stable isotopes.

Internal Inconsistencies

Phillips displays a distinct tendency to argue both sides of an issue if it will benefit his thesis. For example, toward the end of "Problems with Science," he asks rhetorically: "Secondly, how could hallucinations... generate UPA populations in MPAs that always turned out to be about 18 times the correct atomic weights of their elements?" Perhaps, at the time he wrote that question, he was unaware that he would presently answer himself (in the section "A Statistical Test"): "This would explain why Besant and Leadbeater found their calculated number weight for an element to be approximately equal to its atomic weight, most elements having stable nuclides with mass numbers within one or two units range of their atomic weight." The argument from the near-coincidence between atomic weight and mass number explains the consistency of "number weight" determinations, but it undermines the previous reasoning; access to atomic weights meant that Besant and Leadbeater had access to the approximate mass numbers of stable isotopes of those elements they examined.

Similarly, in the "Quark Model" section Phillips argues:

> Leadbeater could not have observed the deuteron in one end of a diatomic HD or D_2 molecule in hydrogen because their rarity compared with H_2 molecules means that he would usually have seen just one hydrogen triangle whenever he examined hydrogen, and so he would have reported the version of the MPA consisting of pairs of hydrogen triangles as rare, as he did sometimes when examining isotopic variations of other elements.

He appears to have forgotten his attempt, under "Micro-psi Investigations," to invalidate such reasoning based on relative abundances. To explain the ability of the Theosophists to detect elements that had not yet been synthesized, and which cannot in any case exist as pure samples for any significant period of time due to their short half-lives, he suggests: "For example, instead of ***single*** atoms always being chosen, perhaps thousands or millions of atoms can come simultaneously under the focus of micro-psi vision, with the final selection of atoms from this sample being non-random." At this point it should also be noted that Phillips' alternative argument for the abundance problem — that these unstable elements might have been spotted due to their appearance (or destruction) through radioactive decay in some mineral consisting largely of other substances — is itself rather hard to sustain. Besant and Leadbeater apparently had no difficulty in identifying two or more variant versions of a single element as such, according to Phillips' account of their identification of distinct isotopes in common elements. But somehow, when it came to the identification of unstable elements fleetingly present in the decay chains of natural radionuclides, they fail to mention that these elements are found as contaminants — rare ones — in samples of such minerals as pitchblende. At least, if any such mention of the provenance of the "unknown" elements is made, Phillips fails to transmit it, despite the fact that it would provide compelling evidence for the utility of micro-psi as an investigative tool.

The discussion of statistics, above, disposed of the argument against fabrication of the ***Occult Chemistry*** tables. However, it also merits mention here, since Phillips on the one hand argues that the results are far enough away from $N = 18X$ to refute fabrication from atomic weights, and on the other hand that they are close enough to $N = 18A$ to demonstrate some knowledge of atomic mass numbers (in "Micro-psi Atoms" and "A Statistical Test" respectively). While these arguments may not appear contradictory on the surface, they become so when one recalls that atomic weight is generally quite close to the mass number of at least one stable isotope of the element in question (as Phillips himself mentions). The observation that the discrepancy between observed and predicted UPA populations is "usually less than 1%," in the paragraph following the equation $e = N - N(A)$, further supports the notion that UPA counts were motived by knowledge of atomic weights rather than mass numbers, since the dicrepancy between the two for the most common stable isotope of an element is also typically of this magnitude.

For a final example of internal inconsistency, let us address the question of MPA composition. In "Quark Model," Phillips asserts that the hydrogen MPA corresponds to a deuteron created by the fusion of two hydrogen nuclei under the impetus of micro-psi observation, justifying this conclusion by a consideration of the number of elementary particles involved and by Leadbeater's insistence that the hydrogen MPA was stable. It necessarily follows that fusion reactions and subsequent emission of particles could take place in the initiation of micro-psi observation without being noted by the observer. This seems incompatible with the later claim (under "Qualitative Tests," and referring to the MPA of gold):

Yet *every* detail of its diagrams — that is, the composition of all the *hundreds* of hydrogen triplets and pairs of UPAs making up more complex particles — can be self-consistently accounted for, this MPA having been shown (Phillips, 1994) to agree exactly with the hypothesis that it was formed from two atomic nuclei of Au-197, the only stable nuclide of this element.

Earlier in the paragraph, Phillips mentions that the "composition of up and down quarks" is one of the factors involved in identifying the theoretically required populations of the types of UPAs. Yet the composition of up and down quarks is exactly what distinguishes a proton (UUD) from a neutron (UDD). Now, unlike a deuteron, a nuclear body made up of 158 protons and 236 neutrons is wildly unstable — yet the Theosophists made no claim of instability for gold. In the time frame required for a pair of tightly bound protons to form a deuteron, the product of the fusion of two gold nuclei should at the very least emit a number of positrons, even if it avoided mass-number-changing decays such as alpha emission or even spontaneous fission. Any of these decays would, of course, change the UPA populations from the exact correspondence with ^{197}Au. The suggestion that stable MPAs are forms of a crystallized quark-gluon plasma or even of strange matter does not resolve the contradiction, for one then must ask why the hydrogen MPA still consists of distinct nucleons. Once again arguments from different sections of the paper appear to undermine each other.

Problems Unresolved

Phillips claims (in "Problems Solved") that his model of micro-psi as inducing fusion of two (or more) nuclides, together with the subquark model, answers the objections enumerated in the section "Problems with Science." Yet his proposed resolution for the several impossible elements (X, Y, Z, kalon, etc.) identified by Besant and Leadbeater raises more difficulties than it solves. If the MPA of non-element X, for example, was formed by fusion of ^{102}Ru and ^{192}Os, it should bear some relationship to the MPA of neodymium — in fact, it is exactly the same assemblage of elementary particles that would be produced by the collision of two ^{147}Nd nuclei. While Table 2 suggests that neodymium was normally examined in the form of ^{143}Nd, this does not explain why X was not identified as an isotopic variation of neodymium. Similar considerations show that all of the "impossible" elements, if created through this mechanism, should have been observed as isotopic variations of other known elements.

Besides this difficulty, Phillips does recognize that this proposed rescue mechanism introduces another problem of its own: "But if MPAs could be formed from nuclei of two *different* elements, it raises the question of why such hybrids were rarely observed. Reasons can be speculated but will not be discussed here." Yet without such discussion, we are left with no particular grounds for believing in this alleged explanation for the impossible elements.

Given that some observations appear to be correct, and that some (the impossible elements) appear to be wrong, any error mechanism proposed to explain the wrong observations must be accompanied by some model to explain why it only operated in certain cases, *beyond* the simple fact that those cases were wrong. Otherwise, the error mechanism is no true explanation at all, but only a relabeling of the empirical fact that "micro-psi" observations are sometimes completely inaccurate. Lacking the explanation that Phillips declines to give on this point, one is obliged to accept Besant's and Leadbeater's prediction of impossible elements at face value: as refuting evidence against the existence of micro-psi.

Theoretical Concerns

In his discussions of quantum chromodynamics and string models of the nuclear force, Phillips is generally correct. It must be noted, however, that the delocalization that he proposes as a mechanism for MPA formation ("Quantum Chromodynamics" section) is incompatible with the depictions of MPAs as having definite components at definite locations. They would, if still delocalized, constitute indistinguishable smears in a veridical representation. On the other hand, Besant and Leadbeater apparently do not report a relaxation of their "braking" effect on the rapid movements of the constituent particles. They appear to have been able to constrain both the positions and the momenta of the objects they were observing, in a manner quite inconsistent with the uncertainty principle *if* they were seeing veridical renditions of actual subnuclear particles. Likewise, the stable structure of the the "whorl" components discussed in "Structure of the UPA" and the subsequent several sections is incompatible with the quantum fluctuations expected of objects on superstring scales. One must, in short, abandon either strict veridicality of Besant's and Leadbeater's visions, or the uncertainty principle.

Phillips' proposal ("UPA As Subquark State of Superstring") that the UPAs or subquarks are themselves composite objects made of bound states of ten supersymmetric strings raises the theoretical ante, so to speak. Not only is he suggesting, in the face of all currently available evidence, that quarks are composite, but furthermore that their components are themselves composite on a finer scale. The energy regime of superstrings is, however, so far beyond accessible laboratory energies that very little can be said of this model except that it seems to ignore the spirit of Ockham's razor. Phillips' blithe dismissal, on the other hand, of string theorists' discomfort with his preferred model of dimensional compactification is something of a problem; the gauge group of quarks must be a proper subgroup of the more fundamental symmetry group of the strings, even in a composite-quark model.

Less than Meets the Eye

Phillips repeatedly makes much of correspondences that seem, on closer examination, to be quite unremarkable. In a passage already quoted on page 535, for example, he rejoices, with repeated emphasis, in the exact correspondence between the MPA of gold and the subquark structure of two nuclei of ^{197}Au. Yet, since by his own admission the majority of the contents of MPAs do not consist of identifiable "neutron" or "proton" configurations, this exact match can only consist in correct totals of the UPA populations. While it is nice to have two pairs of numbers add up to the expected totals, this is somewhat short of the detailed structural correspondence that his text would seem to indicate.

Similarly, the discussion of string theory (here of chromodynamics, rather than fundamental superstrings) appears to place a good deal of weight on the correspondence between Leadbeater's and Besant's diagrams and more recent renditions of flux tubes between quarks. Yet, if one is to depict a connection between separated objects, and to envision this connection as something akin to an extended physical entity in its own right, how many ways of drawing such a thing *are* there? The "Y-shaped" connection among three objects can scarcely be reckoned as a significant correspondence between physical theory and MPA diagrams, for example: it is just the simplest symmetric way to connect three bodies, touching each only once.

Conclusions

Aside from a few tantalizing bits of historical evidence, "Extrasensory Perception of Subatomic Particles" consists almost in its entirety of unsupported, frequently self-contradictory, speculation. The two-body-fusion model of micro-psi, as discussed above, introduces as many problems as it solves. The subquark theory, with its baroque elaboration at the superstring level, gives every appearance of being an *ad hoc* imposition whose only justification is that it allows one to interpret every element of Besant's and Leadbeater's perceptions as physically real. Phillips does not seem to understand that far more support of micro-psi as a valid experimental tool would be required before its findings could themselves be used to support such an overburden of speculative physics. Neither does he seem to understand that, lacking such empirical support for micro-psi, the theoretical parts of his paper do not strengthen his position, but instead weaken it, since they appear to be driven not by a *priori* theoretical concerns but instead by an effort to vindicate Besant and Leadbeater in every observational particular. It is a special frustration to see the paper conclude with a parenthetical reference to recent micro-psi observations under controlled conditions. A serious effort to validate micro-psi should have dealt with the empirical data *first,* to build the case for its observational utility.

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Reply to Dobyns

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The reader may be surprised to learn that, unlike Dobyns, the second referee recommended my article unreservedly without criticisms. I will rebut Dobyns' criticisms in the order in which they appear in his critique.

I wholeheartedly reject Dobyns' misconceived view that I could have done more for the subject by not insisting on the detailed accuracy of the visions of Leadbeater and Besant. He fails to appreciate that I emphasized this feature on purpose because it is the very abundance of details about the particles in MPAs — all remarkably consistent with my theory of MPAs, as my book ESP of ***Quarks*** demonstrates — that provides such ***overwhelming*** evidence for their micro-psi ability. The whole point about their research which he misses is that it is the ***detailed*** correlation between theory and observations that gives this evidence its remarkable strength, their sheer number making their work impossible to dismiss in terms of conventional explanations.

Dobyns' mistaken assertion that I rely on special pleading betrays confusion. I admitted none of the various scientific problems I raised about MPAs as an "error" or "inaccuracy" of observation for what I would have thought is the obvious reason that this would presuppose that MPAs were atoms, whereas I have made a different interpretation. By claiming that I am resorting to special pleading by not admitting scientific discrepancies as such, he is begging the question that MPAs are atoms! By hypothesizing a different interpretation, I do not ***have*** to admit that the discrepancies which Dobyns mentions are true errors. Instead of invoking "speculative physics" at the start, my reinterpretation of MPAs leads to the exciting deduction that subquarks exist. So the "invalid mode of argument" is Dobyns' rather than mine.

The fact that there is at yet no conclusive, experimental evidence for subquarks can hardly be taken as an argument against my theory of MPAs. Skeptics said the same of quarks for a while before experiments began to establish their existence. My work makes me confident that such evidence will appear within the next thirty years — perhaps sooner from the proposed LHC facility at CERN. It is incorrect to say that there is no experimental evidence for quark compositeness. One such piece, which the Nobel Prize winner Abdus Salam encouraged me to publish, is the behavior of the magnetic form factor of the proton at large momentum transfers, which is consistent with composite quarks (Phillips, 1979). The issue of the mass scale is not an insuperable obstacle, as Harari and others have pointed out (Harari, 1984). If massless subquarks confined by hypercolor forces have a chiral symmetry which is unbroken at the energy scale of these forces, then the latter can remain massless. Whilst it is true that my own subquark model prediction of five generations of quarks and leptons has turned out to be inconsistent with observation, this is quite beside the point because, as I emphasized in both my book and my article, my analysis of MPAs does not need to make *any* assumptions based upon a particular theory of subquarks, and so the validity of my conclusions is entirely unaffected by this incorrect aspect of my subquark model, in other features of which I still have confidence. Readers should be warned that Dobyns' comments are heavily prejudiced by his dogmatic belief that subquarks do not exist. Most physicists remain open-minded.

It is a distortion of the logic of the situation to assert that I "invoke" subquarks as a way of avoiding discrepancies between science and micro-psi observations. As I pointed out earlier, Dobyns wrongly presupposes that MPAs are atoms. Now he does not seem able to recognize a hypothetico-deductive theory when he sees one. Far from *invoking* subquarks, just one hypothesis concerning MPAs enables me to *deduce* that UPAs are subquarks. No amount of logical pettifoggery by Dobyns can hide this fact.

None of the Nobel Prize winners, Fellows of the Royal Society and other scientists with whom I have discussed my theory of micro-psi has ever called my thesis "extravagant." Indeed, they have praised its economy of hypothesizing. Dobyns uses this adjective merely because he does not wish to accept that the micro-psi observations of Besant and Leadbeater imply the existence of subquarks, this forcing him to make the absurd pretense that the notion of subquarks is unnecessary to an understanding of the micro-psi observations.

It is inaccurate to say that Besant and Leadbeater saw "too many particles inside atoms to be accommodated by the standard model of particle physics." This is an example of logical and semantic carelessness, for what he *should* have said is that too many *types* of particles were observed. I did not consider the further possibility that their observations were not veridical because the idea is self-evidently vacuous. Quite apart from the two Theosophists having no reason to report their experiences *dishonestly*, the possibility explains absolutely nothing at all. To claim that it amounts to a "more parsimonious explanation of the facts" is a piece of intellectual sophistry that should not fool the reader. The only interesting possibilities to consider concerning the Theosophists' perceptions is that they were either fabricated, genuine but hallucinatory or genuine and paranormal. Only the lattermost is scientifically viable.

Dobyns' alternative explanation of *Occult Chemistry* is self-contradictory and thoroughly confused — that's why I did not seriously consider it. By definition, hallucinations contain illusions which do not refer to anything existing in the objective world, while ESP experiences are not wholly hallucinatory because by definition they do refer to the real world. So how can a discrete, visionary experience be hallucinatory and paranormal at the same time? It can only be one or the other. Anyway, as my article pointed out, hallucinations influenced by a knowledge of chemistry would not have led to descriptions of the molecules of methane, benzene and other chemical compounds which are utterly at variance with facts known at the time. Once again, logic is not on Dobyns' side. It is very easy to use fallacious arguments to create the illusion that I did not consider all possible alternatives to micro-psi.

To say that it is artificial and implausible to assume that the experiences of the two Theosophists corresponded to real objects is yet again just another unjustified opinion. Far from being artificial, it is the only view which makes sense, whilst it is only implausible to someone who has a prejudice to defend, namely, that subquarks do not exist, and who therefore resorts to ill-thought out arguments to avoid having to admit overwhelming evidence that disproves his belief. His dogmatic disbelief, which is not the mainstream opinion of particle physicists, has seriously distorted his evaluation. Once again, he offers no reason why it is worth the reader nothing that the diagrams in *Occult Chemistry* are more plausible as "symbolic or schematic representations of some kind than as veridical representations of quantum objects in space," and so I reject this as yet another unsubstantiated opinion with which other scientists I know disagree.

It *would*, indeed, be peculiar if I had argued that inaccuracies in observation made its validity more credible. But, of course, I did not. This is another misrepresentation. As before, he fails to understand that an apparent discrepancy between micro-psi observations and science would only have to be regarded as a real one if MPAs were atoms. *Ex hypothesi*, MPAs are not, and so such observations are not *necessarily* wrong! His failure to see the logic of this constantly discredits his arguments. It is of course possible that *hallucinations* could contain wrong elements as well as those influenced by a knowledge of chemistry. But this assertion is a contextual sleight-of-hand by Dobyns which should not deceive the reader, for I was referring here not to hallucinations but to fabricated descriptions and the way a knowledge of chemistry could have been expected to influence them. His remarks are thus inapposite and my argument, quoted by Dobyns, remains valid.

Dobyns has misunderstood my statistical argument against fabrication. His comments about there being "excellent reasons to provide a special role for integer multiplicity of hydrogen's composition" in MPAs are beside the point because my argument proves that the population data could not have been concocted with the table of atomic weights referred to in *Occult Chemistry, not* that it could not have been fabricated on the assumption that atomic weights were whole numbers. This comment, anyway, is incorrect, for while many elements do have have atomic weights close to whole numbers, many others do not. In fact 47% of the atomic weights reprinted in the first edition of *Occult Chemistry* from the scientific handbook the Theosophists referred to differ from whole numbers by 0.2 or more — a proportion hardly likely to have made Besant and Leadbeater think that atomic weights should be whole numbers!

This pattern of irregularity could not therefore have induced Besant and Leadbeater to concoct UPA populations that were multiples of that of hydrogen. Dobyns' suggestion does not stand up to the evidence.

The 57 elements in question are listed on page 20 of the first edition of ***Occult Chemistry.*** They also appear in table 4.3 of my book. Dobyns obviously has not read either book as otherwise he would know which elements I was talking about. His calculation is completely irrelevant because it is based upon ***modern*** values of atomic weights, which were unavailable to Besant and Leadbeater. If anything, he ought to have rounded off the values of the atomic weights as known to the investigators, i.e. those listed in ***Occult Chemistry.*** I am amazed that he does not see the pointlessness of his exercise. How can anyone take his critique seriously if he makes silly mistakes like this? It is his, not my, statistical argument that is meaningless. His statement that the Theosophists' procedure for counting UPAs "would necessarily introduce an integerizing distortion similar to the effects of rounding" is utterly wrong. It would not ***necessarily*** do anything of the sort! Slipping in here the key word "necessarily" is inappropriate, and the reader should not be deceived by it. Combinations of multiplying factors based upon repeated structural elements in MPAs would not necessitate that the resultant UPA population was a multiple of 18 in even one, let alone in a statistically significant fraction of cases. This might have happened by accident now and again. But the odds are stacked heavily against it occurring in every MPA — the implication of the word "necessarily."

My argument was obviously against conscious fraud. The Theosophists were only self-deluded to the extent that they thought they were observing atoms. To suggest anything else is just a vacuous speculation — there is no evidence to support it.

Dobyns' motivation for scrutinizing my Table 2 is questionable. Does he not realize that mass numbers were not even scientifically conceived — let alone known — when the bulk of the descriptions of MPAs was completed? In other words, they could not ***in principle*** have been informed by a knowledge of mass numbers. Dobyns' exercise is pointless!

I would have thought it obvious to anyone how conflicts between criteria for choice of nuclides should be resolved. Criterion 1 takes precedence provided the most abundant nuclide also satisfies criterion 2. If it does not, then criterion 2 takes over and the next most abundant nuclide satisfying criterion 2 is the correct choice. But let me put to rest Dobyns' suspicions about the choice of certain nuclides. The reason why Sm-154, Er-168, Hg-199 and Hg-200 were chosen was of course not to minimize errors but the perfectly innocent one that the three criteria selected them — pure and simple. Why did this not occur to him? I do not suppose it could be that it did but that he ignored the obvious answer in order to damn my work with the innuendo of selection bias? If so, the reader should not be taken in by this. Rigorous application of the three criteria meant that considerable labor, shared between myself and a distinguished biochemist and Fellow of the Royal Society, went into Table 2, making it not always immediately obvious why particular nuclides appear in it.

The question why the Theosophists did not detect more isotopic MPAs is easy to answer and I am surprised it did not occur to Dobyns (but then he ignores the amazing fact that they were detected at all!). They did not of course expect to find such variations. But when they did chance upon one, they left it at that and did not bother to look specifically for more because science at the time provided no motivation to do so, isotopes not being suspected to exist. According to Jinarajadasa: "Isotopes were not specifically sought for by the clairvoyant investigators" ***(Occult Chemistry,*** 3rd ed., p. 351). So there is no mystery why so few isotopes were detected. Let us marvel at the fact that they were detected in the first place!

In attempting to demonstrate internal inconsistency in my argument, Dobyns once more missed the point I was making in asking how hallucinations could create UPA populations about 18 times the atomic weights of elements. According to their account, Besant and Leadbeater did not usually know what element it was whose MPA they had examined until after they checked its so-called "number weight":

$$\text{number weight} = \text{UPA population118}$$

So again I ask: how could hallucinations exhibit this correlation if the investigators did not know beforehand what the element corresponding to the MPA was and therefore what its atomic weight had to be? The only possibility is that — contrary to what they claimed — they ***did*** know individual atomic weights beforehand and that they experienced hallucinations embodying the appropriate numbers of UPAs. But this cannot explain why the agreement between number weights and atomic weights exists even for elements like francium and astatine whose exact atomic weights must have been unknown to the two Theosophists because their scientific discovery came years after their deaths. There is therefore no problem-free, rational answer to my question.

In arguing that the hydrogen MPA could not be the deuteron in an HD molecule because of the relative rarity of the latter compared with H_2 molecules, I did not in the least forget "my attempt, ... to invalidate such reasoning based on relative abundances." Dobyns' attempt to expose an inconsistency confuses issues of relative abundance in dissimilar contexts. It is perfectly consistent on the one hand to identify MPAs with nuclides which are sometimes not the most abundant one because they do not satisfy criterion 2 and, on the other hand, to argue that the hydrogen MPA could not be a deuteron in an HD molecule because — this being rarer than the protons in H_2 molecules — the more frequently observed hydrogen MPA would then have consisted of one hydrogen triangle, not two. My argument is not simply that deuterons are rarer in hydrogen molecules than protons. I am afraid Dobyns has failed to understand my subtle argument eliminating the possibility that the hydrogen MPA was one end of an HD molecule.

It is incorrect to say that the two Theosophists "had no difficulty in identifying two or more variant versions of a single element." It would not have been easy to detect minor differences, amounting typically to only one or two UPAs, in a structural component of an MPA containing thousands of UPAs. This is why their detection of isotopic variations was driven by chance and less frequent than facts about abundance of isotopes would lead one to expect. The fact that Besant and Leadbeater did not mention that certain unstable elements are found as rare contaminants is neither here nor there. They rarely mentioned the nature of the chemicals they examined and they had no particular reason to mention that they had seen these MPAs amongst other elements, for this was not unusual, they rarely using pure specimens. We are told by Jinarajadasa (Occult Chemistry, 3rd ed., p. 350) that technetium was described in rare earth oxides that he had obtained from the chemical company Hilger & Co.

Dobyns attributes to me an argument I never made. I did not argue that the data are "close enough to $N = 18A$ to demonstrate some knowledge of atomic mass numbers." How on earth could I when there was no knowledge of mass numbers in existence when the Theosophists determined the UPA populations of MPAs?! His argument that the small discrepancy between counted and predicted UPA populations suggests that atomic weights rather than mass numbers determined UPA counts is completely false — it makes no such preference at all! Dobyns ignores the highly significant fact (pointed out in my article) that the fit of the data to mass numbers is more accurate than that to atomic weights. This should have been evident to him but would have discredited his argument. I repeat it here for the reader: the populations Y of MPAs of elements with atomic weight X are best fitted by the equation:

$$Y = (18.055 \pm 0.014)X,$$

which represents a worse deviation from Besant's and Leadbeater's empirical rule:

$$Y = 18X$$

than that between the best fit for MPAs corresponding to isotopes with mass number A:

$$Y = (0.48 \pm 3.99) + (18.03 \pm 0.03)A$$

and the prediction:

$$Y = 18A$$

made by my theory of MPAs.

As far as the claimed incompatibility between the fusion process needed to form the hydrogen MPA and my claim about the gold MPA is concerned: well, where is it? Dobyns does not specify it. He errs in thinking that the gold MPA consists of 158 protons and 236 neutrons. I never said this. If he had taken the trouble to consult Occult Chemistry, he would have discovered his mistake, for the gold MPA is made up not of nucleons but of quarks and subquarks that originated in the 158 protons and 236 neutrons comprising two Au-197 nuclei (in my new book [Phillips, 1994] I provide spectacular verification of this). His argument that various types of decay accompanying the fusion of two gold nuclei would change the UPA populations from the exact correspondence with Au-197 is inappropriate because, had he read my earlier book, he would have known that it proposes a process of formation of MPAs that differs from the fusion process familiar to nuclear physicists and in which such decays need not occur. He erroneously ascribes to me the suggestion that MPAs are forms of a crystallize quark-gluon plasma. This is misrepresentation. What I actually proposed is that MPAs are quasi-nuclear systems (not plasmas) that have crystallized out of a quark (and subquark)-gluon plasma briefly created from the freeing of particles inside two atomic nuclei by the psychokinetic intervention of the micro-psi observer. There is thus no problem why the hydrogen MPA still consists of distinct nucleons, for both it and other MPAs represent the final state of condensation from an initial plasma state formed from two nuclei. Dobyns' error means that arguments from different sections of my paper do not undermine one another.

As Dobyns would have realized had he read Chapter 7 of my book, the shapes of MPAs are not determined simply by comparing protons and neutrons in different nuclides. Instead, their correlation with the electronic properties of atoms suggests that the electromagnetic environment of the two parent atoms influences the process of condensation of particles from the initial plasma state. So two Nd-197 nuclei would not form an MPA which is similar to the X MPA even though, according to my theory, the two parent nuclei had the same numbers of protons and neutrons. The process of formation for MPAs is not nuclear fusion. The "impossible" elements would not therefore have been observed as isotopic variations of other known elements, as simple-minded counting of nucleons might suggest.

Dobyns takes me to task for not explaining why hybrid MPAs were rarely observed. A proper discussion would need another paper. Limitations of allowed space prevented its inclusion. The observations of the six "impossible" MPAs were not "wrong," as Dobyns illogically describes them. They would have been wrong only if MPAs had been atoms! Nor are these MPAs examples of where micro-psi observations are "sometimes completely inaccurate" — again because MPAs are not atoms. I provided two pieces of supporting evidence (out of four which are available) for my explanation of these MPAs in the form of agreement between counted and predicted UPA populations, so my discussion hardly amounts just to relabeling of empirical facts. Dobyns is being overly pedantic in contending that the lack of a full explanation makes one obliged to regard observations of these MPAs as evidence refuting micro-psi. I mean — given the power of my theory to explain in ***detail*** 105 of the 111 MPAs recorded by Besant and Leadbeater (as my new book will prove), as well as all the other remarkable connections between the micro-psi observations and particle physics discussed in my article, how can anyone argue this in all seriousness? The truth is that he is trying to make as much capital as he can out of an omission I made with innocent intentions. I fear the man doth protest too much.

The delocalization of nuclear constituents that I proposed as part of the process of MPA formation is only confined to their initial "slowing down." Once the quarks and subquarks of two nuclei overlap and interact strongly to form new bound states, they come under micro-psi observation, which tends to pin them down so to speak in space, so that each one is no longer in a state of known momentum. Hence, according to the uncertainty principle, as they recombine into observed, quasi-nuclear bound states, particles will become more localized again as the uncertainties in their moments assume non-zero values again. The delocalization that I propose is therefore perfectly compatible with the components of MPAs having definite locations because it is not permanent. Besant and Leadbeater did not arbitrarily constrain both the positions and momenta of particles. Being able to see a particle at rest does not mean that you know where it is! Conversely, observing a particle moving within a certain domain does not mean that you know exactly how fast it is moving! So it is quite incorrect to say that their ability to constrain both the positions and momenta of particles is inconsistent with the uncertainty principle. It would have been only if, for example, they had also known where in space a stationary particle observed in their field of view was. This of course was never the case. Anyway, the fact that they could experience a stationary image of a particle does not mean that it really was stationary. It some cases where they held single particles in their field of view, their observational apparatus converting information into virtual reality-like images could have been moving alongside it. In my micro-psi experiments with a clairvoyant in 1992, he sometimes reported such an experience.

The whorl structure of a UPA is not on the superstring scale of 10^{-33} cm but on a scale a number of orders of magnitude larger, for this is the form of a superstring (or rather its 26-d string component) in ordinary 3-d space. It is the size of the highest-order spirillae (the smallest dimension of the compactified, 6-d torus) that is the Planck scale, where quantum fluctuations of the space-time metric are expected to take place. I know that closed superstrings are often said to be of the Planck scale in size. But this cannot be strictly true of their three-dimensional form if — as Leadbeater's observations indicate — the compactified dimensions are not all of the same scale (or else the smallest dimension would be tinier than the Planck scale!) So Dobyns is incorrect to say that the structure of whorls is incompatible with these fluctuations and one does not have to choose between strict veridicality and the uncertainty principle. It is a pity that Dobyns' obvious antipathy towards superstring theory ("it ignores the spirit of Ockham's razor") should stop him being impressed by the fact that — as I pointed out, Leadbeater described at least three features of UPAs that are remarkably consistent with string theory. I think more impartial minds would be quite impressed by this. It is not my preferred model of dimensional compactification but the one indicated by Leadbeater's observations. Once again Dobyns displays a lack of logic in his analytical thought by stating that the gauge group of quarks must be a subgroup of the more fundamental symmetry group of superstrings, as if my resurrection of the 6-d torus model were incompatible'with this. Let me repeat my argument: The 6-d torus was rejected by theorists because it implies gauge groups other than the U(1)xSU(2)xSU(3) found for quarks. But, if quarks are composite, the unified gauge group of superstrings need only contain this as a proper subgroup and so the phenomenological problem falls away and this model of compactified space becomes in principle relevant once more.

It is a complete misrepresentation to say that the exact correspondence between the MPA of gold and the subquark composition of two nuclei of Au-197 only consists in correct UPA populations. As my article stated, recent research (Phillips, 1994) has demonstrated exact, detailed, qualitative correspondence as well as the latter quantitative agreement. By not mentioning this, Dobyns creates the false impression that I was not substantiating my claim concerning the gold MPA. Either he overlooked it or it was a deliberate omission. The reason that he calls it "less than meets the eye" is that he closed his own eyes to a crucial passage in my article. His attempt to trivialize the correspondence between string models of baryons and mesons and diagrams depicting the lines of force between UPAs will not convince anyone.

I will not labor the point by commenting upon Dobyns' conclusions.

To conclude: Dobyns' critique contains misconceived arguments, misrepresentations and lack of intellectual penetration. He thereby fails to rebut any element of my claim that the micro-psi observations of Besant and Leadbeater are genuine. Certainly, they have not persuaded me that ***anything*** in my article is incorrect. I advise readers to ignore all Dobyns' talk of "straw men," which is out of place in a sober, scientific evaluation. They would do far better to make up their minds for themselves.

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