



Kushi Institute
STUDY GUIDE

SPECIAL
ISSUE

on

Atomic
Transmutations

lectures with Michio Kushi

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The purpose of this publication is to provide stimulating material that will broaden and deepen our understanding of the natural order of life. Our hope is to awaken the memory of our relationship with the infinite universe.

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DAILY DEDICATION FOR ONE PEACEFUL WORLD

When we eat, let us reflect that we have come from food which has come from nature by the order of the infinite universe, and let us be grateful for all that we have been given.

When we meet people, let us see them as brother and sister and remember that we have all come from the infinite universe, and let us be grateful for all that we have been given.

When we meet people, let us see them as brother and sister and remember that we have all come from the infinite universe through our parents and ancestors, and let us pray as One with all of humanity for universal love and peace on earth.

When we see the sun and moon, the sky and stars, mountains and rivers, seas and forests, fields and valleys, birds and animals, and all the wonders of nature, let us remember that we have come with them all from the infinite universe. Let us be thankful for our environment on earth, and live in harmony with all that surrounds us.

When we see farms and villages, towns and cities, arts and cultures, societies and civilizations, and all the works of man, let us recall that our creativity has come from the infinite universe and has passed from generation to generation and spread over the entire earth. Let us be grateful for our birth on this planet with intelligence and wisdom, and let us vow with all to realize endlessly our eternal dream of One Peaceful World through health, freedom, love and justice.

ONE PEACEFUL WORLD PRAYER

Having come from, being within, and going towards infinity,

May our endless dream be eternally realized upon this earth,

May our unconditional dedication perpetually serve for the creation of love and peace.

May our heartfelt thankfulness be devoted universally upon everyone, everything and every being.

----Michio Kushi

A PEACEFUL REVOLUTION

This year as many of you know, our macrobiotic approach to healing sickness, using only very natural home cooking and very simple remedies such as ginger compress or certain condiments, has begun to spread very rapidly throughout the country and the entire world. Already, following several well-publicized case histories of cancer patients who began macrobiotics, several major hospitals have approached us to initiate some kinds of macrobiotic activities in their facilities; and many other similar developments are going on.

Very, very soon, we will discover that we have totally changed the institution of modern medicine itself - not by attacking and saying, "You are wrong," but by their own initiative, wanting to incorporate and adopt our methods and whole approach.

However, although this is of course very wonderful, there are also other peaceful revolutions that we may need to make in the near future in addition to the revolution in medicine and food. For example, the whole area of people's spiritual view is in a state of chaos, with many different religions all saying different things; and the real meaning and understanding behind all of their traditions have been lost. We may also use our macrobiotic view to unify and synthesize these things.

Another example, which may become very critical in the near future is science, which I would like to study with you tonight. Especially, let us study the background and findings so far in the field of atomic transmutations.

CLASSIFICATION OF ELEMENTS BY YIN AND YANG

Let's see how our understanding of yin and yang applies to the world of elements. Yang temperature is what - more high temperature or more low temperature? High temperature (hot) is more yang; low temperature (cold) is more yin. Yang size is what? It is smaller and more compact; larger is more yin size. Heavier is more yang; lighter is more yin. In terms of density, yang is more dense, more hard or solid; less dense is yin. Red color is more yang; purple or violet is more yin; various colors are there in between - red, orange, yellow, green, blue, violet. Beyond red is infra-red, which we don't see anymore as actual color; beyond violet is ultra-violet.

	<u>YANG</u>	<u>YIN</u>
TEMPERATURE	Hotter	Colder
SIZE	Smaller	Larger
WEIGHT	Heavier	Lighter
DENSITY	More Dense	Less Dense
COLOR	I-Red, Red, Orange, Yellow, Green, Blue, Violet, U-Violet	

Now by applying this kind of understanding, let's see among elements which are more yang and which are more yin; please refer to the alphabetical table of elements. (Next page).

ATOMIC WEIGHT

An atom's orbiting electrons do not influence weight much, as they are so small. Atomic weight is essentially the weight of the nucleus. A large atomic weight means this atom is heavier, a more yang element.

ATOMIC WEIGHTS

Based on the assigned relative atomic mass of $^{12}\text{C} = 12$

The following values apply to elements as they exist in materials of terrestrial origin and to certain artificial elements. When used with the footnotes, they are reliable to ± 1 in the last digit, or ± 1 if that digit is in small type.

Name	Sym- bol	At. No.	At. wt.	M.P. °C	B.P. °C
Actinium	Ac	89	(227)	1050	1300 ± 300
Aluminum	Al	13	26.9815 ¹	933.37	2467
Americium	Am	95	(243)	991 ± 4	2607
Antimony	Sb	51	121.75	630.74	1750
Argon	Ar	18	39.948(1) ²	189.2	185.7
Arsenic	As	33	74.9216 ¹	611	613
Astatine	At	85	(210)	302	317
Barium	Ba	56	137.33	725	1640
Berkelium	Bk	97	(247)		
Beryllium	Be	4	9.01218 ¹	1278 ± 5	2970
Bismuth	Bi	83	208.980 ¹	271.3	1560 ± 5 ¹⁰⁰
Boron	B	5	10.81(1) ²	2300	-2550
Bromine	Br	35	79.904(1) ²	7.2	58.78
Cadmium	Cd	48	112.40	320.9	765
Calcium	Ca	20	40.08	839 ± 2	1484
Californium	Cf	98	(251)		
Carbon	C	6	12.011(1) ²	3550	4827
Cerium	Ce	58	140.12	798 ± 1	3447
Cesium	Cs	55	132.905(1) ²	2840 ± 0.01	678.4
Chlorine	Cl	17	35.453(1) ²	-100.908	-34.6
Chromium	Cr	24	51.996(1) ²	1857 ± 20	2672
Cobalt	Co	27	58.933(1) ²	1495	2870
Copper	Cu	29	63.546(1) ²	1083.4 ± 0.2	2567
Cupferric iron	Fe ³⁺	56	127.36	1240 ± 100	2335
Einsteinium	Es	99	(252)		
Erbium	Er	68	167.26	1522	2510
Europtium	Eu	63	151.96	833 ± 3	1597
Euterium	Em	100	(257)		
Fluorine	F	9	18.998(1) ²	219.62	188.14
Franium	Fr	87	(223)	1771	16771
Gadolinium	Gd	64	157.25	1311 ± 1	1211
Gallium	Ga	31	69.72	29.78	2403
Germanium	Ge	32	72.64	937.4	2830
Gold	Au	79	196.9665 ¹	1063.43	2807
Hafnium	Hf	72	178.49	2233 ± 20	4602
Helium	He	2	4.00260(1) ²	-272.296 ¹⁰⁰	-268.934
Holmium	Ho	67	164.930(1) ²	1130	2720
Hydrogen	H	1	1.0080(1) ²	249.14	252.87
Indium	In	49	114.82	156.61	2080
Iodine	I	53	126.90448 ¹	113.5	184.35
Iridium	Ir	77	192.22	2410	4140
Iron	Fe	26	55.845(1) ²	1535	2750
Krypton	Kr	36	83.80	-150.6	-152.30 ± 0.10
Lanthanum	La	57	138.905(1) ²	920 ± 5	3454
Lawrencium	Lr	103	(257)		
Lead	Pb	82	207.2(1) ²	327.502	1740
Lithium	Li	3	6.941(1) ²	180.54	1347
Lutetium	Lu	71	174.97	1676 ± 5	3115
Magnesium	Mg	12	24.305(1) ²	648.8 ± 0.5	1090
Manganese	Mn	25	54.938(1) ²	1244 ± 3	1962
Mercurium	Hg	80	200.59	368.7	356.58
Mesbryum	Me	101	(256)		
Mendelevium	Md	101	(258)		
Moscovium	Mc	115	(288)		
Nobelium	No	102	(259)		
Oganesson	Og	118	(294)		
Osmium	Os	76	190.23(1) ²	3045 ± 30	5027 ± 100
Oxygen	O	8	15.999(1) ²	-218.4	-182.962
Palladium	Pd	46	106.4	1552	3130
Phosphorus	P	15	30.9738(1) ²	44.1 (white)	280 (white)
Platinum	Pt	78	195.084	1772	3552
Plutonium	Pu	94	(244)	641	3522
Polonium	Po	84	(210)	254	962
Potassium	K	19	39.102	633.5	774
Praseodymium	Pr	59	140.907(1) ²	931 ± 4	3212
Promethium	Pm	61	(145)	-1050	2470
Protactinium	Pa	91	231.036(1) ²	-1040	
Radium	Ra	88	226.0254(1) ²	700 ± 1	1110
Rhenium	Rh	75	186.21	1911	3180
Rhodium	Rh	45	101.07(1) ²	1962 ± 1	3627 ± 100
Rubidium	Rb	37	85.468(1) ²	39.3	38.9
Ruthenium	Ru	44	101.07(1) ²	2310	3600
Samarium	Sm	62	150.4	1075	1774
Scandium	Sc	21	44.9559(1) ²	1539	2432
Seaborgium	Sg	106	(263)		
Selenium	Se	34	78.96(1) ²	217	647 ± 10
Silicon	Si	14	28.085(1) ²	1410	2100
Silver	Ag	47	107.868(1) ²	961.93	2165
Sodium	Na	11	22.9897(1) ²	97.80 ± 0.03	883.9
Strontium	Sr	38	87.62(1) ²	769	1384
Sulfur	S	16	32.06(1) ²	115.8	444.634
Tantalum	Ta	73	180.947(1) ²	2996	5425 ± 100
Tellurium	Te	52	127.60	2172	4877
Terbium	Tb	65	158.92534 ¹	1362 ± 4	3041
Thallium	Tl	81	204.38	303.5	1457 ± 10
Thorium	Th	90	232.037(1) ²	1730	4790
Thulium	Tm	69	168.934(1) ²	1545	1950
Tin	Sn	50	118.710(1) ²	231.960(1)	2270
Titanium	Ti	22	47.88	1660 ± 10	3287
Tungsten	W	74	183.84	3410 ± 20	5660
Uranium	U	92	238.0289(1) ²	1132.3 ± 0.8	3818
Vanadium	V	23	50.9415(1) ²	1900 ± 10	3100
Wolfram	(see Tungsten)				
Xenon	Xe	54	131.30	111.9	-107.1 ± 1
Ytterbium	Yb	70	173.04	824 ± 5	1193
Yttrium	Y	39	88.905(1) ²	1523 ± 8	3337
Zinc	Zn	30	65.38	419.58	907
Zirconium	Zr	40	91.22	1852 ± 2	4375

* Monoisotopic element.

* Element with one predominant isotope (about 99 to 100% abundance).

* Element for which the atomic weight is based on calibrated measurements.

* Element for which variation in isotopic abundance in terrestrial samples limits the precision of the atomic weight given.

* Element for which users are cautioned against the possibility of large

variations in atomic weight due to misadvent or undisclosed artificial isotopic separation in commercially available materials.

* Most commonly available long-lived isotope.

* In some geological specimens this element has a highly anomalous isotopic composition, corresponding to an atomic weight significantly different from that given.

Taken from Robert C. Weast, Ph.D., CRC Handbook of Chemistry and Physics (52nd Edition 1971-1972). Chemical Rubber Co. 18901 Cranwood Parkway, Cleveland, Ohio 44128.

MASS OR DENSITY

Again, higher density means a more yang element.

MELTING POINT/BOILING POINT

These indicate borderlines of transformation. Below the melting point an element is in what form? Solid, or gross matter. Above the melting point and up to the boiling point is what form? Liquid. Beyond boiling point this becomes gas. Further beyond this becomes plasma, the intermediate stage between matter and energy. Further beyond, this plasma becomes what? Here matter dissolves into vibrations, waves, or you may say spirit. So, matter has four stages, plus vibrations.

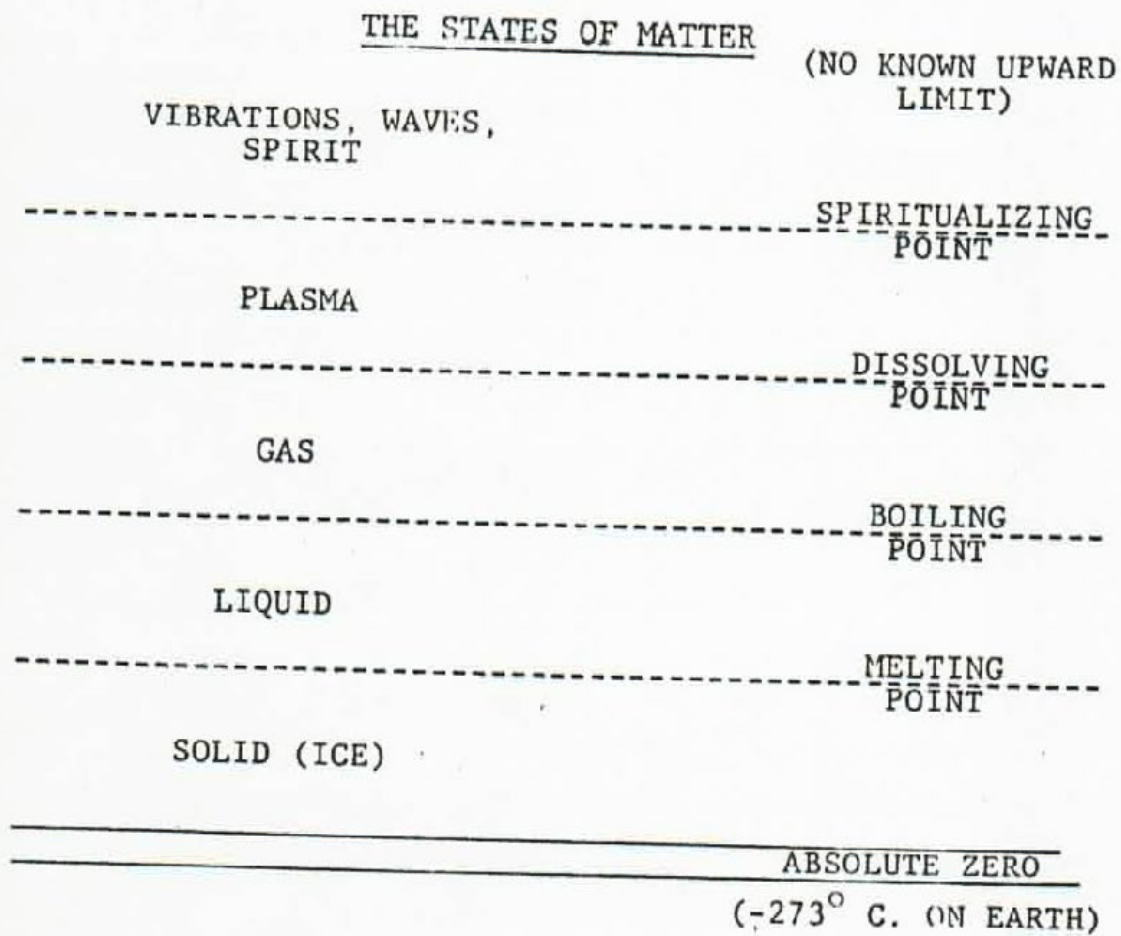
The upward limit of temperature is very huge - we don't know this limit; but we do know the low temperature limit. That we call Absolute Zero, -273° Centigrade, or 273° below the freezing point of water. We cannot make anything colder than that here on this earth. On some other planet or in some other place in the universe we may be able to go much lower, but as far as the earth is concerned, that is the absolute limit.

Compared with water, which has a melting point of 0° C. and a boiling point of 100° C., some elements have a very low melting point, these elements are more yin. Others have a very high melting point, these are more yang elements.

Let's take some examples: right here room temperature is about 32° C.; in this temperature, water is between melting and boiling, in a liquid state. At the same time, some elements, such as iron or copper, are already frozen at this temperature; they appear solid, which means frozen. You may say, for iron, copper and other similar elements, ice formation is already taking

place at room temperature. It naturally takes a very high temperature to change these into liquid form. Other elements, such as oxygen, nitrogen and hydrogen are already far above their boiling point, existing here in gas form. These gases become liquid only at very cold temperatures, fairly near to absolute zero.

So within our surroundings, although we may not notice it, all states of matter are occurring at once - some elements are in a frozen or "ice" state, some are in a semi-frozen state (like mercury), some are in liquid state, some are in gas or plasmic state, some are already in a vibrational or wave state. Our present material civilization is very limited in its view, only dealing with frozen and liquid states - not gas, plasma or vibrations.



SIZE

Which is the smallest atom? Hydrogen, so in terms of size, hydrogen is very yang. As we go higher in atomic number, the atoms get larger and larger, going from yang to yin.

WEIGHT

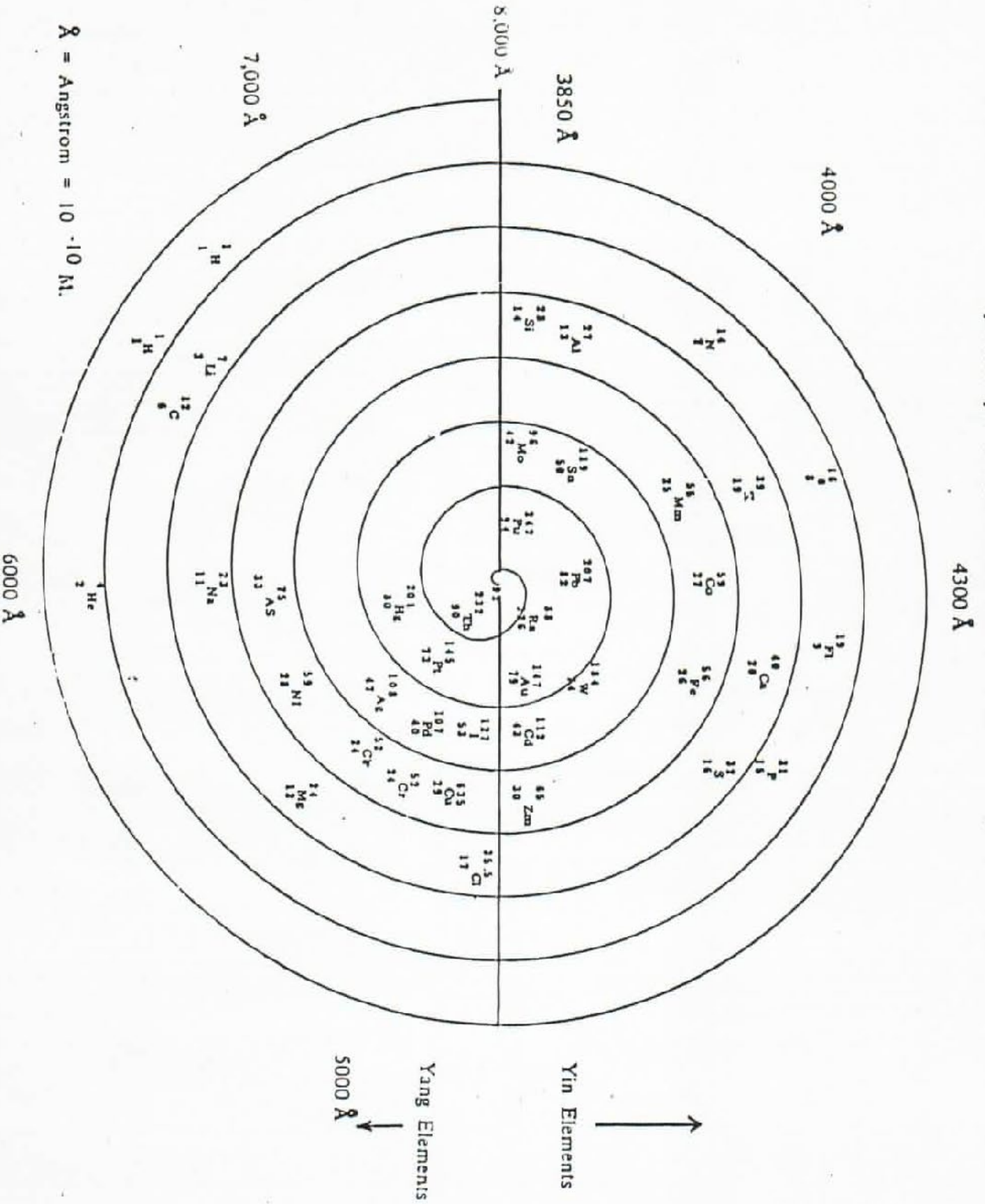
As far as weight is concerned, the opposite happens; the atoms get heavier and heavier, going from yin to yang. So, both yin and yang factors are there, balancing each other. Of course, this balance is not exact but is different for each element.

COLOR

Suppose we burn an element, and put a prism in front of it to see what colors are most strongly emitted. This is called spectroscopic examination; by examining the color spectrum of each element, we can make a more exact classification of yin and yang elements. (Please see the accompanying chart on the next page.)

Of course, to make this more exact, you can also include information such as melting point/boiling point and so forth, and adjust everything slightly to make it still more accurate. But the general idea is here.

This chart is arranged in a seven-orbit spiral; towards the center, atomic weight becomes heavier and heavier, and atomic number goes higher and higher. Furthermore, the elements in the lower half of each orbit have generally longer spectroscopic wavelengths (measured in Angstrom units) - more yang colors - the elements in the upper half have shorter wavelengths - more yin.



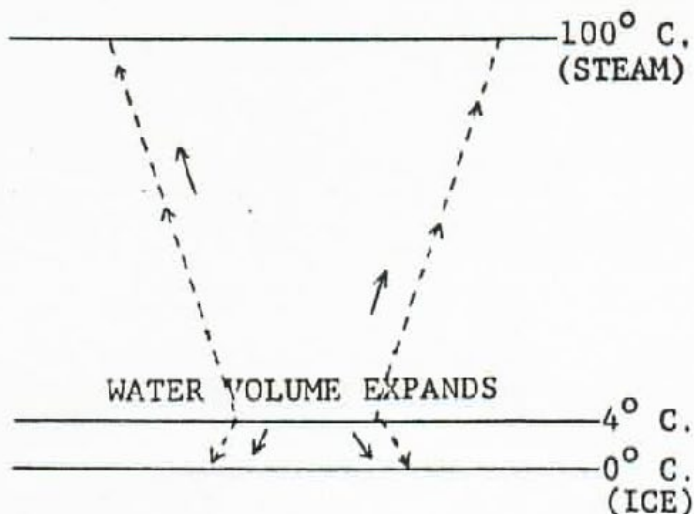
You can discover some very interesting things from this chart. For example: find oxygen and carbon; oxygen is in a more yin category, carbon is more yang. (Also compare their melting and boiling points.) Yang carbon and yin oxygen are something like male and female; they have nearly opposite tendencies, and can therefore combine very easily. Hydrogen and oxygen are very far from each other in this chart, they can also combine very easily, as in H_2O (water). This is one reason water can naturally occur in abundance.

This chart can solve all chemical mysteries, such as why some elements can easily combine and others can't. Suppose, we want to combine two elements, X and Y, and we see they are both more yang. Then we could introduce some yin condition, by changing temperature and making them more expansive, or by introducing some other more yin element as a catalyst or using some other technical adjustments. Carbohydrates, for example, are composed largely of H,C and O. Can you see how this occurs, according to their yin and yang natures?

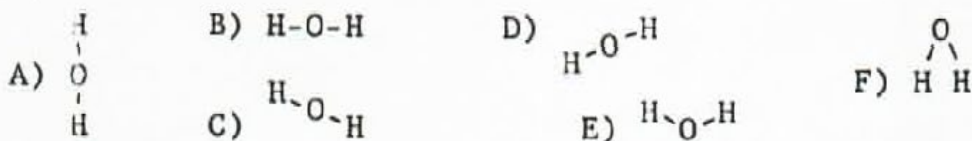
Carbohydrates, for example, are composed largely of H,C and O. Can you see how this occurs, according to their yin and yang natures?

THE MYSTERY OF WATER

Let's use this understanding to solve some scientific mysteries. Water (H_2O) has a very strange property. If we take some water and apply heat, as the water heats up towards boiling, its volume expands. However, if we apply cold, at a certain point the volume also expands. The borderline is about $4^{\circ}C$. - below this, water expands and above this water expands. Why? These are simply facts which science knows, but nobody has any good explanation for why. So we must use our magic spectacles - yin and yang.



We know hydrogen is more yang and oxygen is more yin. A water molecule has two hydrogen and one oxygen atom, but what does the structure look like? Here are six possibilities; please study them and decide for yourself which one you think is the right structure.

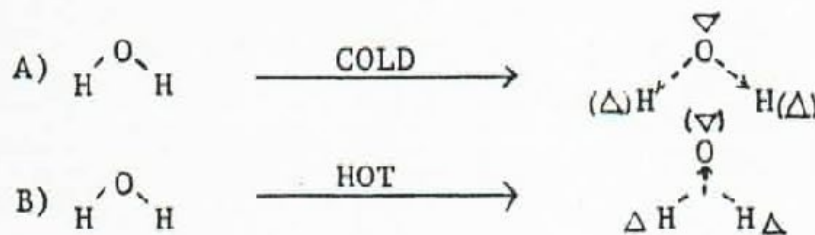


This is such a simple question, a child of seven or eight years should be able to figure out the answer very quickly. Yet it took scientists 60 years to figure out the structure of water! The result of 60 years and 1000's of scientists work is the version marked in the diagram, (F). This is the structure of water.

Since they don't know yin and yang, they can't explain why this is so. However, we can see that hydrogen is more yang so it naturally goes down; yin oxygen goes up. The two hydrogen atoms can't come too close, though, because they repel each other, so this structure results.

Now if we apply heat, what happens? Which atoms can attract this high temperature? Oxygen. Hydrogen does not react so fast,

as it is already more yang; but the oxygen atom quickly absorbs the heat and becomes more yang. What happens to this structure then? The attraction begins to deteriorate as the oxygen atom begins to repel the hydrogen atoms; the molecule becomes larger and the water's total volume expands. Now, if we apply cold, the yin oxygen does not react so quickly; but the hydrogen atoms become more yin quickly. Again, the molecule's attraction deteriorates, and the water begins to expand.



You can see this mechanism very easily, right? In this way, using yin and yang, we can solve many technical and scientific riddles; let's see some other examples.

THE DELUSIONS OF SCIENCE

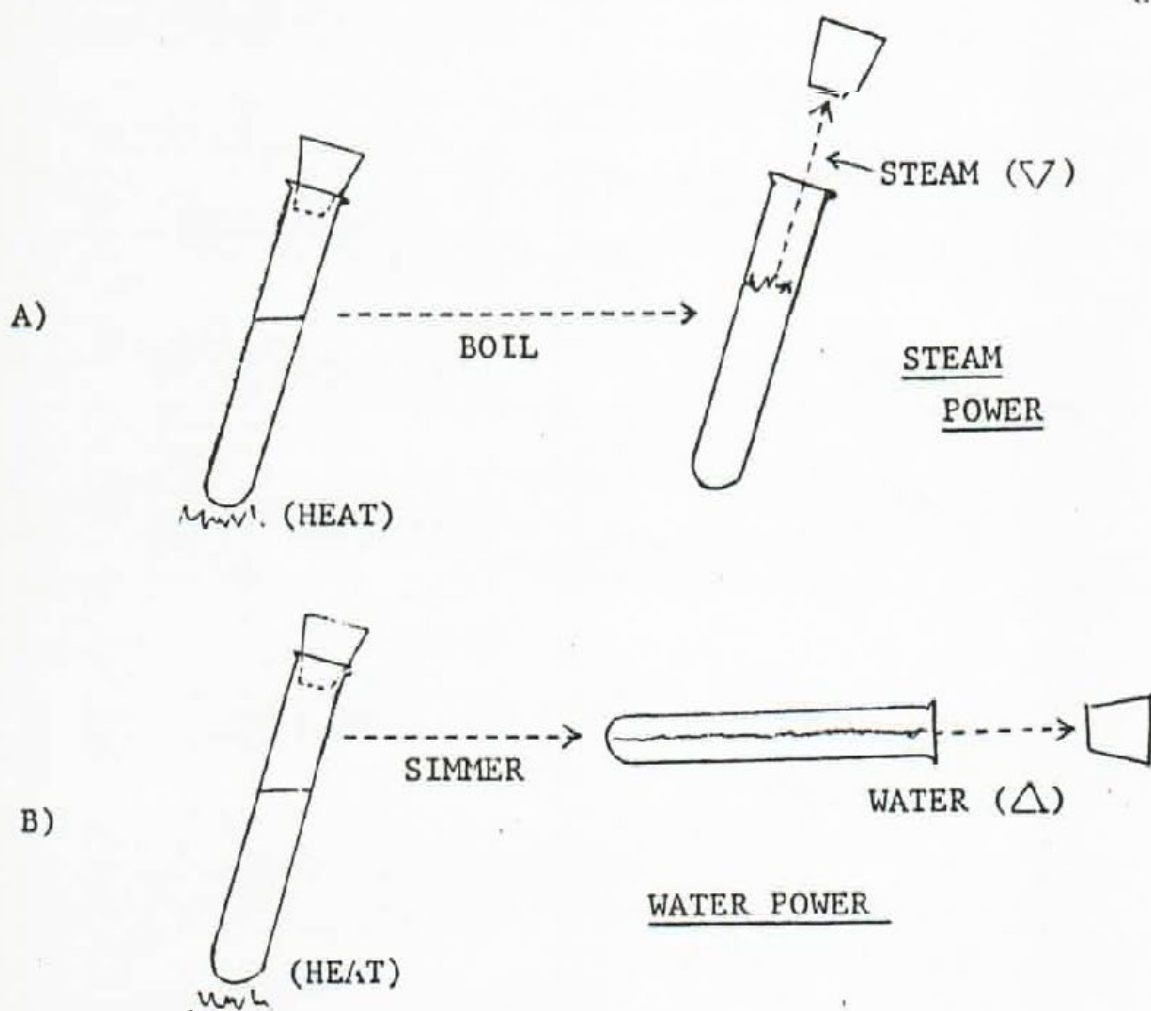
Does anybody know who discovered the steam engine? James Watt. One day he was sitting in the kitchen and was watching a kettle of water begin to boil; he saw the lid moving up and down, and started to think, "If we use this steam as an applied force, we can generate tremendous power." This thinking led to the invention of the steam engine and all its contributions to industry.

However, if James Watt had known yin and yang, he could have made a far greater contribution to industry. Which is more yang, water or steam? The water in his tea kettle was more yang, particularly at the bottom of the kettle. He was only using his senses, so he observed the steam's action, and he simply imitated that. If he had used our magic spectacles, he would have paid attention to this more yang part.

This steam is already more diffused, more inefficient; the water part has much greater power - that part we should use. You can try this at home.

Go to the drugstore and buy a test tube. Fill it part way with water and put a cork on it. Then heat it with a candle or gas burner. After several minutes, when it begins to boil, the steam will blow the cork off. This confirms James Watts principle of steam power.

Now refill and recork the tube and apply heat again. This time, though, when the water is just at simmering stage, before it begins to boil, turn the tube onto its side. The more yang water will blow off the cork.



You can see that the steam engine is absolutely a waste of energy. It requires much more heating time, more fuel, and gives off less power than our method. If you design a method of applying the power of the more yang part of water, you can create a much more efficient, stronger machine. The person who knows yin and yang can always invent more efficient technologies.

Nearly all of modern science's theories and inventions are tremendously inefficient, because they are created out of mechanical thinking and do not understand yin and yang. Sometimes, these inventions can be disastrous.

For example, Newton was sitting under a tree, according to the famous story. (The story doesn't say with whom he was sitting, perhaps his girlfriend.) When he saw an apple fall, he thought, aha, maybe the earth is pulling on that apple. This was the beginning of the theory of gravity.

But this idea ran directly counter to religion, which believed God created the earth. If Newton had stood far away, he might have thought, no, maybe the heavens are pushing the apple down. Heaven's force is actually pushing apples and other objects to the earth's surface, and is also pushing the earth itself, as well as all other planets, around the sun in spirals. "God created the earth" means: from the periphery, or from infinity, heaven's force created all material phenomena by pushing in.

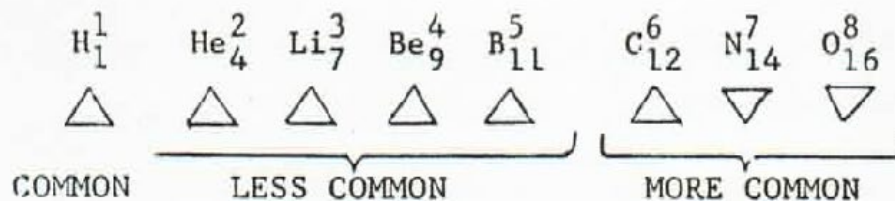
But Newton didn't think that way. He thought that everything has a center, like the earth, and this center is pulling everything else towards it. This idea corresponds to materialism, the idea of pulling many material objects into one's own orbit and accumulating them. Newton's theory of gravity provided scientific support for various forms of behavior, such as egoism and individualism, as well as materialism; and further such social ideas

as independent national sovereignty. This superstitious view also separated people from their intuitive awareness of God, or infinity, as our universal source of life, energy and matter; so church and science split apart. Ideologically speaking, Newton's way of thinking as he observed that falling apple became crime number one - selfishness, or arrogance, or you may say ignorance of infinity or God.

If you carefully examine all our modern scientific "laws," discoveries, technologies, and so forth, one by one, you find something very interesting. Most of them - not all, but most - are wrong. Most are superstitious, baseless assumptions, and will all naturally be changed or discarded, ten, fifty, or one hundred years from now.

For example, medicine. Suppose in 1980, perhaps one or two thousand new medicines are invented. In five years, already 95% of them will be gone - they will be found dangerous or ineffective and will be replaced by new medicines and thrown out. Then in several years, those replacements too will be thrown out. This all wastes such tremendous amounts of energy, power, money, time and ideas; and it is not helping humanity at all. But by using our magic spectacles, our understanding of the spiral of yin and yang, we can create a scientific revolution of common sense. This as you know, is already going on in medicine; now, let us further study the transmutation of elements.

EVOLUTION OF THE ELEMENTS



These first eight elements are nature's basic elements, some-

thing like the basic octave of the musical scale. As you can see, some are more yin and some are more yang. Among them, helium, lithium, beryllium, and boron are not found so much on the earth's surface; but hydrogen, oxygen, carbon, and nitrogen are found in abundance. Within these four, hydrogen and carbon form a more yang group; nitrogen and oxygen form a more yin group. As you can imagine, these four can very easily combine chemically.

When hydrogen, carbon and oxygen combine chemically, what is result? Carbohydrate. When these three combine chemically with nitrogen, what results? Protein. Vitamins and enzymes belong to which group? Also protein. Now, how did all these different elements arise? By your common sense, you can see that nature's more than one hundred different elements could not have suddenly appeared, one by one - one day oxygen, one day nitrogen, one day platinum, etc. No, they must be linked together by some continual process.

This is like an evolutionary continuum. When we see a fish and a human being, they appear very different; but we know that a connection is there, they are both part of one evolutionary chain. In the same way, one process must be linking between hydrogen and iron, between nitrogen and gold, or silicon and sodium. That evolution of elements, science has not yet explained, because they believe one element cannot change into another within natural conditions.

In scientific terms, this changing process is totally different from chemical combination - as in carbohydrates - when two or more atoms mix together but each retains its own nature as hydrogen, carbon, etc. - or from transformation of state, such as solid to liquid to gas etc. In this evolutionary process, two elements overlap, merge their electrons into a single set of orbits and become a totally different element. This is called

PERIODIC TABLE OF THE ELEMENTS

3 Li 6.94		4 Be 9.01																				5 B 10.81		6 C 12.011		7 N 14.01		8 O 16.00		9 F 18.998		10 Ne 20.18			
11 Na 22.99		12 Mg 24.31																				13 Al 26.98		14 Si 28.09		15 P 30.97		16 S 32.06		17 Cl 35.45		18 Ar 39.95			
19 K 39.10		20 Ca 40.08		21 Sc 44.96		22 Ti 47.90		23 V 50.94		24 Cr 52.00		25 Mn 54.94		26 Fe 55.85		27 Co 58.93		28 Ni 58.71		29 Cu 63.55		30 Zn 65.37		31 Ga 69.72		32 Ge 72.59		33 As 74.92		34 Se 78.96		35 Br 79.90		36 Kr 83.80	
37 Rb 85.47		38 Sr 87.62		39 Y 88.91		40 Zr 91.22		41 Nb 92.91		42 Mo 95.94		43 Tc 98.91		44 Ru 101.07		45 Rh 102.91		46 Pd 106.4		47 Ag 107.87		48 Cd 112.40		49 In 114.82		50 Sn 118.69		51 Sb 121.75		52 Te 127.60		53 I 126.90		54 Xe 131.30	
55 Cs 132.91		56 Ba 137.34		57 La 138.91		58 Ce 140.12		59 Pr 140.91		60 Nd 144.24		61 Pm (145)		62 Sm 150.4		63 Eu 151.96		64 Gd 157.25		65 Tb 158.93		66 Dy 162.50		67 Ho 164.93		68 Er 167.26		69 Tm 168.93		70 Yb 173.04		71 Lu 174.97			
87 Fr (223)		88 Ra (226.03)		89 Ac (227)		90 Th 232.04		91 Pa 231.04		92 U 238.03		93 Np 237.05		94 Pu (244)		95 Am (243)		96 Cm (247)		97 Bk (249)		98 Cf (249)		99 Es (254)		100 Fm (257)		101 Md (258)		102 No (259)		103 Lr (262)			

Lanthanides

57 La	58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb	71 Lu
138.91	140.12	140.91	144.24	(145)	150.4	151.96	157.25	158.93	162.50	164.93	167.26	168.93	173.04	174.97

Actinides

89 Ac	90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No	103 Lr
(227)	232.04	231.04	238.03	237.05	(244)	(243)	(247)	(249)	(249)	(254)	(257)	(258)	(259)	(262)

(available radioactive isotope of longest half-life)

This is taken from a book by Andrew Streitwieser Jr., and Clayton H. Heathcock.
Introduction to Organic Chemistry. Macmillan Publishing Co., Inc - 866 Third Ave.,
 New York, NY 10022, 1976.

transmutation. According to modern physics, transmutation can only occur in conditions of very high temperature, very high pressure and intensive energy, such as the conditions created artificially in a cyclotron or atomic reactor. But common sense tells us this must have been going on naturally when this earth or this solar system were being created. Let's look at these first basic elements, and trace their evolution.

Hydrogen is the number one basic element; one proton plus one electron. This is the original form energy takes when it evolves from a more vibrational state towards more condensed energetic "particles" (which in reality are simply very compact "clouds" or spirals of energy.) Hydrogen's atomic number (number of electrons or peripheral "particles") is 1; it's atomic weight (generally corresponding to the number of "particles" in the nucleus or central region, including protons and neutrons) is also 1; one proton.

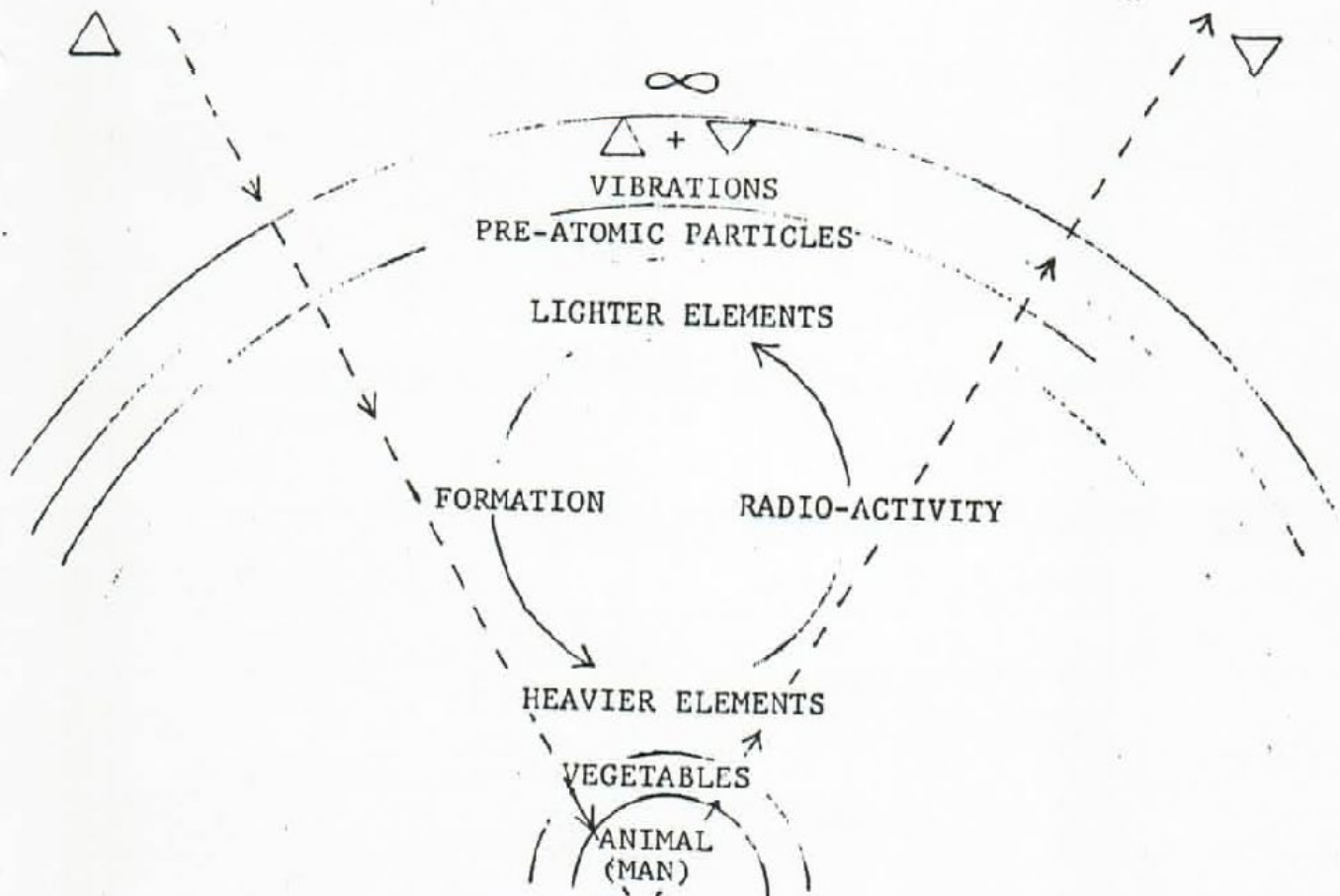
Then hydrogen₁¹ combines with "heavy" hydrogen, an isotope which contains two neutrons as well as one proton, or H₃¹, to create helium; H₁¹ + H₃¹ = He₄².

Then how does lithium arise? One helium plus one heavy hydrogen; He₄² + H₃¹ = Li₇³. Then lithium combines with one semi-heavy hydrogen (having one neutron) to make beryllium; Li₇³ + H₂¹ = Be₉⁴. Then further processes go: He₄² + Li₇³ = B₁₁⁵, or boron, or alternatively, Be₉⁴ + H₂¹ = B₁₁⁵. Then carbon; B₁₁⁵ + H₁¹ = C₁₂⁶; then nitrogen; C₁₂⁶ + H₂¹ = N₁₄⁷. Oxygen; N₁₄⁷ + H₂¹ = O₁₆⁸, or C₁₂⁶ + He₄² = O₁₆⁸.

As you can see, as the elements get heavier and more complex there are several possible roots or originating processes possible; each of these different ways creates a slightly different quality of oxygen, or boron, etc. Then this type of evolution continues

after these initial eight, in "higher octaves" so to speak, until we arrive at very heavy elements like lead, gold and so forth.

Meanwhile as we go towards the more central part of this spiral, we can imagine that the reverse should also be taking place: yang always changes back into yin, right? So as we reach the very heavy elements with atomic weights like 200, 230 and so on, such as radium and uranium, what kind of character arises? Radioactivity: heavier elements changing back into lighter elements. So although present day physics has a very rigid, fixed view, saying that elements cannot change into other elements without very violent circumstances, we can see that all elements are constantly changing back and forth, not only in different chemical combinations and different states of matter, but also in different positions along the spiral of atomic evolution.



UNIVERSAL PROCESS OF ATOMIC EVOLUTION

Now, under what circumstances does this transmutation naturally occur? First we know that the two elements should be complementary; one more yin and one more yang, right? Furthermore, in order to do fusion, this central nucleus part should become more fragile, in a more plasmic state. In this state they are more flexibly adaptable; then if one is yin and the other is yang, fusion can occur. You can picture two big galaxies swerving towards each other; one is spiralling clockwise, the other is spiralling counter-clockwise. They come closer and closer and then - Baaaaaa, fusion!

Same thing like sex, one person's energy spiralling clockwise and one spiralling counterclockwise; then they become closer and closer, and heat up more intensely to something like a very energetic plasmic state and - Baaaaaa, again, fusion! So transmutation of elements is the same process which is creating new human life, new DNA, out of two existing ones.

THE DISCOVERY OF TRANSMUTATION

About 17 years ago, when I was still in New York, I was lecturing every week, and Mr. Ohsawa was coming nearly every year to America to lecture for one week or ten days. One summer, after his lecture we were eating in a macrobiotic restaurant in New York, and some American friends brought a newspaper clipping. It said that Dr. Louis Kervran in France had presented the idea that sodium and potassium were changing into each other under certain natural conditions; this meant, of course, transmutation.

We thought, of course, that is natural; but anyway, for modern science to recognize this is a very big event. That means science has discovered that the material world is not absolute, but ephemeral. In our macrobiotic cosmology, our number one principle is that everything is constantly changing. For modern science which is so rigid, to have discovered this is a really

great event.

Soon afterward, Mr. Ohsawa was lecturing in Paris, talking about health and so forth, and he began to talk about Professor Kervran's discovery and what significance it had in terms of our cosmology of yin and yang. After the lecture many people came up to say hello; finally, an old gentleman, standing behind everyone else, came to shake hands with Mr. Ohsawa, and said, "I am Dr. Kervran."

Mr. Ohsawa was so happy! Then they made an appointment, and two or three days later met to exchange ideas. Prof. Kervran did not have any books at that time and he was facing much criticism and opposition from his colleagues and other scientists; so Mr. Ohsawa encouraged him - "Why don't you write a book?" He was very encouraged and wrote his first book, Transmutations Biologique, or Biological Transmutations.

In this book, he described the circumstances of his discovery. He was working as a doctor for the French government in or Biological Transmutations.

In this book, he described the circumstances of his discovery. He was working as a doctor for the French government in a construction project in the Sahara desert. In order to control the worker's health, he was every day checking and analyzing what they ate and what they discharged. Then, he discovered something very strange; for some elements, the volume discharged was not equal to what was consumed. Some elements were discharged more than consumed, and some less. Then very wisely, he picked out two major elements for studying this discrepancy; sodium and potassium.

In the macrobiotic view, among all minerals, the sodium/potassium ratio is a key issue. This was discovered about one hundred years ago by George Ohsawa's teacher, Dr. Ishizuka Sagen. He presented these two minerals as a critical complementary and antagonistic functioning force in the body, and maintained that

if Na and K are within a certain general ratio, the body is healthy. If this ratio becomes too far off, sickness arises; he established the ideal Na/K ratio as about 1:5.

Dr. Ishizuka already used the terminology of yin and yang to explain this mechanism, because yin and yang was still at that time a common traditional way of thinking for Oriental people. Mr. Ohsawa then developed this further, and proved it extensively. Since then, I have modified and extended this concept, as you can read in the Book of Macrobiotics. The reason is, we need a more adaptable method we can apply to the whole world. For example, if you go to a very cold region like Alaska or Iceland, this should be more like one versus five; if you go to a very hot, tropical climate, then it should be more like one versus nine or ten. So this ratio is generally one versus five to one versus ten; average is about one versus seven. This also correlates with our cosmological understanding: heaven's force is presently about seven times greater than earth's force.

At the same time, not only sodium and potassium but various other yin elements and yang are also making balance in our bodies. So I have made it a little more clear; the yin group of elements as a whole, as represented by potassium, and the yang group of elements as a whole, as represented by sodium, are making balance generally according to this flexible ratio, averaging about one versus seven. (This idea is presented in more detail in the Teachings of Michio Kushi, Volume III, in the supplement.)

Anyway, Dr. Kervran discovered that the workers were taking certain volumes of sodium and potassium, but eliminating less sodium and more potassium. After rechecking all his data, he came to a conclusion; sodium must be changing into potassium within the body. Somehow, with very low temperatures, low pressure and low energy supply, transmutation must be taking place. How?

Please check the atomic number and weight of Na and K in the charts; what element is needed for this process? $K_{39}^{19} - Na_{23}^{11} = O_{16}^8$. Oxygen, coming from the air we breathe, combining with sodium from salt and certain foods, must be transmuting into potassium. In other words, taking yang (Na) yet creating or discharging yin (K). How was this possible?

- 1) Everyday they were working hard, so energy level was high.
- 2) With hard work, body metabolism and breathing were also high.
- 3) Since they were perspiring, they were taking salt tablets, (sodium).
- 4) In order to accelerate transmutation, we also need higher temperature - they were working hard under the hot Sahara sun.

Many macrobiotic friends are thinking, well, I can eat plenty and transmute whatever I eat while lying on the couch. It doesn't happen. You need to be active, physically and mentally, for this process to go on smoothly and actively.

Where do you think this transmutation occurs - in the blood, in the lungs, liver, intestines, brains, all over the body? I leave this question for you to figure out.

Then both Mr. Ohsawa and Prof. Kervran wanted to begin testing, to prove this process by experimentation. But neither of them were mechanical technicians; so Mr. Ohsawa began to look for a chemist who could help them. He recalled back to when he was living in Paris, eating brown rice and vegetables (and hard brick-type of bread) and studying at the Sorbonne. At that time he had a good friend who later became a brilliant chemist and was employed by Dupont. His name was Dr. Henoff.

Dr. Henoff was born in Breton, of Celtic descent. Breton as annexed to France many years ago, but many Celtic descendants in Breton still wanted to have independence. While Dr. Henoff was working as a chemist, he also became very involved in this independence movement, even becoming an important leader.

One day, before World War II, there was a big celebration in Paris of the anniversary of the annexation of Breton. It was a very big festive celebration with music and costumes, and many famous people giving speeches, and so forth. Then suddenly the central platform exploded - Baaaagh!

Dr. Henoff and his friends had put a bomb there! He was chief of the invention department where he worked. Soon afterward, he was caught and jailed; but with his friends' help, he escaped from jail and fled to Germany.

Several years later, World War II began. As the Nazis' so called March Army marched on France, Dr. Henoff and his friends organized their own independent troops to march on Paris, to fight for the liberation of Breton. Later, when Nazism was destroyed, Henoff escaped to Ireland and moved to the remote countryside where he changed his name.

When Mr. Ohsawa tried to find him it took about one year; but he finally located him. They flew together to this country and stayed in my home in New York. For six months, Dr. Henoff worked everyday on translating the manuscript of Dr. Kervran's book; and every day, we talked with him about how to make our transmutation experiments.

Then Dr. Henoff and Mr. Ohsawa went back to Japan, and continued trying to figure out how to design the technology; but he still couldn't do it. Meanwhile a young, macrobiotic,

Japanese girl was helping him; and soon, not element's fusion but human fusion came about! (Henoff was about 50 years old.) Then he told Mr. Ohsawa, "OK, time has passed, I cannot discover how to do this experiment, I'd like to marry this girl and take her back to Europe." George Ohsawa scratched his head and said, "OK, fine," and they left.

Then George Ohsawa wrote to me and said, "Now from today I go on number seven diet until I discover solution." I don't know if he really went on number seven or not - but I sent back a letter saying "Bravo!"

Then two weeks later, I got a special delivery letter marked "URGENT!" It said, "I have discovered a way to do it!" Here is the story:

While he was asleep at night, he saw a dream. From the darkness of heaven a big hand stretched out; every time it stretched out, thunder and lightning shot out from it's fingers. While this was happening, on the surface of the earth, various elements began to arise, creating the beginnings of life.

The next morning he called some Japanese scientist friends, who were professors at a university, and asked for their collaboration to make some very simple equipment for an experiment. This is what they made:

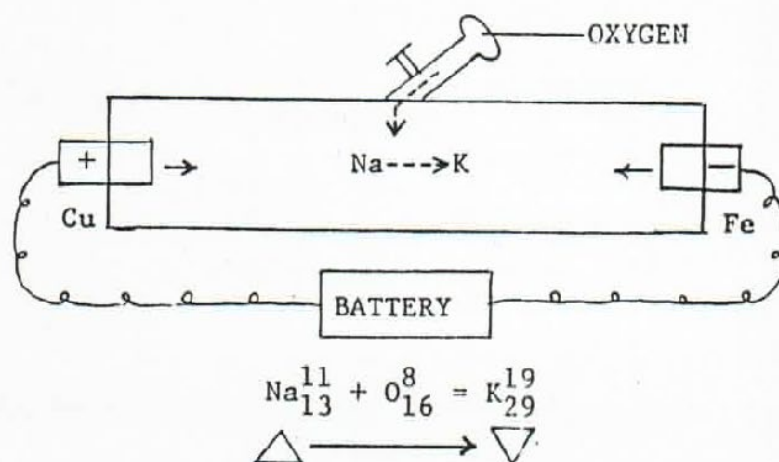
You already learned: infinity---yin and yang---vibrations---pre-atomic particles (like protons and electrons)---elements---plants---animals and man. In order to make elements, we must duplicate the first several steps of this process. So practically speaking, for infinity they used vacuum, a vacuum tube. Yin and yang were two electrical poles, a plus terminal and a minus terminal. Vibrations: electrical current. Then inside they put

sodium, and attached a valve to let in air (oxygen) at the right time. They set up this equipment, using copper and iron for the yin and yang electrodes, and put a spectroscope prism and screen in front to monitor the experiment. They finished about midnight, and planned to return the next day to see how it would work.

That night, the professor whose laboratory they used became so curious, he could not wait until the next day. So, he went in and began. He applied electricity to the sodium for 20 or 30 minutes, until it became very hot and expanded. Finally, a clear band of orange appeared on the screen. Then he released the valve and let the oxygen enter - the screen went black, and then the next moment a band of pure blue appeared - potassium!

He was shocked! Immediately he called Mr. Ohsawa - "It seems we did it!" So the next morning, Mr. Ohsawa and the other scientists went to the laboratory and repeated the experiment - and again, the orange band disappeared for a moment, then blue appeared. To make sure, they ran complete analysis on this new element, and found it was in fact potassium.

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TRANSMUTATION OF SODIUM TO POTASSIUM

THE SOCIAL APPLICATION OF TRANSMUTATION

Now, the theoretical part was proven; but the technological part, that means the way to practically apply this process on a large scale for society, this was not there yet. We needed to figure out how to produce on a massive scale.

Potassium is being used as what? Fertilizer. At that time, one pound of potassium cost about \$23.00. Today it may cost about \$70.00 or so. It is quite expensive, in other words. Sodium and oxygen are freely available from the ocean and the air, in virtually unlimited supply. I calculated at that time, it would cost us about 3¢ per pound to produce potassium, after the initial cost of setting up the equipment. We could sell it for 20¢ a pound - more than one hundred times less than the current price - and still make a big profit! Then, the potassium industry would quickly collapse.

Then we needed to decide, should we try to industrialize and do this ourselves, or offer it to some government, or to some existing industry. That question George Ohsawa gave me as homework.

Then when he next came to visit (I had moved to the Boston area by this time), we reached the conclusion that our main purpose was to change the world of human spiritual, psychological and physical health. If we got involved with this project it might take us full time work for many years.

So, we decided to offer it to some industry, for some kind of royalty. Mr. Ohsawa said, "Yes, we can ask for one million dollars advance payment, and then some annual percentage as royalty. That will make our macrobiotic movement strong. Suppose, Michio, if we got one million in advance, what would you do with

it?" So I said, "Let's see...maybe I will set up a school, or maybe a foundation." He said, "That's good, but let's buy a newspaper company, like the New York Times. That's very good, OK; but to whom shall we offer the project?"

Again, that was my homework, so I wrote to all the big chemical companies and made appointments, one by one to see them. Most of them, like Monsanto and Union Carbide, could not believe it. Meanwhile, I also wrote a letter to the White House. They wrote back, "We are not interested in securing the rights to this, why don't you go ahead and get patent?"

Then some company, which we will call F, became very interested, and negotiations began. The day before we were to meet with them, Mr. Ohsawa said to me, "This formula is so simple, how will we present it to them? When we explain it, they will know everything. So, let's tell them everything, but then tell them they need all this - plus alpha!" I said, "What is alpha?" And he said, "You know! Yin and yang, but we should call it a special agent to make it as industrial as possible." I was frankly not convinced, but said OK.

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The next day, we went to the conference and met with about ten directors, doctors, and the Vice President of F. Mr. Ohsawa asked them, "Do you know what is the most important book in China?" They were a little confused - most important book in China?! Then he told them, "I Ching," and began explaining everything about the experiment, and I explained when they couldn't understand him. I added all details, and then he said, "However, we also need plus alpha as an agent, as catalyst." They all nodded solemnly to each other; I though I would pass out, trying to keep from laughing.

Then Mr. Ohsawa returned to Japan, and I began to work out

all arrangements with them - laboratory facilities, funds, staff, factory etc. George Ohsawa or I would supervise, and so forth. And I notified George that we were ready to begin. But he started then to wonder, should we disclose this or not? Maybe not yet. So he wrote, "Urgent, Michio, let's wait; the time has not yet come." They were very disappointed, but we did not proceed.

Meanwhile, with Prof, Kervran, we started to think, "Let's not be limited to this one experiment, let's do others." We can now change all agricultural orientation, how can we change industry's orientation? What is the key element? Iron, the base of steel, which is the base of industry. Now let's make steel by atomic transmutation.

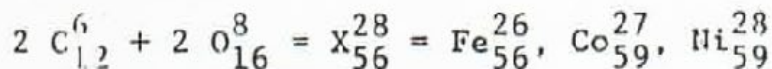
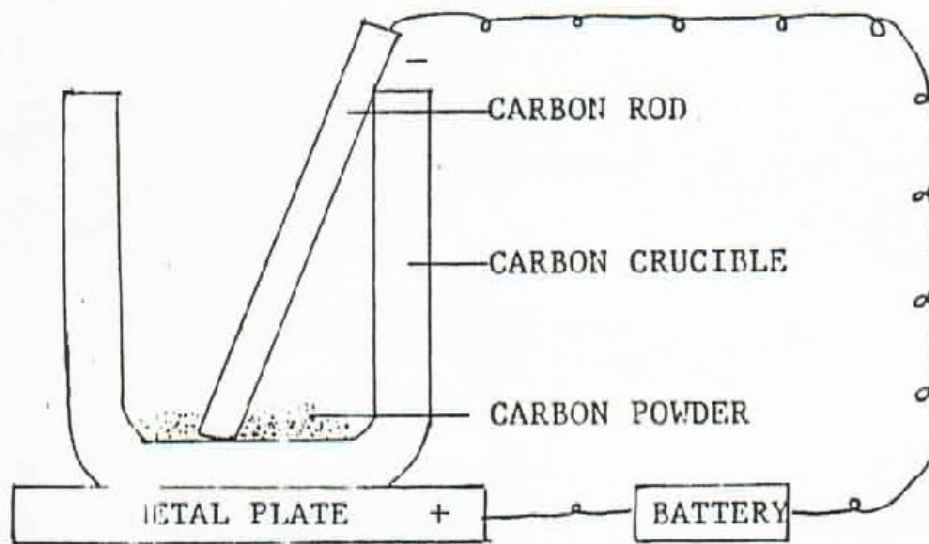
Please check the atomic number and atomic weight of iron: Fe_{56}^{26} . We already know, our first eight elements are the basis of all others; all others can be made by these eight. Among them, carbon and oxygen are most complementary; this is how practically all the heavier elements come out. Of course, other light elements are also combining, but carbon and oxygen is the most basic combination.

Suppose we combine one carbon and one oxygen, what is the result? $\text{C}_{12}^6 + \text{O}_{16}^8 = \text{Si}_{28}^{14}$, silicon. Because this bond is so strong, silicon is a very hard, strong element. Then suppose we combine two carbon and two oxygen: $\text{C}_{12}^6 + \text{C}_{12}^6 + \text{O}_{16}^8 + \text{O}_{16}^8 = \text{X}_{56}^{28}$. What is this X? Atomic weight 56 is iron, right? Atomic number, i.e., the number of electrons, is 28, that is nickel, right. Cobalt is in between: Fe_{56}^{26} , Co_{59}^{27} , Ni_{59}^{28} . So, generally, 2 C + 2 O is creating this iron-cobalt-nickel group. From X_{56}^{28} , two electrons must fly out, then making iron.

Then we set up another experiment, using only carbon and oxygen; we used a carbon rod as one electrode, with carbon powder,

standing on a metal table as the other electrode, then let electricity pass through and air combine.

We found that iron, cobalt and nickel all came out, furthermore, many other elements also came out! From the air, also nitrogen was combining, hydrogen was combining, and different combinations of oxygen were combining, etc.



So in order to make good steel, we must make very exact conditions, just so much voltage or ampere, and so forth, all technical considerations. But these are minor problems; any of you can experiment a little, and work out solutions.

Then all complicated mining and refining operations would become unnecessary. Again, steel would become very cheap, maybe 1% of the present cost. Also, present day steel rusts very easily; you know big steel ships sitting in the harbor, must be constantly scraped and repainted, meanwhile, all the rust is contaminating the water.

But very strangely, if we make iron this way, bonding two carbon and two oxygen, this is very strong; it does not take any additional oxygen, so it doesn't rust.

They have discovered in India and also in Bonn, iron poles standing $1\frac{1}{2}$ meters out of the ground and 25 meters into the ground. These poles never rust. Local legends say they were built a long time ago; and nobody knows their purpose. So we know that already in ancient times people were practicing the transmutation of steel. Now, we need only work out technical problems for how to make massive application.

Then we have established the way to change agriculture and the way to change industry -- now what is the next area? Economics: the gold standard. How can we make gold?

Again we began experimenting. Already, when we had done the sodium/potassium experiment, there came out a small glittering object. We sent it to the laboratory for analysis, and they said, "This is platinum, no, no, we were wrong. This is gold." In other words, we had accidentally made gold. How?

Please calculate the total of atomic weights from all the pieces of equipment involved: oxygen, copper and iron (for the electrodes), sodium and potassium: $O_{16}^8, Cu_{64}^{29}, Fe_{56}^{26}, Na_{23}^{11}, K_{39}^{19} =$ atomic weight 197 - this is very close to gold: Au_{197} . In other words, some minute part of the electrodes must have been melted into plasma, and combined together with oxygen, sodium and potassium, to make gold, because all of these elements have such strong complementary/antagonistic natures.

However, if we can make gold but it is very expensive, it is of no use. To totally change economic conditions, we must find a way to make gold that anyone can use, anywhere. So we need to

calculate the costs of mass production methods, and possibly experiment with several different ways.

In the Orient there are stories of ancient macrobiotic men called Sen Nin; they were living in the mountains and developing their cosmological consciousness and the realization of their health, longevity and physical, mental and spiritual freedom. Perhaps you've seen pictures of wise, old men with large beards and strong eyes - have you see The Empire Strikes Back? Something like Yoda - wise old men with unusual powers.

These legends also say that these men made gold. Their school of instruction had four stages:

- 1) Self Mastery;
- 2) Longevity - not only 78 years, but 100, 200, 300 years longevity and health;
- 3) Education - talking to people, spreading ideas and writings, etc.;
- 4) Alchemy.

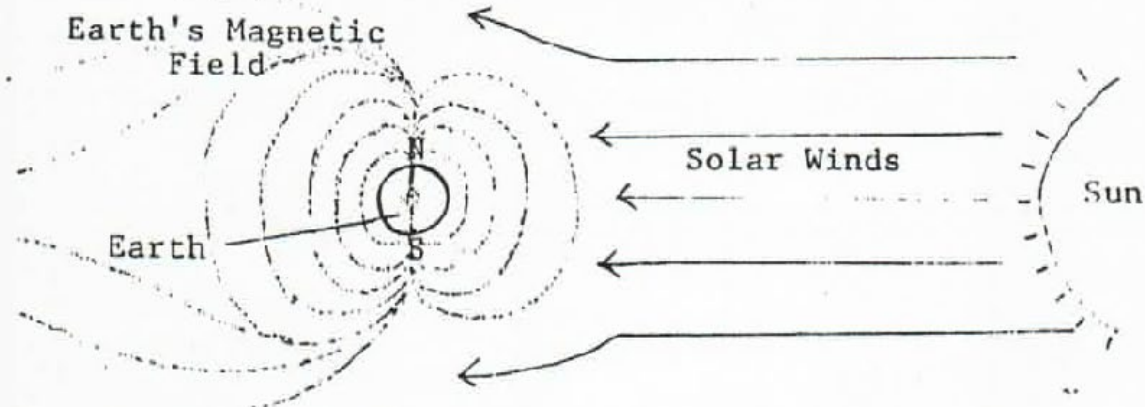
When they discovered the way to make gold, they were then graduates.

Of course, there was no university or actual school for learning these things. The mountain itself was their school; so they lived in the mountains for many years, eating buckwheat, tree bark and wild grasses; meditating, exercising and gradually figuring out and mastering all these levels.

According to legend, they made gold from mercury. Mercury is the next element after gold, with atomic weight 200. How could they know this - that a silver semi-solid/semi-liquid and a soft yellow metal were so close on the periodic table?

Unlike all the methods we had tried so far, this ancient method must have been not adding elements together, but subtract-

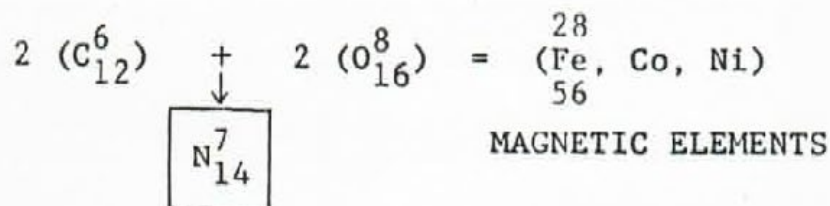
large and small is a current which takes the form of electricity, vibration, or acid/alkaloid. The core of the earth is composed of iron, nickel, and some cobalt, which are the three most magnetic elements. They are in the same family, all having been formed from the transmutation of two carbon and two oxygen atoms. These elements are the cause of the magnetic field, which forms around the periphery of the earth.



As it rotates the earth is like a large gyroscope; the core and the magnetic ocean around it exchange an electric charge. Ultimately speaking, the ocean of the magnet is the Infinite universe.

Within our body is a small quantity of ionized iron, which remains ready to receive magnetic influence. Iron is found mostly in the center of hemoglobin, within our red blood cells. This iron in hemoglobin and Infinity's magnetic ocean charge each other.

Iron is transmuted from two oxygen and two carbon atoms. In the middle of this process is nitrogen:



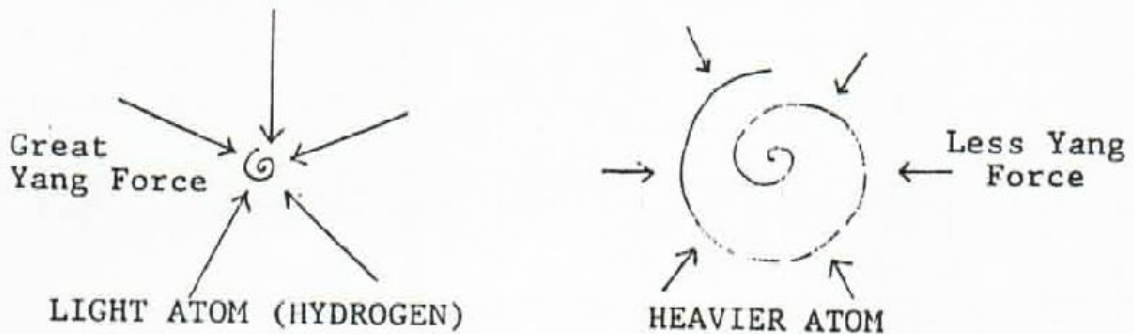
Nitrogen comprises about 70% of the air. The yin and yang elements

of iron are well balanced since both carbon and oxygen have similar weights. Infinity in its entirety is also balanced by the infinitesimally small volume of iron. A charge passes between the two, which we call judgement. This judgement works both ways. Iron in our body is like the needle point of a compass that is pointing north. In the same way the infinitesimal is attracted to the infinite and the infinite to the infinitesimal. When this attraction is in perfect line, we call the resulting condition supreme judgement. At this time our judgement is the judgement of infinity, the judgement of God. This is the real meaning of self-realization. No longer is there yin or yang, because the two are well-balanced. Often the needle does not detect infinity because the iron is ionized too much. The environment of the iron-the other elements in the blood-easily influence the quality of the iron. If iron is not capable of having a magnetic reaction, we may only detect some light, intermediate vibration. At that time, we say we have lost our memory. Now you can see the mechanism of our body and infinity; this is the way that judgement works. "Paradise lost" means loss of the body's magnetic capacity. This Infinite universe, the other pole, has not changed, rather it is we who have become insensitive. If the environment becomes cold, more yin, our food becomes more yang and the iron magnet is more sensitive. On the other hand, warmth makes us more subject to electrifying influences. Electrifying and magnetism are two complementary elements, so that in a cold climate judgement becomes more sharp.

THE SPIRALLIC UNIVERSE

One question occurs to many thinking people when they first study this chart. Why is hydrogen, which is very yang, found in the most peripheral (yin) position? Can you answer this before reading further? (We are referring to the "spectroscopic classification of elements in a logarithmic spiral" chart on pg. 9.)

Hydrogen is very small; this means that the centripetal force, the pressure from the outside is very great. We can observe the same thing in the solar system. Pluto is tiny and very yang in the most peripheral, yin position.



Furthermore, hydrogen is very small because it is at the center of another spiral, the huge spiral of preatomic formation. What are the protons and electrons? Recently, scientists discovered electrons in the nucleus of atoms! This completely upset thirty years of study. According to our thinking, an atom is spirally formed; and after billions of years, the electrons changes into a proton. The nucleus is the condensation, and accumulation of particles, the very yang conclusion.

Now you can see the symphony of the universe: a prelude, seven movements of a main composition, and a grand finale. The first octave or eight elements (H, He, Li, Be, B, C, O, N) represent the prelude. Then among these eight elements, the greatest antagonism is between carbon and oxygen which together produce silicon. This combination produces seven movements in the world of matter. $(C + O) = Si$, $2(C + O) = Fe$, and so on, until: $7(C + O) = Pt$.

Platinum is the last of the metallic elements. The finale is a dissolution, the diminishing melodies beginning with gold and mercury and culminating in the radioactive elements.



The pre-atomic world is also arranged spirally; the conclusion of this world becomes the periphery of the next, the atomic world. The spiral of elements is also at the periphery of a huge biological spiral which begins with virus and bacterial life, grows into cells, and proceeds toward the creation of man.

This is the order of the universe, spirals within spirals, manifolds of spirals. The governing principle of all worlds is therefore the same: contripetality and centrifugality, yang and yin.

The biological spiral is itself on the periphery of another, a huge social and historical spiral. If present science discovered this enormous principle, everything could be united; now psychology, biology, religion and technology are separate, with hundreds of laws and theories in each discipline. The unifying principle can bring them together and make them into one, embracing, and understanding the laws of change.