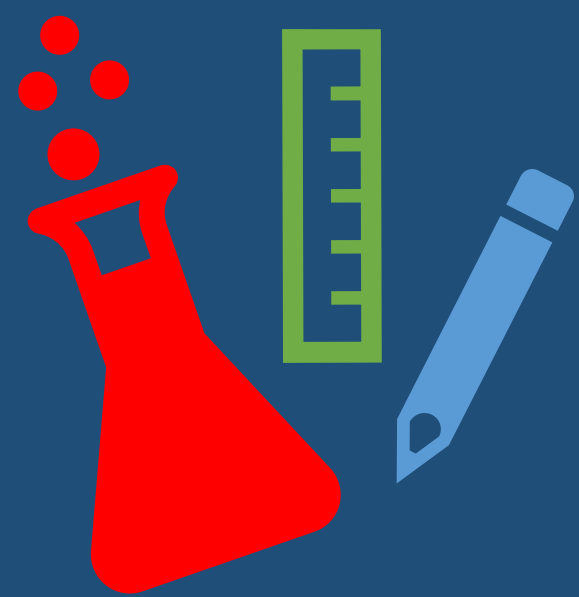


The Chemistry of God



Mr. Derek Marshall
Revolution Against Evolution
New Covenant Christian School
March 11, 2023

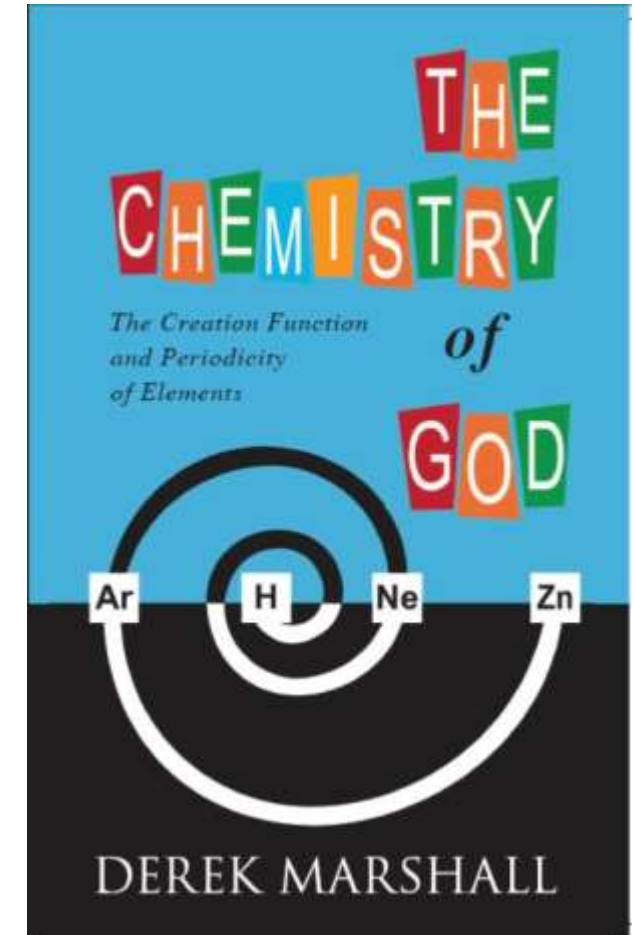
Who is Derek?

- Graduated from Evergreen Baptist Academy in Kalkaska, MI. K-12 approximately 70 students
- Honorably served in USMC six years active duty
- Graduate of Michigan State University with a Bachelors Degree in Physics.
- Co-Inventor three U.S. Patents with MSU dealing with biomass conversion and densification into value-added products such as ethanol, animal feed, renewable building materials.
- Currently Electrical Controls Engineer at Roberts Sinto Corporation: OEM of foundry equipment used in steel industry. Currently working on a project with Waupaca Foundry in Wisconsin
- Been with Revolution Against Evolution for 7 years in various roles as Guest, Crew, Producer, and Host



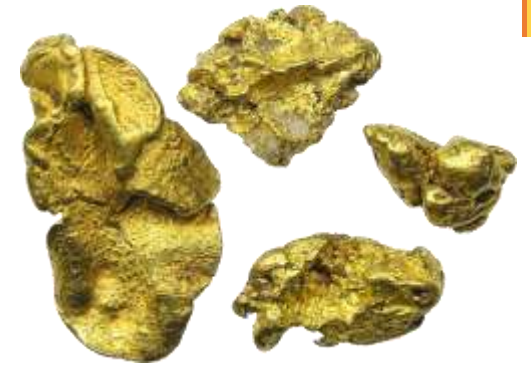
What is the Chemistry of God?

- The *Chemistry of God* is my book which asks the question: Could the periodic table of the elements be a link between science and scripture? (Available at the book table)
- Elements are found by name in the Bible
- The Creation is orderly and it is based upon immutable laws, such as the Word of God who spoke it into existence.
- This allowed several scientists to use scientific method to discover the Periodic Table of the Elements.
- We will do a short review of the Periodic Table of the Elements (PTOE)
- We will talk in-depth about Solomon's Molten Sea: One of several examples of the PTOE I have found in the Bible.



The Elements of the Bible

- **What is an Element?** We have found that any material is fundamentally made up of a combination of pure substances which have unique properties not necessary related to those of the parent material.
- Elements are mentioned by name in the Bible. It was ahead of its time, during the time of Greek "Air, Water, Earth, Fire" theory of materials.
- Some elements mentioned: Gold, Silver, Lead, Copper, Tin, Iron
- Some properties of elements: Melting Point, Density, Color, Metal/Semi-metal/Non-Metal/Gas
- Spiritual Significances: "Streets of Gold", "Rod of Iron", "Feet of Brass" (Copper Alloy)
- Bible says all works shall be "tried by fire" Fire is often used to "smelt" metals to obtain the pure elements like iron or copper.





A Short PTOE review: The Entries

- **Atomic Number:** Number of protons
- **Atomic Mass:** Number of protons + Neutrons
- **Abbreviation** for element: Fe is Iron (old latin name Ferrum)
- **Common Name:** Iron
- **Electron Configuration:** How s, p, d, f orbitals are filled.

The Periodic Table of the Elements: How to Read the Entries

Atomic Number

26	55.845
	762.5 kJ/mol
	1.83
Fe	+2 +3 +4 +6
Iron	
[Ar] 3d ⁶ 4s ²	

Atomic Mass

1st Ionization Energy

Electronegativity

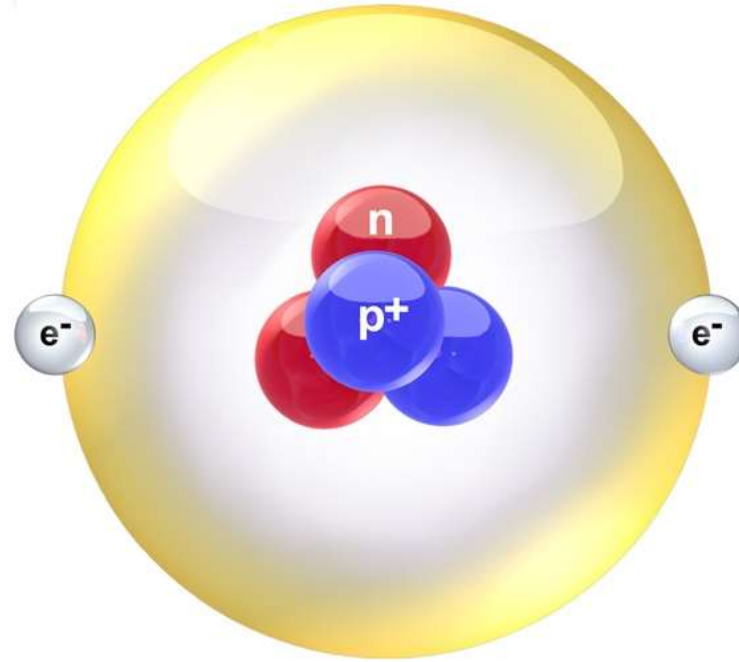
Oxidation States

Chemical Symbol

Common Name

Electron Configuration

Protons, Neutrons, Electrons: Helium



Helium, He
Atomic number: 2
Mass number: 4
(2 protons + 2 neutrons)
2 electrons



A Short PTOE review: The Table

- Rows are "Periods" there are 7 periods
- Columns are "Groups", there are 18 groups
- Arranged in order of Atomic Number
- Groups have similar properties
- Currently the PTOE is "full" having discovered the last element of 7th Period, Oganesson.
- There are 118 Elements

Periodic Table of the Elements (PTOE)

After IUPAC Commission on Isotopic Abundances and Atomic Weights, 2019

1																	18	
1	H Hydrogen 1.008											He Helium 4.003						
2	Li Lithium 6.94	Be Beryllium 9.012											B Boron 10.81	C Carbon 12.011	N Nitrogen 14.007	O Oxygen 15.999	F Fluorine 18.998	Ne Neon 20.180
3	Na Sodium 22.990	Mg Magnesium 24.305	3	4	5	6	7	8	9	10	11	12	Al Aluminum 26.982	Si Silicon 28.085	P Phosphorus 30.974	S Sulfur 32.06	Cl Chlorine 35.45	Ar Argon 39.948
4	K Potassium 39.098	Ca Calcium 40.078	Sc Scandium 44.956	Ti Titanium 47.867	V Vanadium 50.942	Cr Chromium 51.996	Mn Manganese 54.938	Fe Iron 55.845	Co Cobalt 58.933	Ni Nickel 58.693	Cu Copper 63.546	Zn Zinc 65.38	Ga Gallium 69.723	Ge Germanium 72.630	As Arsenic 74.922	Se Selenium 78.971	Br Bromine 79.904	Kr Krypton 83.798
5	Rb Rubidium 85.468	Sr Strontium 87.62	Y Yttrium 88.906	Zr Zirconium 91.224	Nb Niobium 92.906	Mo Molybdenum 95.95	Tc Technetium [97]	Ru Ruthenium 101.07	Rh Ruthenium 102.905	Pd Palladium 106.42	Ag Silver 107.868	Cd Cadmium 112.414	In Indium 114.818	Sn Tin 118.710	Sb Antimony 121.760	Te Tellurium 127.60	I Iodine 126.904	Xe Xenon 131.293
6	Cs Cesium 132.905	Ba Barium 137.327	La Lanthanum 138.905	Hf Hafnium 178.496	Ta Tantalum 180.948	W Tungsten 183.84	Re Rhenium 186.207	Os Osmium 190.23	Ir Iridium 192.217	Pt Platinum 195.084	Au Gold 196.967	Hg Mercury 200.592	Tl Thallium 204.38	Pb Lead 207.2	Bi Bismuth 208.980	Po Polonium [209]	At Astatine [210]	Ra Radium [222]
7	Fr Francium [223]	Ra Radium [226]	Ac Actinium [227]	Rf Rutherfordium [261]	Db Dubnium [270]	Sg Seaborgium [269]	Bh Bohrium [270]	Hs Hassium [270]	Mt Meitnerium [278]	Ds Darmstadtium [281]	Rg Roentgenium [281]	Cn Copernicium [285]	Nh Nihonium [286]	Fl Fleovium [289]	Mc Moscovium [289]	Lv Livermorium [293]	Ts Tennessine [293]	Og Oganesson [294]
				Ce Cerium 140.116	Pr Praseodymium 140.908	Nd Neodymium 144.242	Pm Promethium [145]	Sm Samarium 150.36	Eu Europium 151.964	Gd Gadolinium 157.25	Tb Terbium 158.925	Dy Dysprosium 162.500	Ho Holmium 164.930	Er Erbium 167.259	Tm Thulium 168.934	Yb Ytterbium 173.045	Lu Lutetium 174.966	
				Th Thorium 232.038	Pa Protactinium 231.036	U Uranium 238.029	Np Neptunium [237]	Pu Plutonium [244]	Am Americium [243]	Cm Curium [247]	Bk Berkelium [247]	Cf Californium [251]	Es Einsteinium [252]	Fm Fermium [257]	Md Mendelevium [258]	No Nobelium [259]	Lr Lawrencium [262]	

The Discoverers of the PTOE

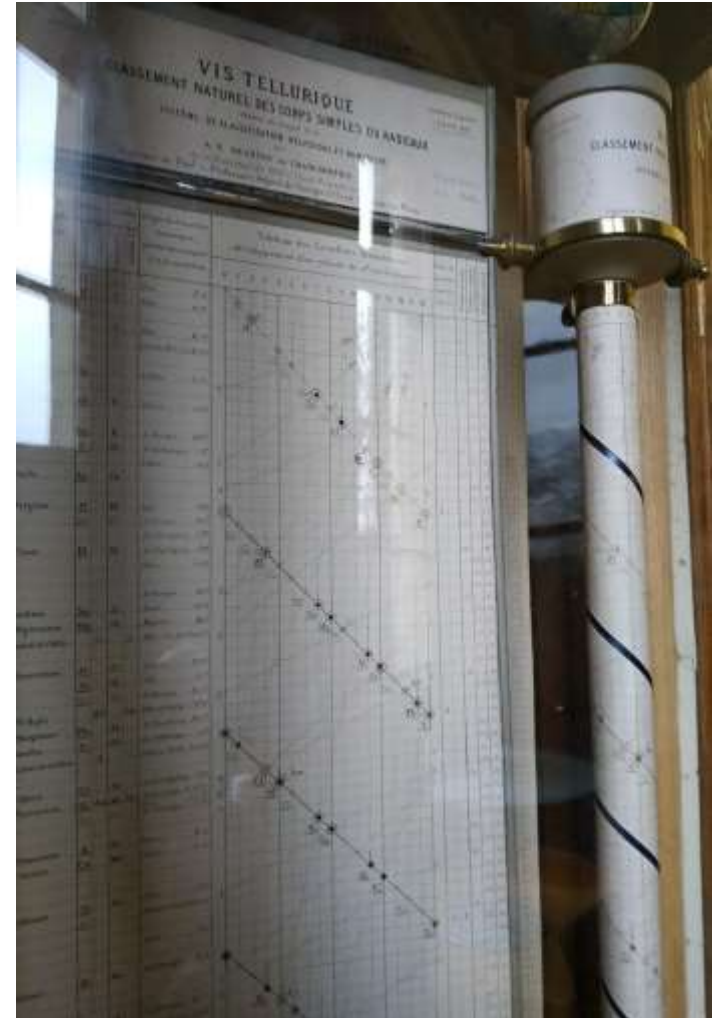


Easy Table: Heroes of the Periodic Table	
Lavoisier	List of elements, chemistry is quantitative
Prout	All elements are composed of "protyle"
Richter	Equivalent weights table wide early use
Dalton	Elements combine in whole numbers
Berzelius	Precise atomic weights, not all whole numbers
Avogadro	Avogadro's Number, N_A , and diatomic compounds, such as O_2 , H_2 , N_2
Naquet	Grouped atoms by similar chemical properties, families
Cannizzaro	The distinction between molecular, atomic weights, first accurate atomic weights
Dobereiner	Triads of similar elements helping form groups
Pettenkofer	Difference relationships interpolate elements in Series
De Chancourtois	The first periodic system was a spiral table
Newlands	More groups of elements by properties
Odling	Periodic table with gaps, predicting spaces for undiscovered elements to fill
Hinrichs	Relating spectra to atomic weights, spiral table, a similar proportion to planet orbits
Meyer	Periodic table with groups and valences
Mendeleev	Tabulates elements by atomic weight, discovers group and series periodicity follows. Predicts 3 elements



Alternative Periodic Tables: Telluric Screw of 1862

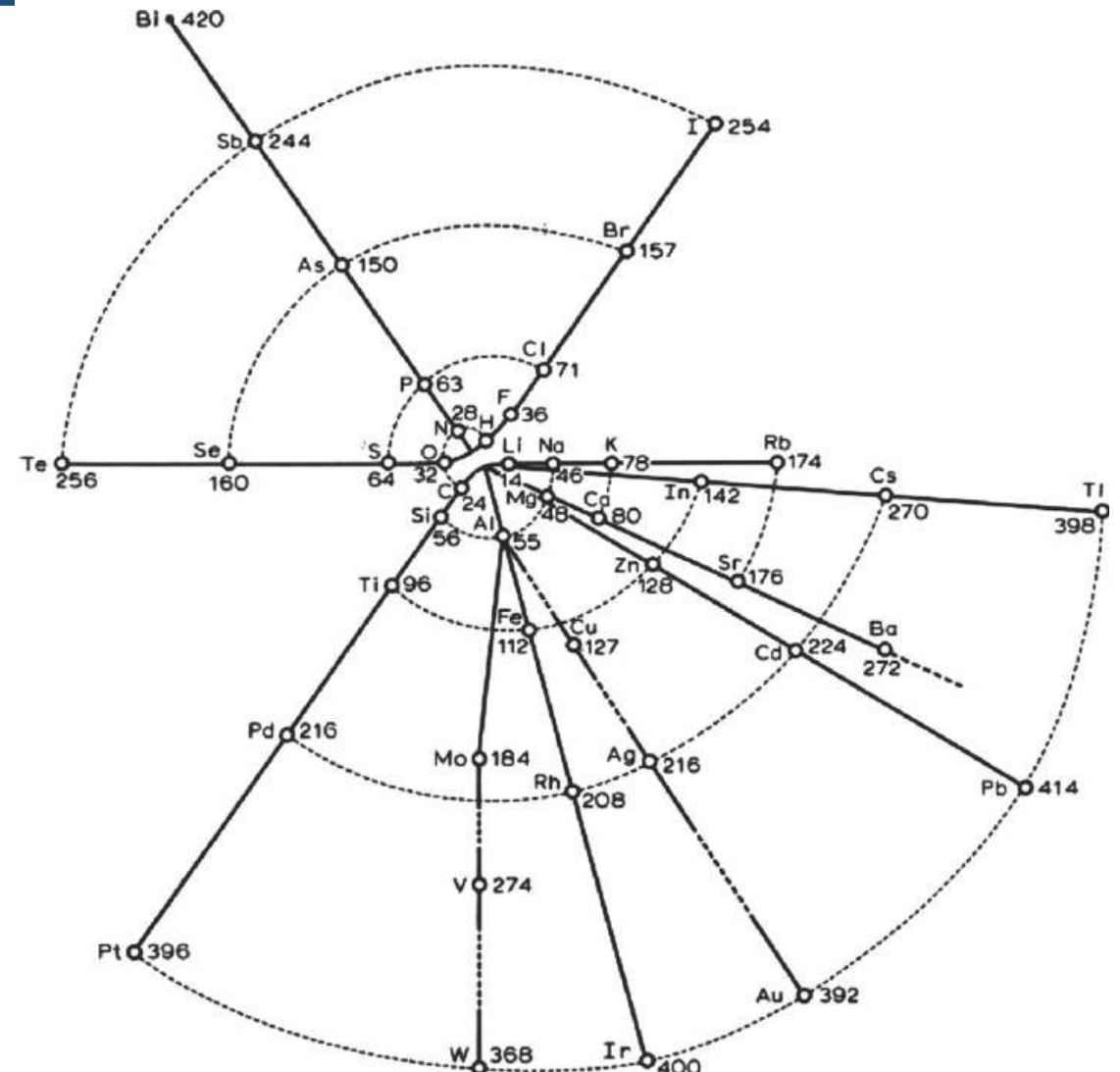
- The first Periodic Table was a spiral: The Telluric Screw of 1862
- Scientist: French Geologist Alexander DeChancourtois
- Cylinder 16" in diameter (based upon atomic weight of oxygen)
- "The properties of bodies are the properties of numbers."
- Elements shown with some degree of accuracy:
 - 1) Group 1: Lithium, Sodium
 - 2) Group 2: Magnesium, Beryllium
 - 3) Group 13: Boron and Aluminum
 - 4) Group 14: Carbon and Silicon
 - 5) Group 16: Oxygen and Sulfur



Alternative Periodic Tables: The Hinrichs Spiral, 1867



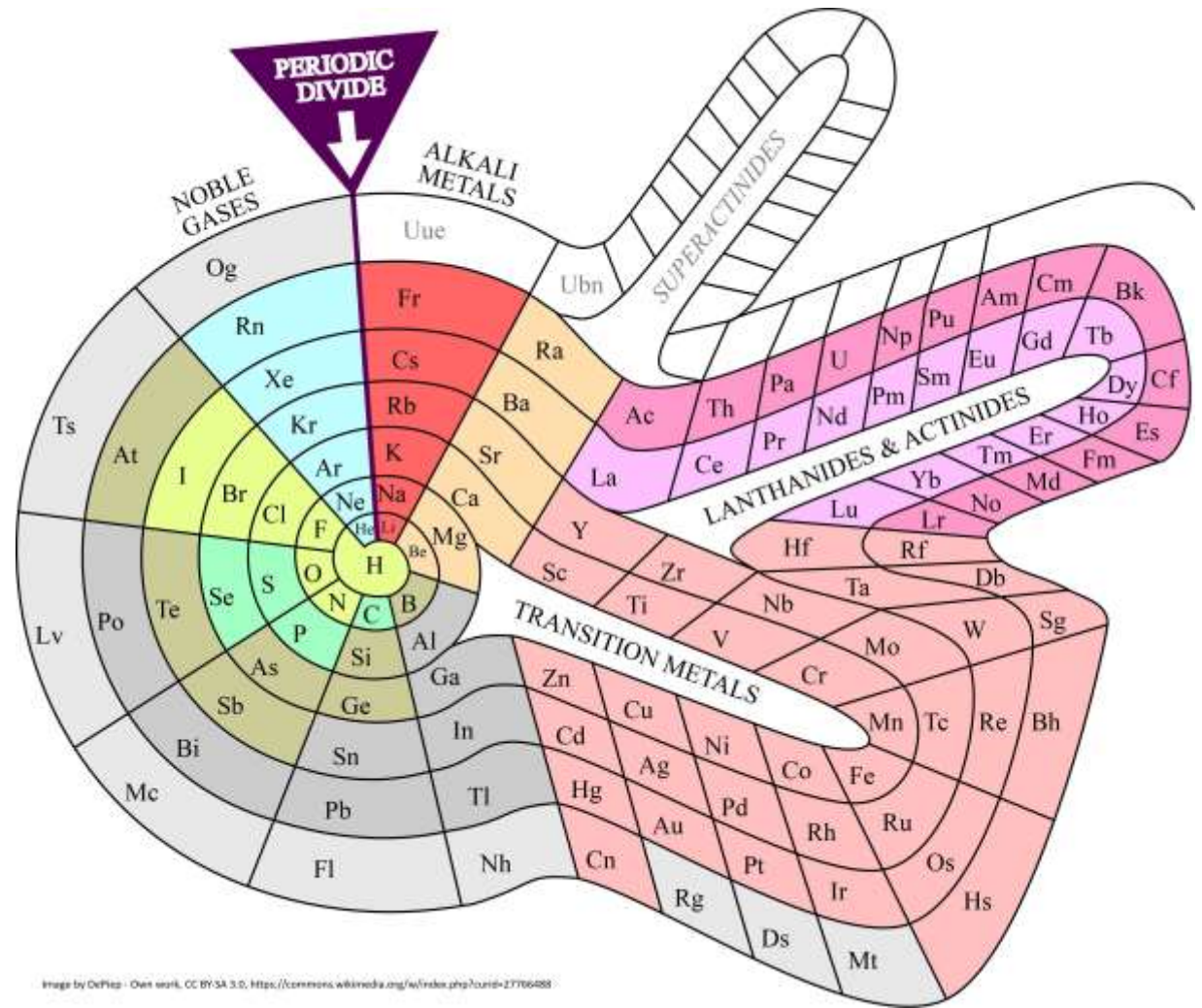
- Danish scientist Gustavus Hinrichs
- Circular table with heavier elements towards the outside.
- Non-metals in upper portion form triangular patterns (trigonoides) in relation to each other.
- Metals in lower portion form square patterns (tetragonoides) in relation to each other.
- Groups along the 11 “spokes” of the wheel.
- Was the first (besides the Bible in Daniel) to put Copper, Silver and Gold in the same group.



Alternative Periodic Tables: The Benfey Spiral, 1964



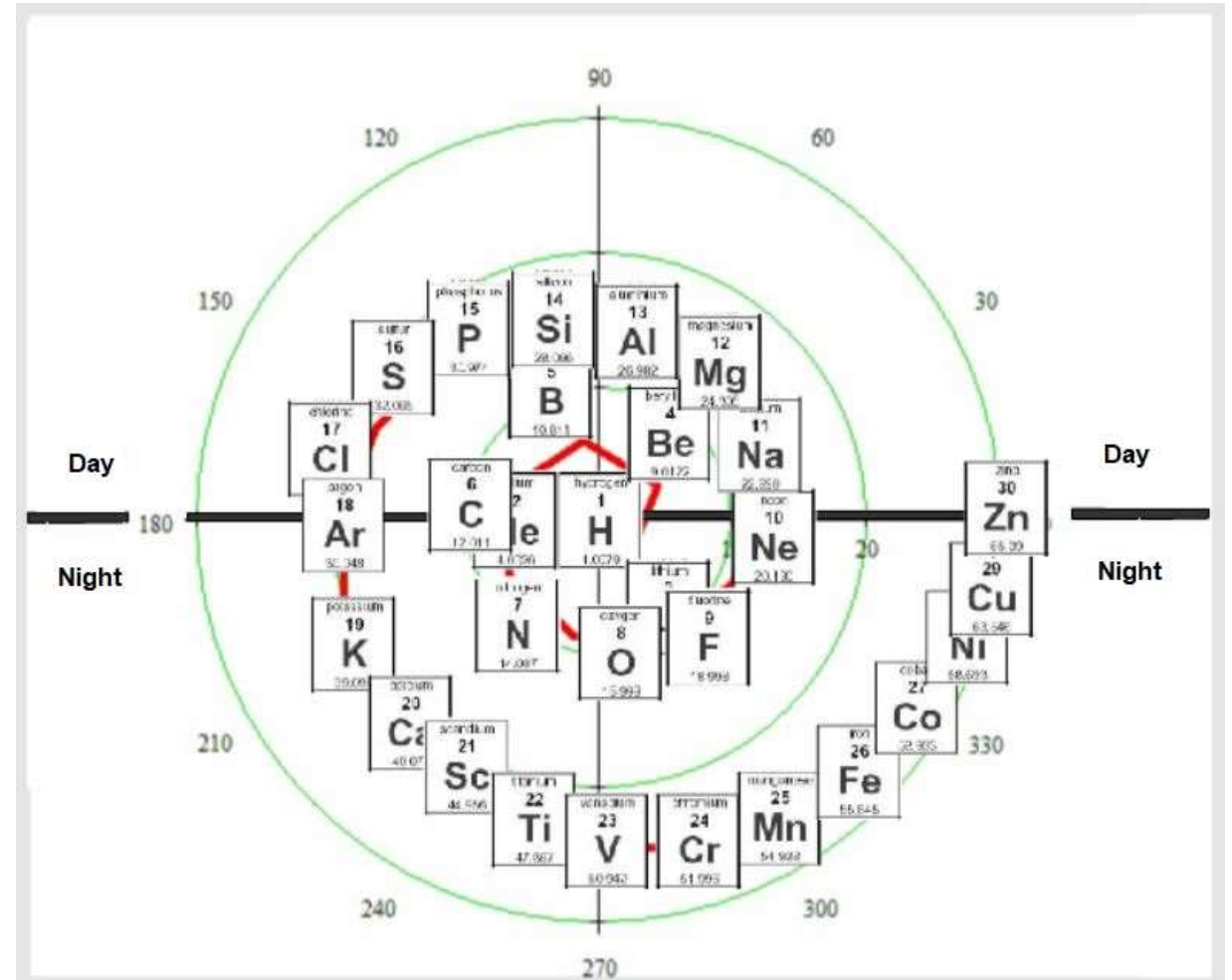
- American scientist Theodor Benfey
- Spiral table with Hydrogen in the center and heavier elements towards the outside.
- “Periodic Divide” marks where the square table must make shift from left to right like a typewriter.
- Special branches for the transition metals and Lanthanides/Actinides
- Groups along the “spokes” of the spiral.



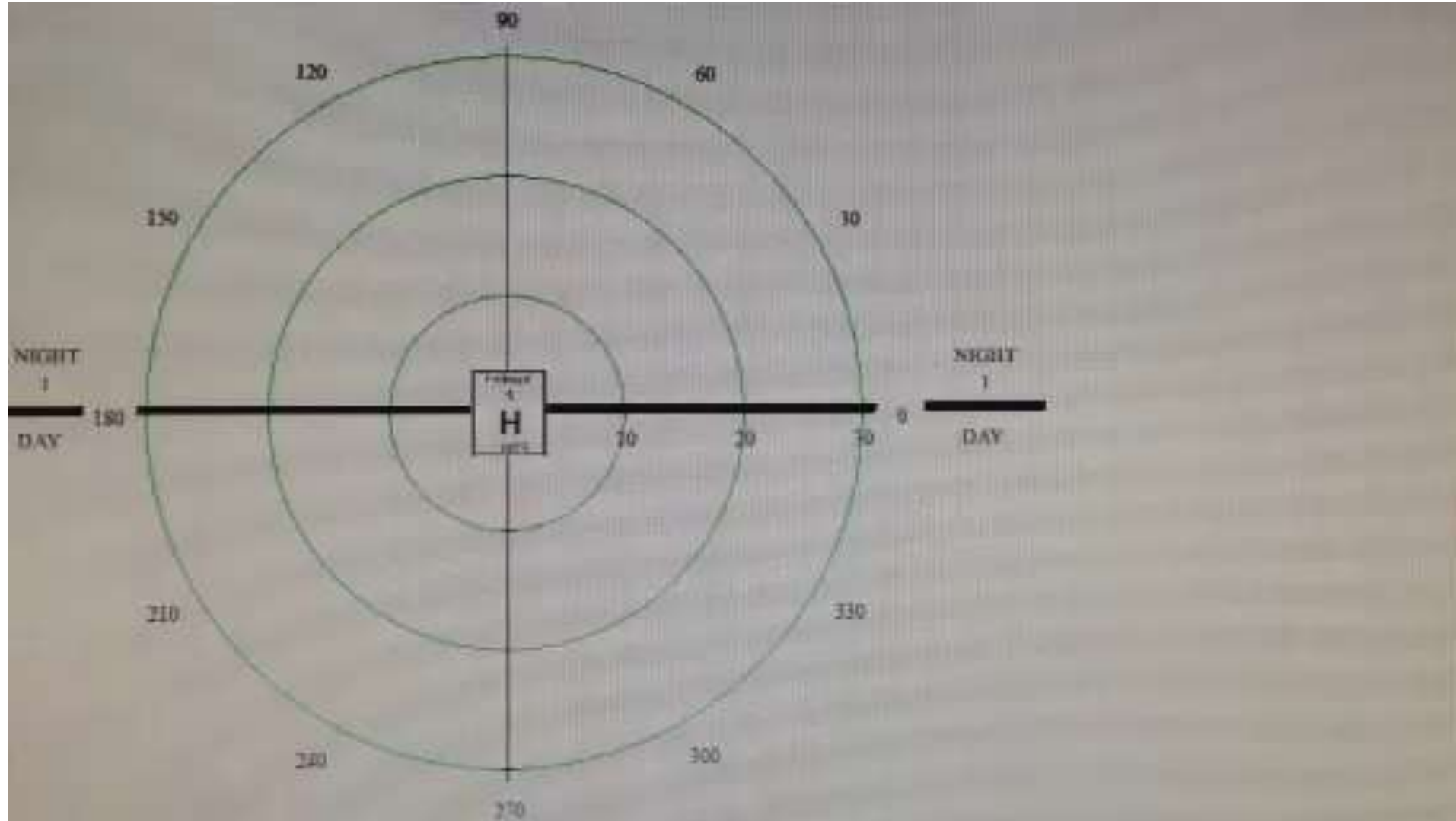


Alternative Periodic Tables: The Creation Function, 2005

- Discovered by Yours Truly in 2005 while a physics student at MSU.
- Spiral radial graph with Hydrogen in the center and heavier elements towards the outside to Zinc
- Represents the first three days of Creation. Three rotations of Earth
- Elements created: "God's Toolbox" to create the for the first three days.
- Scripturally-based math formula:
- Is. 40:26, By Number (1,2,3,..)
- Prov. 8:27, Used a compass, 360°
- Ps. 139:16, In continuance
- Ps. 139:17, Adding/summation



The Creation Function

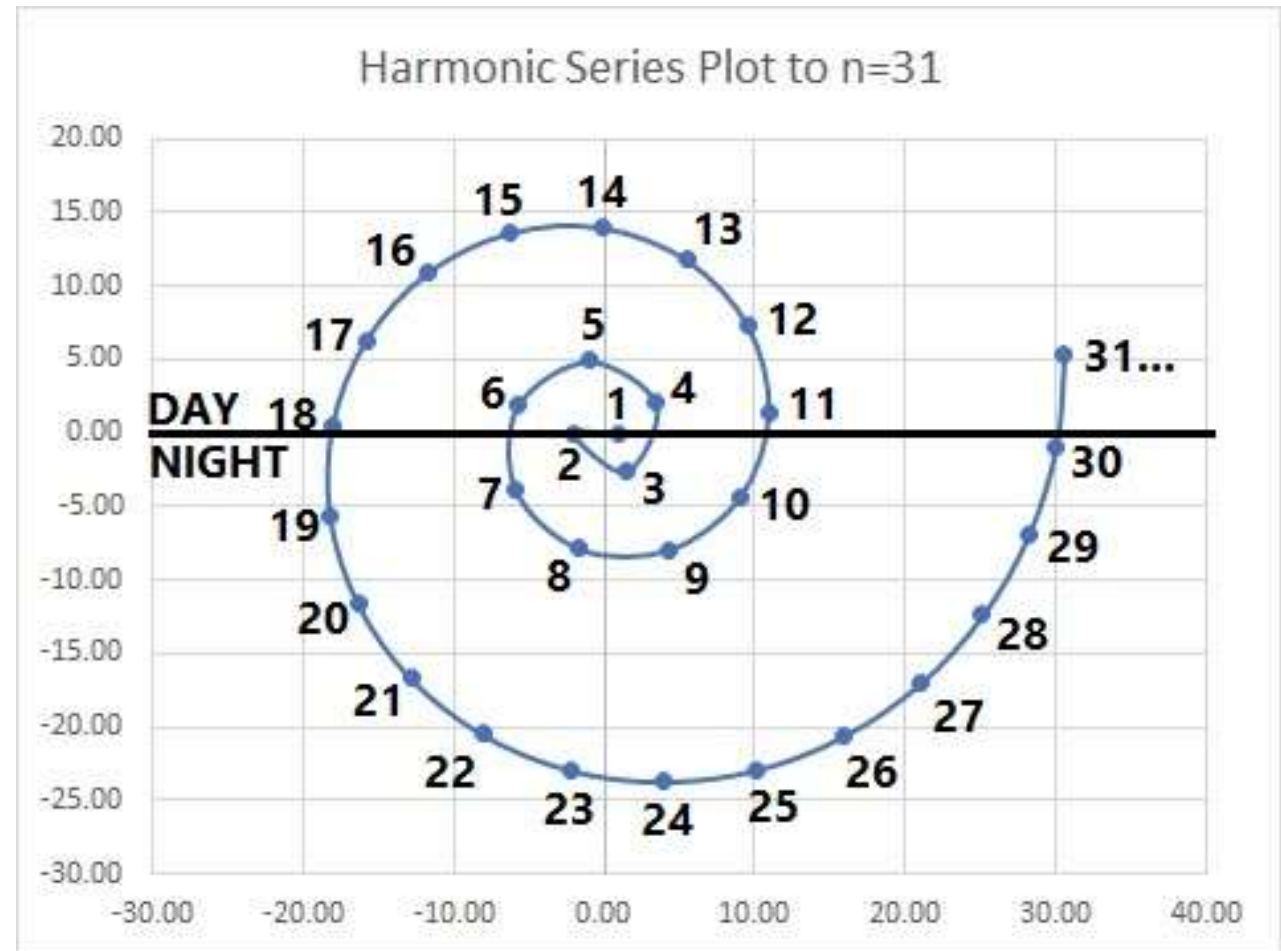


The Creation Function: Formalized Definition

The Harmonic Series and Logarithmic Spiral



Step	Harmonic Series Equation	n	S_n	Time Interval Ratio n_{step} / n_{step-1}	=	Compare to e
0	$\sum_{n=1}^1 \frac{1}{n} = \left(\frac{1}{1}\right)$	1	1	-	-	-
1	$\sum_{n=1}^4 \frac{1}{n} = \left(\frac{1}{1} + \frac{1}{2} + \frac{1}{3} + \frac{1}{4}\right)$	4	2.08	4/1	4	2.718
2	$\sum_{n=1}^{11} \frac{1}{n} = \left(\frac{1}{1} + \frac{1}{2} + \dots + \frac{1}{11}\right)$	11	3.02	11/4	2.750	2.718
3	$\sum_{n=1}^{31} \frac{1}{n} = \left(\frac{1}{1} + \frac{1}{2} + \dots + \frac{1}{31}\right)$	31	4.03	31/11	2.818	2.718
4	$\sum_{n=1}^{83} \frac{1}{n} = \left(\frac{1}{1} + \frac{1}{2} + \dots + \frac{1}{83}\right)$	83	5.00	83/31	2.677	2.718
5	$\sum_{n=1}^{227} \frac{1}{n} = \left(\frac{1}{1} + \frac{1}{2} + \dots + \frac{1}{227}\right)$	227	6.00	227/83	2.735	2.718
6	$\sum_{n=1}^{616} \frac{1}{n} = \left(\frac{1}{1} + \frac{1}{2} + \dots + \frac{1}{616}\right)$	616	7.00	616/227	2.714	2.718
7	$\sum_{n=1}^{1674} \frac{1}{n} = \left(\frac{1}{1} + \frac{1}{2} + \dots + \frac{1}{1674}\right)$	1674	8.00	1674/616	2.718	2.718
8	$\sum_{n=1}^{4550} \frac{1}{n} = \left(\frac{1}{1} + \frac{1}{2} + \dots + \frac{1}{4550}\right)$	4550	9.00	4550/1674	2.718	2.718
9	$\sum_{n=1}^{12368} \frac{1}{n} = \left(\frac{1}{1} + \frac{1}{2} + \dots + \frac{1}{12368}\right)$	12368	10.00	12368/4550	2.718	2.718



Follows an approximate e^{day} mathematical pattern.
Every day the function increases by a factor of e

PTOE Follows Days of Creation



Periodic Table of the Elements (PTOE)

After IUPAC Commission on Isotopic Abundances and Atomic Weights, 2019

	1											13	14	15	16	17	18																													
1	1 H Hydrogen 1.008																2 He Helium 4.003																													
2	3 Li Lithium 6.94	4 Be Beryllium 9.012											5 B Boron 10.81	6 C Carbon 12.011	7 N Nitrogen 14.007	8 O Oxygen 15.999	9 F Fluorine 18.998	10 Ne Neon 20.180																												
3	11 Na Sodium 22.990	12 Mg Magnesium 24.305	3	4	5	6	7	8	9	10	11	12	13 Al Aluminum 26.982	14 Si Silicon 28.085	15 P Phosphorus 30.974	16 S Sulfur 32.06	17 Cl Chlorine 35.45	18 Ar Argon 39.948																												
4	19 K Potassium 39.098	20 Ca Calcium 40.078	21 Sc Scandium 44.956	22 Ti Titanium 47.867	23 V Vanadium 50.942	24 Cr Chromium 51.996	25 Mn Manganese 54.938	26 Fe Iron 55.845	27 Co Cobalt 58.933	28 Ni Nickel 58.693	29 Cu Copper 63.546	30 Zn Zinc 65.38	31 Ga Gallium 69.723	32 Ge Germanium 72.630	33 As Arsenic 74.922	34 Se Selenium 78.971	35 Br Bromine 79.904	36 Kr Krypton 83.798																												
5	37 Rb Rubidium 85.468	38 Sr Strontium 87.62	39 Y Yttrium 88.906	40 Zr Zirconium 91.224	41 Nb Niobium 92.906	42 Mo Molybdenum 95.95	43 Tc Technetium [97]	44 Ru Ruthenium 101.07	45 Rh Ruthenium 102.905	46 Pd Palladium 106.42	47 Ag Silver 107.868	48 Cd Cadmium 112.414	49 In Indium 114.818	50 Sn Tin 118.710	51 Sb Antimony 121.760	52 Te Tellurium 127.60	53 I Iodine 126.904	54 Xe Xenon 131.293																												
6	55 Cs Cesium 132.905	56 Ba Barium 137.327	57 La Lanthanum 138.905	72 Hf Hafnium 178.486	73 Ta Tantalum 180.948	74 W Tungsten 183.84	75 Re Rhenium 186.207	76 Os Osmium 190.23	77 Ir Iridium 192.217	78 Pt Platinum 195.084	79 Au Gold 196.967	80 Hg Mercury 200.592	81 Tl Thallium 204.38	82 Pb Lead 207.2	83 Bi Bismuth 208.980	84 Po Polonium [209]	85 At Astatine [210]	86 Ra Radium [222]																												
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	<table border="1"> <tr> <td>58 Ce Cerium 140.116</td> <td>59 Pr Praseodymium 140.908</td> <td>60 Nd Neodymium 144.242</td> <td>61 Pm Promethium [145]</td> <td>62 Sm Samarium 150.36</td> <td>63 Eu Europium 151.964</td> <td>64 Gd Gadolinium 157.25</td> <td>65 Tb Terbium 158.925</td> <td>66 Dy Dysprosium 162.500</td> <td>67 Ho Holmium 164.930</td> <td>68 Er Erbium 167.259</td> <td>69 Tm Thulium 168.934</td> <td>70 Yb Ytterbium 173.045</td> <td>71 Lu Lutetium 174.966</td> </tr> <tr> <td>90 Th Thorium 232.038</td> <td>91 Pa Protactinium 231.036</td> <td>92 U Uranium 238.029</td> <td>93 Np Neptunium [237]</td> <td>94 Pu Plutonium [244]</td> <td>95 Am Americium [243]</td> <td>96 Cm Curium [247]</td> <td>97 Bk Berkelium [257]</td> <td>98 Cf Californium [251]</td> <td>99 Es Einsteinium [252]</td> <td>100 Fm Fermium [257]</td> <td>101 Md Mendelevium [258]</td> <td>102 No Nobelium [259]</td> <td>103 Lr Lawrencium [262]</td> </tr> </table>																		58 Ce Cerium 140.116	59 Pr Praseodymium 140.908	60 Nd Neodymium 144.242	61 Pm Promethium [145]	62 Sm Samarium 150.36	63 Eu Europium 151.964	64 Gd Gadolinium 157.25	65 Tb Terbium 158.925	66 Dy Dysprosium 162.500	67 Ho Holmium 164.930	68 Er Erbium 167.259	69 Tm Thulium 168.934	70 Yb Ytterbium 173.045	71 Lu Lutetium 174.966	90 Th Thorium 232.038	91 Pa Protactinium 231.036	92 U Uranium 238.029	93 Np Neptunium [237]	94 Pu Plutonium [244]	95 Am Americium [243]	96 Cm Curium [247]	97 Bk Berkelium [257]	98 Cf Californium [251]	99 Es Einsteinium [252]	100 Fm Fermium [257]	101 Md Mendelevium [258]	102 No Nobelium [259]	103 Lr Lawrencium [262]
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Creation Function and PTOE follow the Days of Creation



Easy Table: How the Creation Spiral Follows the First Three Days of Creation and the PTOE

Period 1 of the PTOE Creation Day 1: Light	
Z=1	Hydrogen, fuels the Sun
Z=2	Helium, fuels the Sun
Period 2 of the PTOE Creation Day 2: Firmament	
Z=6	Carbon, essential 0.4% of our atmosphere
Z=7	Nitrogen, 78% of our atmosphere
Z=8	Oxygen, 21% of our atmosphere
Period 3 of the PTOE Creation Day 3: Dry Land, Earth, Life	
Z=11	Sodium: An abundant metal of earth (6 th).
Z=12	Magnesium: An abundant metal of earth (7 th).
Z=13	Aluminum: An abundant metal of earth (3 rd).
Z=14	Silicon: An abundant semi-metal of earth (3 rd).
Z=15	Phosphorus: An abundant non-metal of earth.
Z=16	Sulfur: An abundant non-metal of earth
Z=17	Chlorine: An abundant non-metal of earth.
Z=18	Argon: The end of the 3rd period of the PTOE.

Period 4, Transition Metals are in 3d orbital

Z=19: Potassium: 8th most abundant metal of earth.

Z=20: Calcium: 5th most abundant metal of earth

Z=22: Titanium: An abundant metal of earth.

Z=23: Vanadium: An abundant metal of earth.

Z=24: Chromium: An abundant metal of earth

Z=25: Manganese: An abundant metal of earth.

Z=26: Iron: 4th most abundant metal of earth.

Z=27: Cobalt: An abundant metal of earth.

Z=28: Nickel: An abundant metal of earth

Z=29: Copper: An abundant metal of earth

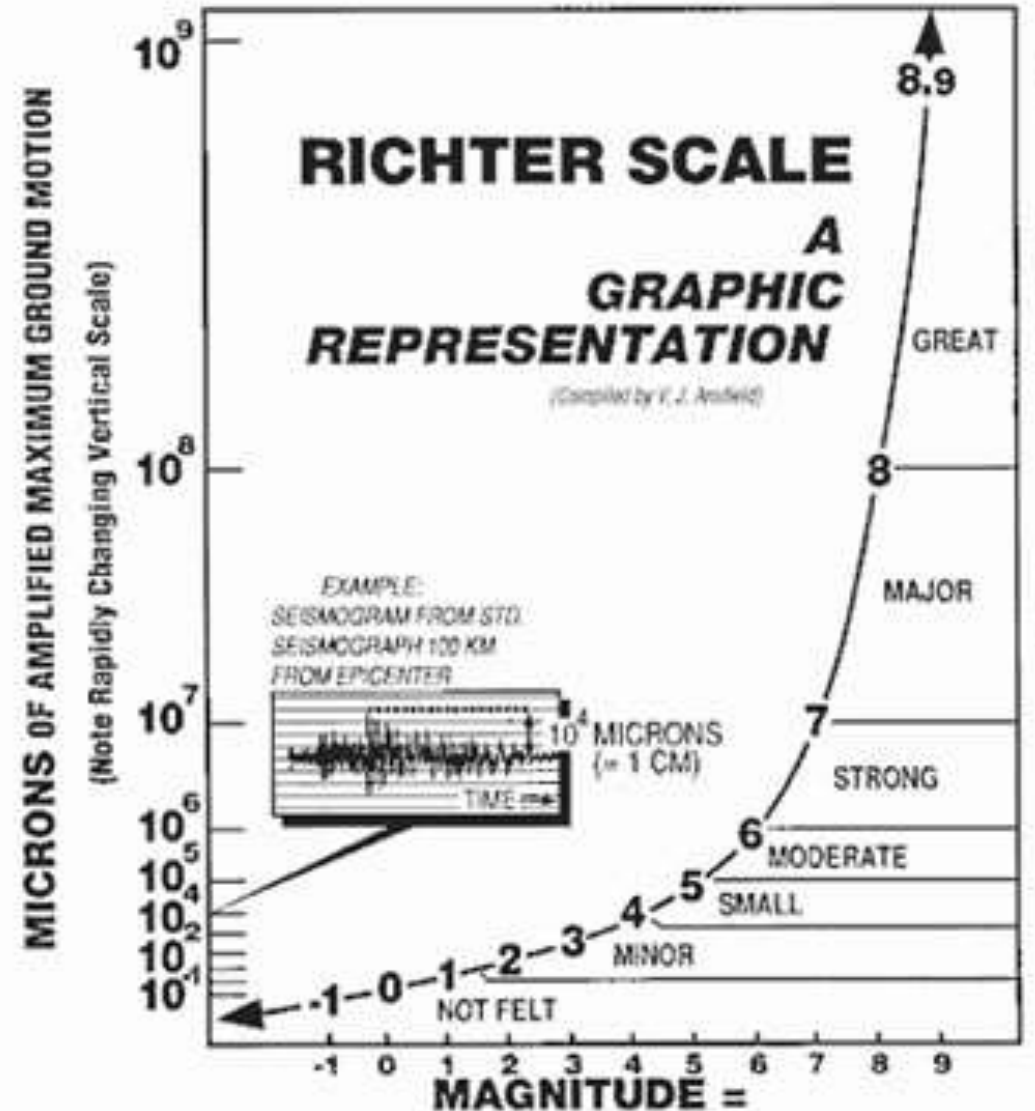
Z=30: Zinc: An abundant metal of earth.

Elemental abundances drop off drastically after Atomic Number 30!

Benefits of the Logarithm and “e”



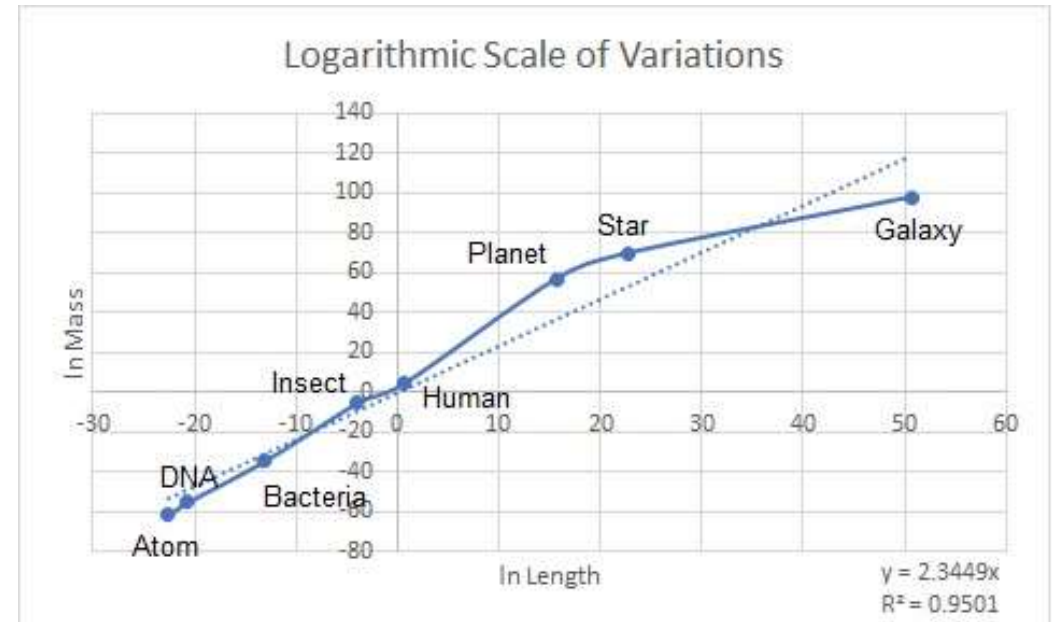
- Exponents and logarithms give us the ability to express large quantities using smaller, more manageable numbers.
- Base-10 logarithms are used to characterize the magnitude of earthquakes and intensity of sound (decibel)
- Base-e logarithms are called Natural Logarithms. Base-e = Base (2.718)
- John Napier, 1618: Produced a table of natural logarithms using the constant.
- Jacob Bernoulli, 1668: An account that starts at \$1, and yields interest at annual rate R with continuous compounding, will accumulate to eR dollars at the end of one year.
- Leonhard Euler: Gave the constant its name “e” retained in his honor “Euler’s Constant”



Fun with Logarithms and “e” for Young-Earth Creationism: Creation Function’s e^{Day}



- Exponents and logarithms give us the ability to express large quantities using smaller, more manageable numbers.
- The Creation Function is a base-e logarithmic spiral. Growth follows e^{Day} formula.
- Creation: Seven Days, Seven rotations of Earth related to $e^7 = \text{CF } 1674$, Calc. 1096
- Flood: Forty Days, Forty rotations of Earth. Relates to $e^{40} = 2.3 \times 10^{17}$
- Compare: 9×10^{17} approximate diameter of Milky way galaxy in km.
- Compare: $e^{39} = 8 \times 10^{16} = \text{“c-squared”}$ from $E=mc^2$ ($c^2 = \text{velocity of light squared}$)
- Compare: Noah’s Ark 17,000T multiplied by $e^{40.4}$ equals 6×10^{24} kg the mass of the Earth.



Solomon's Molten Sea: A 3-D Periodic Table?



Solomon's Molten Sea: A 3-D Periodic Table?

1 Kings 7:23-26, 2 Chronicles 4:2-5



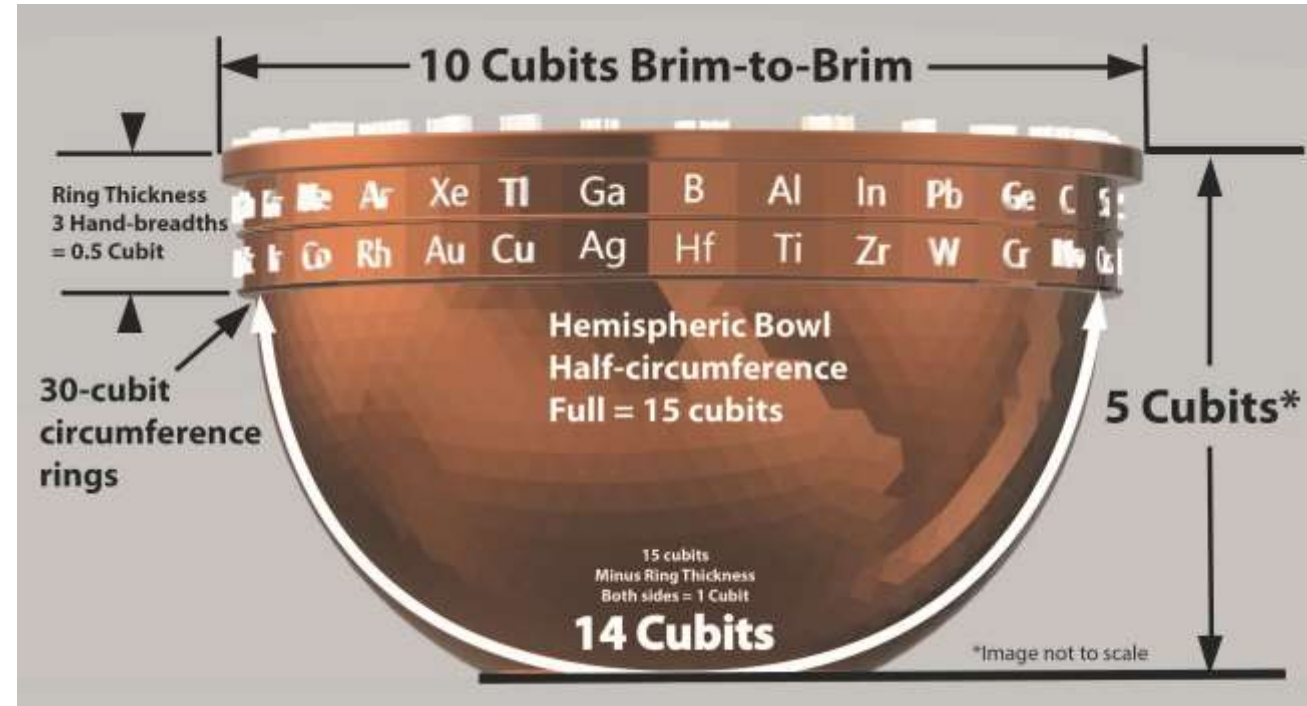
- A large basin holding the water priests used to cleanse themselves before entering The Holy Place.
- This symbol is much like how the Earth is the place we are cleansed before entering the Kingdom of God.
- The Earth is comprised of the elements of the Periodic Table.
- Can this structure could be viewed as a model of the Earth?



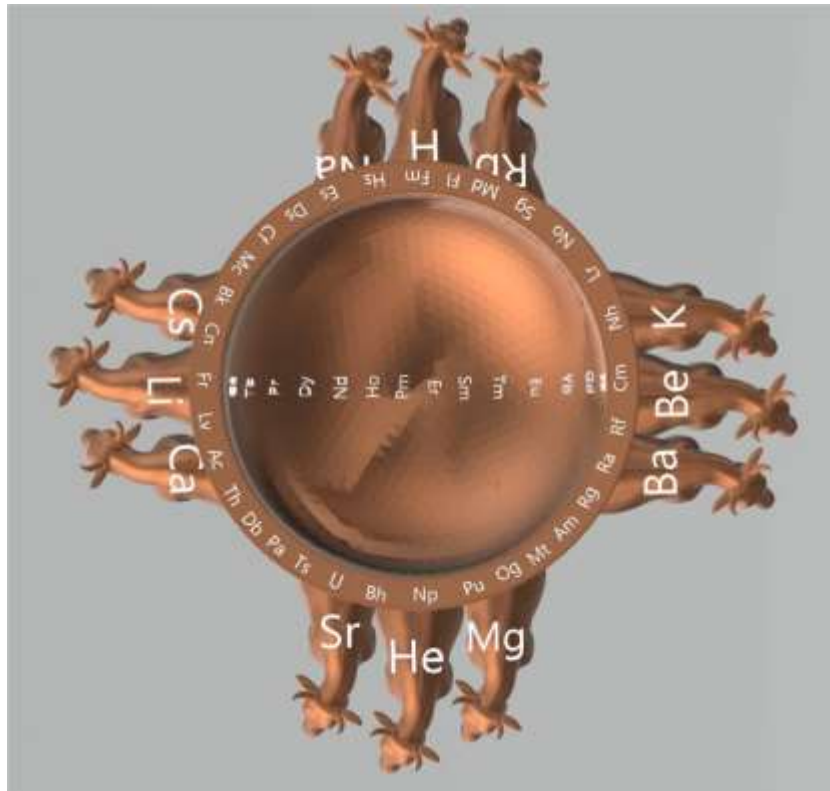
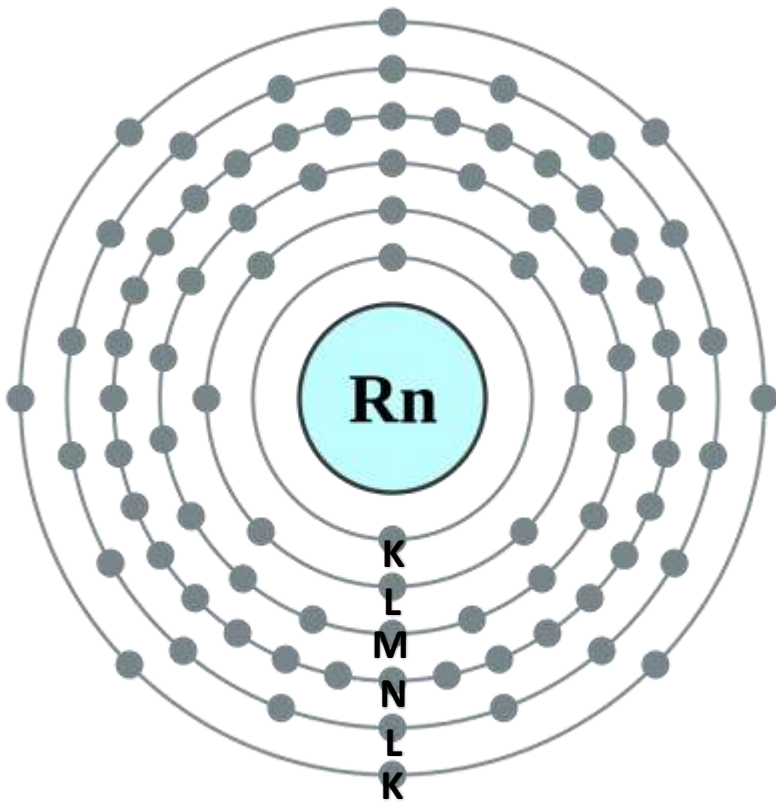
Solomon's Molten Sea (MS): Dimensions



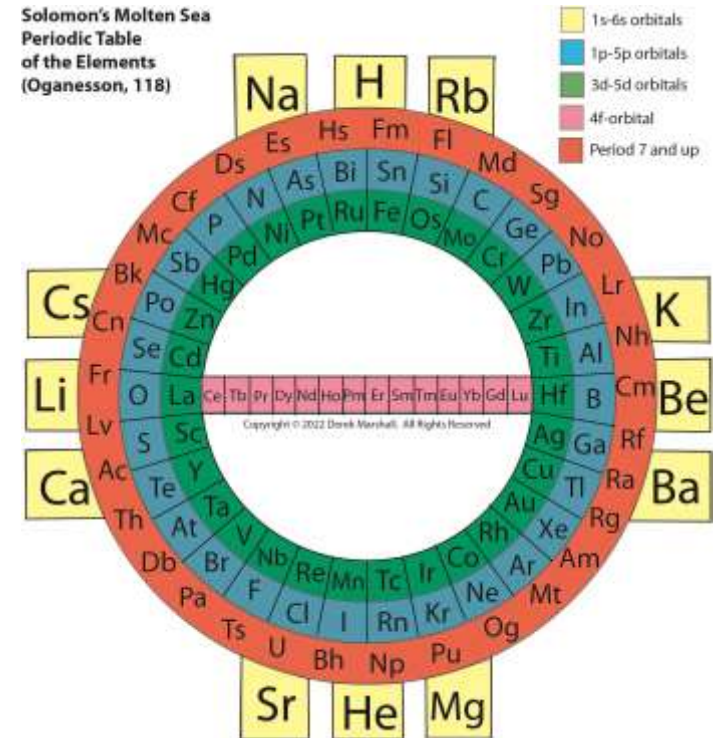
- The MS was a bowl with a fluted lip. It measured **10 cubits** across the top, and **5 cubits** top to bottom.
- It had two rows of 300 “knops” each, ten per cubit = **30 cubits** around the bowl (circumference)
- The brim thickness was 1 hand-breadth (hb). **Six hb. = 1 cubit**
- Assuming bowl was hemispherical (From measurements & *Antiquities*)
- Assuming the brim and two rings together measured 3 hb, the bowl portion = **14 cubits**



Top View of Solomon's Molten Sea: Compare to Shell Model: Qualitative

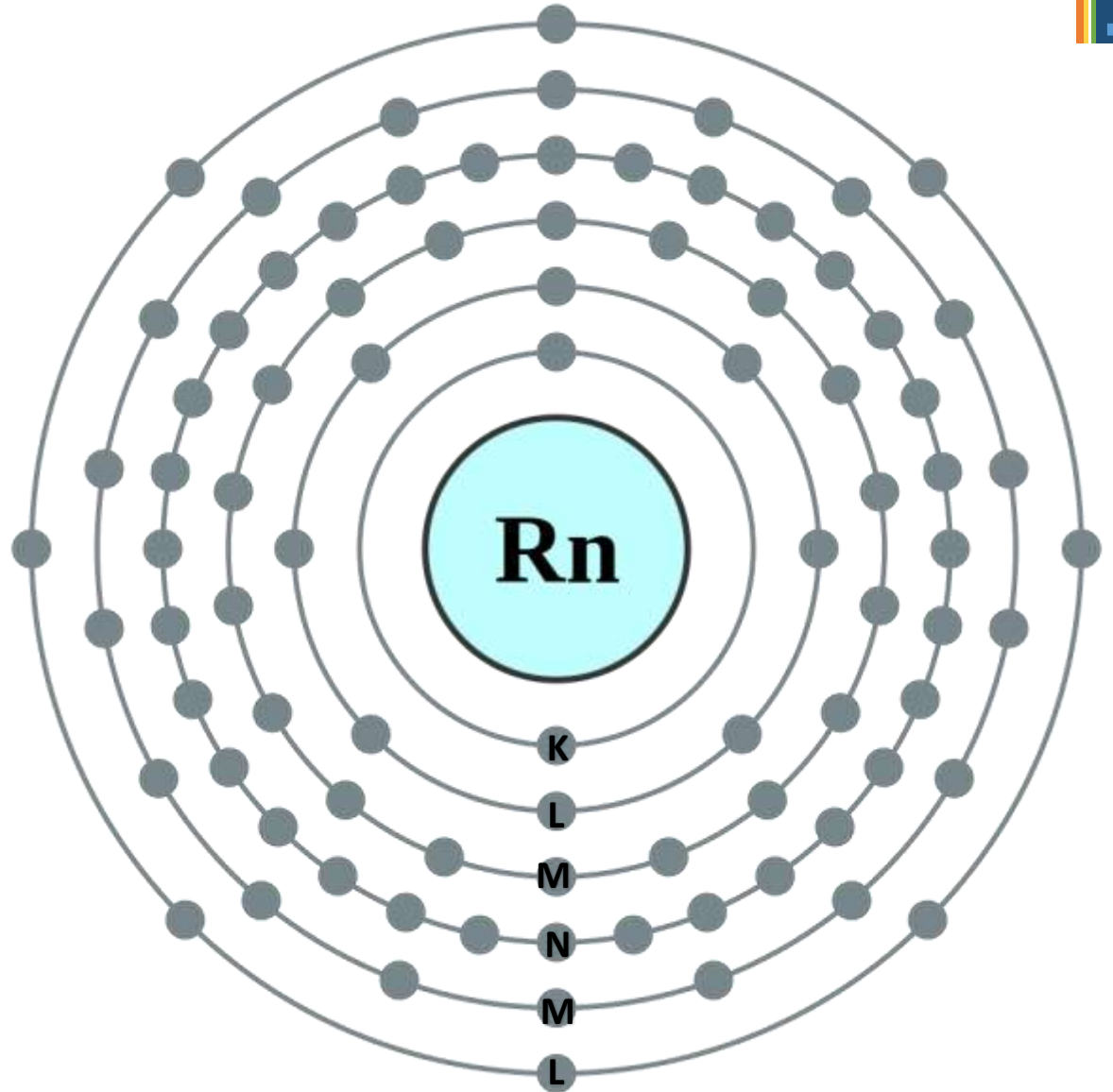


Solomon's Molten Sea
Periodic Table
of the Elements
(Oganesson, 118)

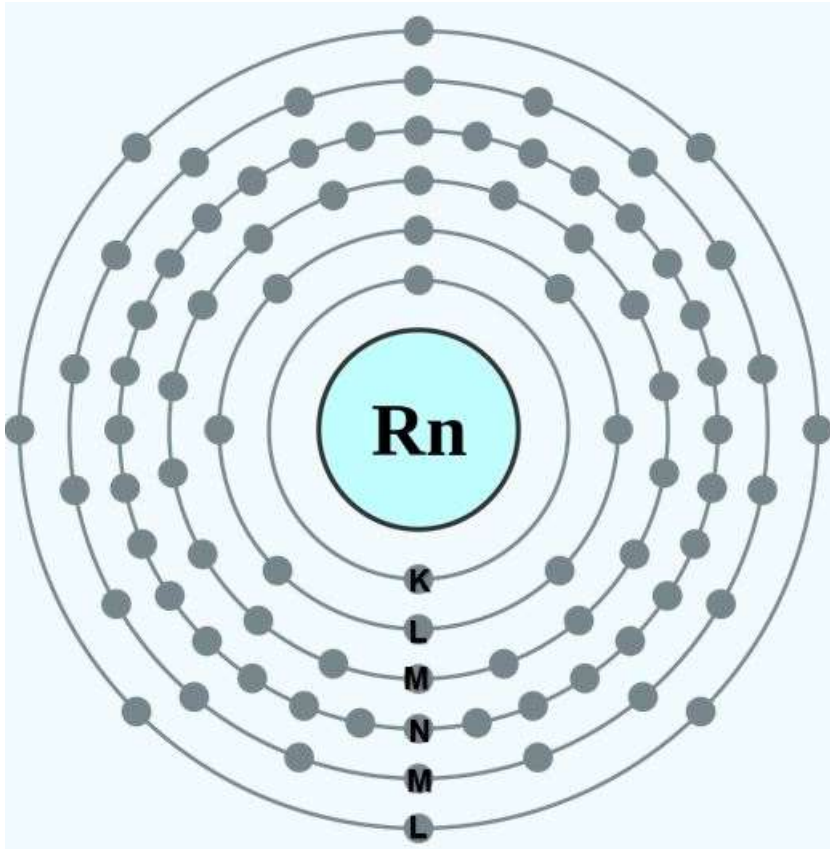


Shell Model of Electronic Orbitals

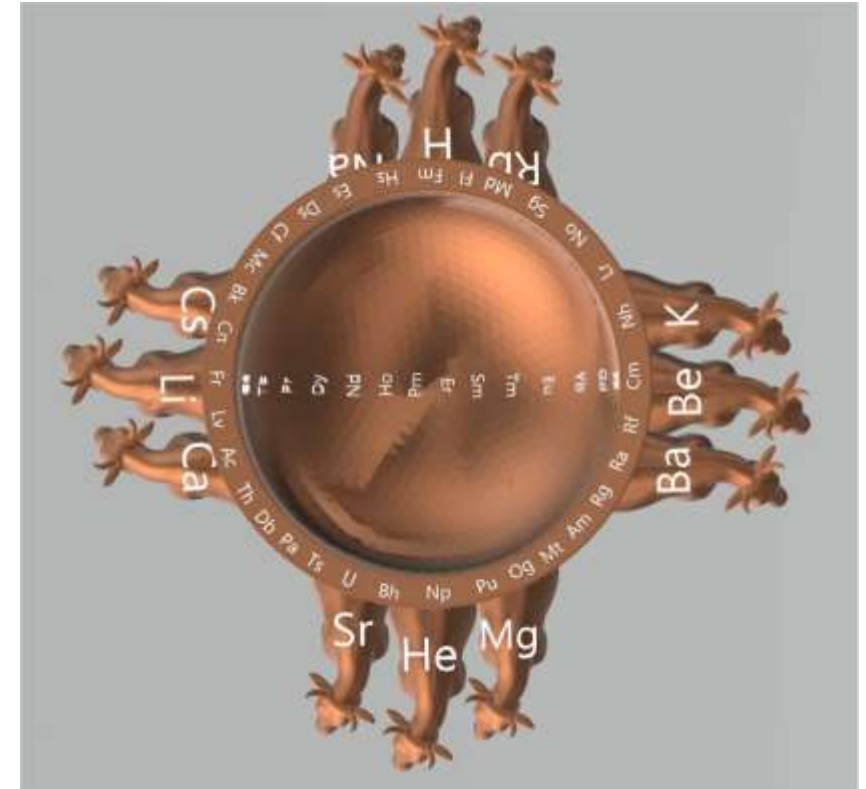
- Expresses the order in which electrons form energy levels within atoms
- Principal quantum number " n "
- " n " Corresponds to Periods (rows) of the PTOE
- Formula: $2n^2$ = Number of electrons per shell
- For " n " from 1 to 4 make K, L, M, N Shells
- {K, L, M, N} -> {2, 8, 18, 32}
- Outer ring is "Valence Shell" with occupancies for up to 8 electrons
- This is where chemistry happens.



Shell Model of Electronic Orbitals: Comparison to Molten Sea Model

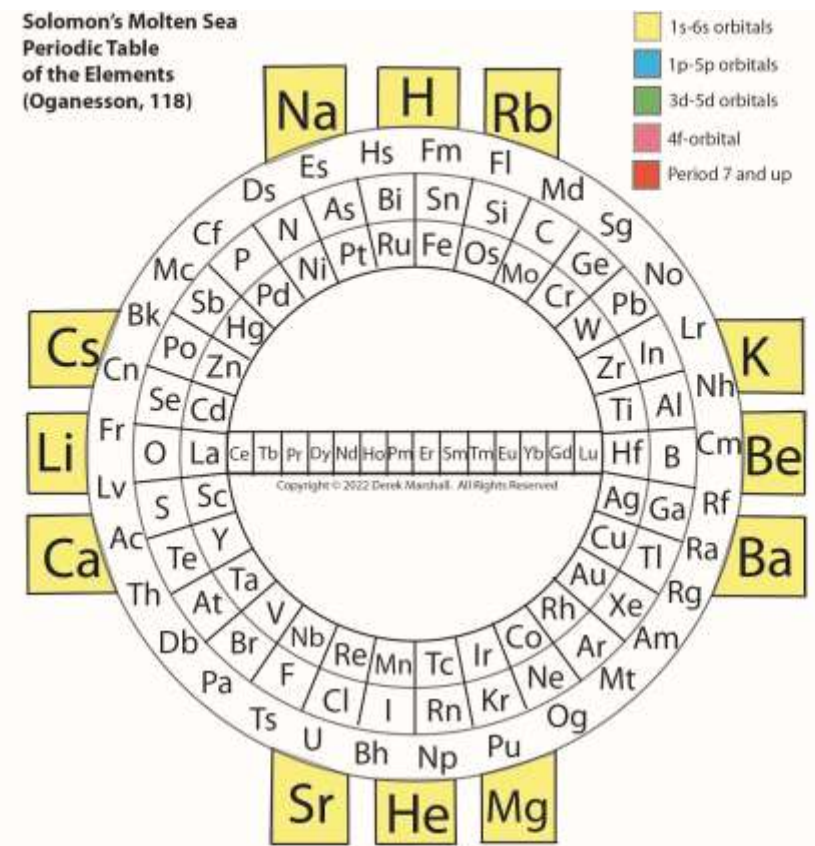


- Both circular models
- Both have points along the circle representing occupancies
- Oxen (mobile) influence felt from inside to outside as K, L shells do.
- Inner rings, bowl and brim fill in the larger M, N shells
- Let us now look at the individual parts of the MS Model.



12 s-orbitals, K-shell: Oxen (Yellow)

- Oxen form the basis on which the bowl rests.
- Oxen arranged in threes, but each ox has its opposite across from it. Corresponds to quantum "spin" of $\pm 1/2$. Oxen are like "fermions"
- Each ox occupies a side, or $1/2$, of the bowl.
- This corresponds Hund's Rule of how electrons are added to an atom. They fill in the empty spots first before they pair up.
- Each s-orbital can take two oxen.
- As shown in yellow, Twelve oxen fill up 1s to 6s orbitals on PTOE = 12 oxen total \rightarrow 12 elements.
- ℓ quantum number relates to angular momentum of electron. Formula: $\ell = \pm (n - 1)$
- Also since the oxen are on a flat plane, this corresponds to an $\ell = 0$ (no angle, just flat spin)

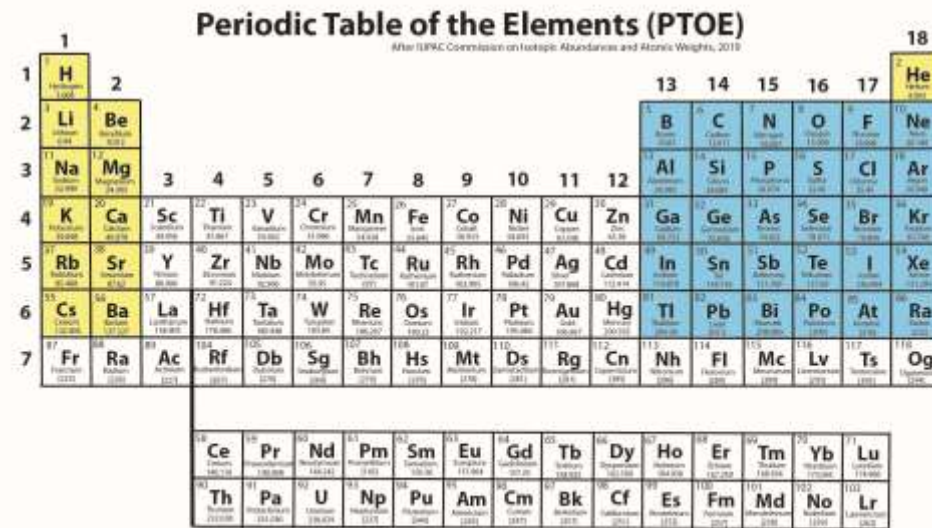
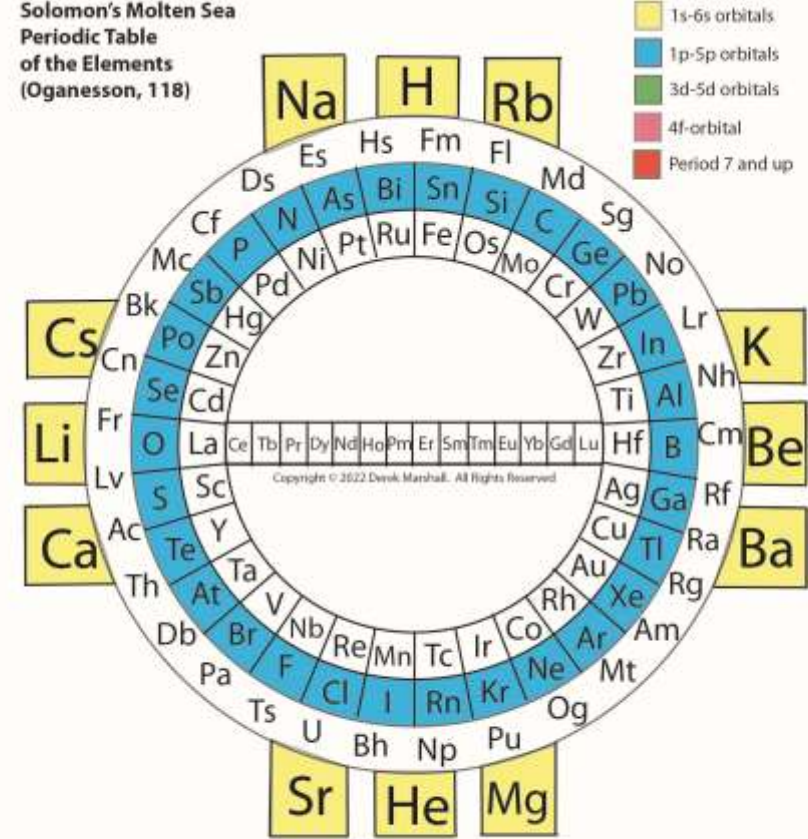


Periodic Table of the Elements (PTOE)
After IUPAC Convention on Isotopic Abundances and Atomic Weights, 2019

1	2											13	14	15	16	17	18										
1 H Hydrogen 1.008												13 B Boron 10.81	14 C Carbon 12.011	15 N Nitrogen 14.007	16 O Oxygen 15.999	17 F Fluorine 18.998	18 He Helium 4.003										
2 Li Lithium 6.941	Be Beryllium 9.012											13 Al Aluminum 26.982	14 Si Silicon 28.086	15 P Phosphorus 30.974	16 S Sulfur 32.06	17 Cl Chlorine 35.45	18 Ar Argon 39.948										
3 Na Sodium 22.990	Mg Magnesium 24.305	3	4	5	6	7	8	9	10	11	12	13 Ga Gallium 69.723	14 Ge Germanium 72.630	15 As Arsenic 74.922	16 Se Selenium 78.96	17 Br Bromine 79.904	18 Kr Krypton 83.798										
4 K Potassium 39.098	Ca Calcium 40.078	Sc Scandium 44.956	20 Ti Titanium 47.88	21 V Vanadium 50.942	24 Cr Chromium 51.996	25 Mn Manganese 54.938	26 Fe Iron 55.845	27 Co Cobalt 58.933	28 Ni Nickel 58.693	29 Cu Copper 63.546	30 Zn Zinc 65.38	31 Ga Gallium 69.723	32 Ge Germanium 72.630	33 As Arsenic 74.922	34 Se Selenium 78.96	35 Br Bromine 79.904	36 Kr Krypton 83.798										
5 Rb Rubidium 85.468	Sr Strontium 87.62	Y Yttrium 88.906	38 Zr Zirconium 91.224	39 Nb Niobium 92.906	40 Mo Molybdenum 95.94	42 Tc Technetium 98	44 Ru Ruthenium 101.07	45 Rh Rhodium 102.91	46 Pd Palladium 106.36	47 Ag Silver 107.868	48 Cd Cadmium 112.411	49 In Indium 114.818	50 Sn Tin 118.710	51 Sb Antimony 121.757	52 Te Tellurium 127.6	53 I Iodine 126.905	54 Xe Xenon 131.29										
6 Cs Cesium 132.905	Ba Barium 137.327	La Lanthanum 138.905	72 Hf Hafnium 178.49	73 Ta Tantalum 180.948	74 W Tungsten 183.84	76 Re Rhenium 186.207	77 Os Osmium 190.23	78 Ir Iridium 192.222	79 Pt Platinum 195.084	80 Au Gold 196.967	81 Hg Mercury 200.59	82 Tl Thallium 204.383	83 Pb Lead 207.2	84 Bi Bismuth 208.98	85 Po Polonium 209	86 At Astatine 210	87 Rn Radon 222										
7 Fr Francium 223	Ra Radium 226	Ac Actinium 227	88 Rf Rutherfordium 261	89 Db Dubnium 262	90 Sg Seaborgium 266	91 Bh Bohrium 264	92 Hs Hassium 277	93 Mt Meitnerium 276	94 Ds Darmstadtium 285	95 Rg Roentgenium 288	96 Cn Copernicium 285	97 Nh Nihonium 286	98 Fl Flerovium 289	99 Mc Moscovium 288	100 Lv Livermorium 293	101 Ts Tennessine 294	102 Og Oganesson 294										
88 Ce Cerium 140.12	89 Pr Praseodymium 140.908	90 Nd Neodymium 144.24	91 Pm Promethium 145	92 Sm Samarium 150.36	93 Eu Europium 151.964	94 Gd Gadolinium 157.25	95 Tb Terbium 158.925	96 Dy Dysprosium 162.50	97 Ho Holmium 164.930	98 Er Erbium 167.259	99 Tm Thulium 168.930	100 Yb Ytterbium 173.054	101 Lu Lutetium 174.967	90 Th Thorium 232.038	91 Pa Protactinium 231.036	92 U Uranium 238.029	93 Np Neptunium 237	94 Pu Plutonium 244	95 Am Americium 243	96 Cm Curium 247	97 Bk Berkelium 247	98 Cf Californium 251	99 Es Einsteinium 252	100 Fm Fermium 257	101 Md Mendelevium 258	102 No Nobelium 259	103 Lr Lawrencium 260

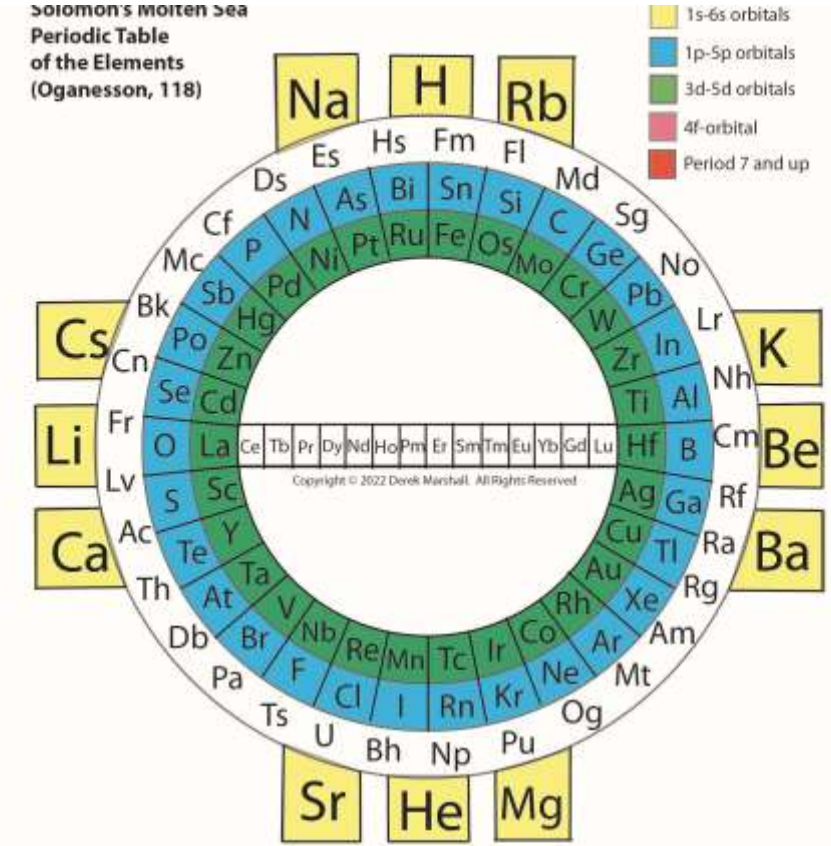
30 *p*-orbitals, L-Shell: Upper Knop Ring (Blue)

- This is the upper ring of 300 knops under the brim.
- There are 10 knops per cubit = 30 cubit circumference.
- Each cubit represents one occupancy, one atom.
- Amazing: Any atom can be made up of combinations of the following 10 sub-atomic particles: p^+ , n , e^- , ν , *up*, *down*, *top*, *bottom*, *charm*, *strange* quarks
- Each *p*-orbital can take 6 cubits of knops.
- As shown in blue, Thirty cubits of knops fill up 2*p* to 6*p* orbitals on PTOE → 30 elements. Here $n = 2$, creates L-Shell = 8 electrons
- ℓ quantum number relates to angular momentum of electron. Formula: $\ell = +/- (n - 1)$. Now ℓ has values.
- Since the knops are on a round bowl, they can have angles above the base plane of oxen.
- *p*-orbitals tend to form 90° angles to each other, maybe related to being "clocked" by oxen also situated at 90°
- Elements on ring next to each other similar properties as in "groups" on PTOE. Periodic nature of the PTOE.



30 *d*-orbitals, M-Shell: Lower Knop Ring (Green)

- This is the lower ring of 300 knops under the brim.
- There are 10 knops per cubit = 30 cubit circumference.
- Each cubit represents one occupancy, one atom.
- Each *d*-orbital can take 10 cubits of knops.
- As shown in green, Thirty cubits of knops fill up 3d to 5d orbitals on PTOE → 30 elements. Here $n = 3$, creates M-Shell → 18 electrons
- l quantum number relates to angular momentum of electron. Formula: $l = +/- (n - 1)$. Now l has values.
- Since the knops are on a round bowl, they can have angles above the base plane of oxen.
- Lanthanum (La) and Hafnium (Hf) begin as opposite each other to allow for the f-orbital bridge, next slide
- Elements on ring next to each other similar properties as in "groups" on PTOE. Periodic nature of the PTOE.



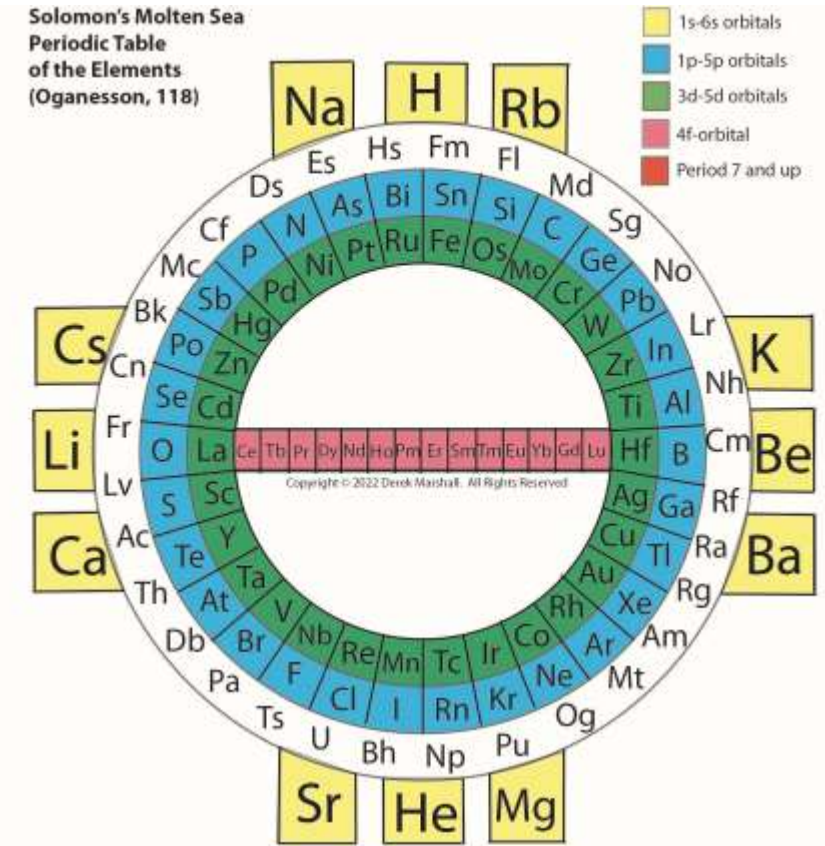
Periodic Table of the Elements (PTOE)
After IUPAC Commission on Isotopic Abundances and Atomic Weights, 2019

1																	18	
1	H																	He
2	Li	Be											B	C	N	O	F	Ne
3	Na	Mg											Al	Si	P	S	Cl	Ar
4	K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
5	Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
6	Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Ra
7	Fr	Ra	Ac	Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg	Cn	Nh	Fl	Mc	Lv	Ts	Og
			Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu		
			Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr		

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14 *f*-orbitals, N-shell: Bowl Hemisphere (Purple)

- This is the lower bowl under the knop rings.
- This partial circumference under the knop rings is 14 cubits, as calculated earlier.
- Each cubit represents one occupancy, one atom.
- The *f*-orbital occupies the 14 cubits of the bowl.
- As shown in purple, 14 cubits fill up 4*f* orbital on PTOE → 14 elements. Here $n = 4$, creates N-Shell → 32 electrons
- l quantum number relates to angular momentum of electron. Formula: $l = +/- (n - 1)$. Now l has values.
- Since these elements form the bowl, they can have angles above the base plane of oxen.
- Also, as a half-ring, it has additional degrees of freedom to move and spin, forming the more complex orbital structures of rare-earth elements.

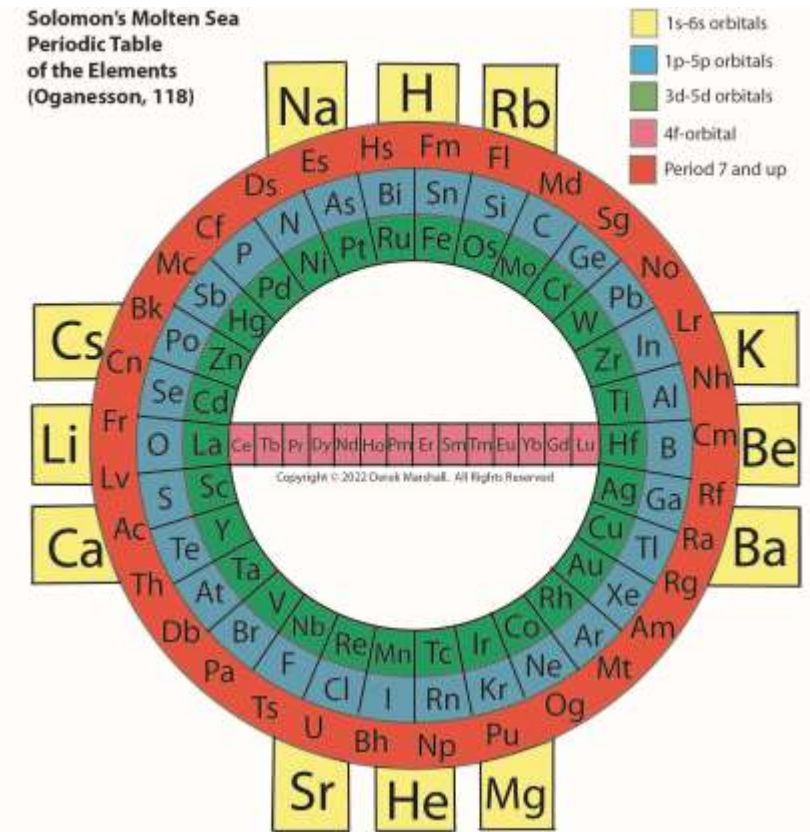


Periodic Table of the Elements (PTOE)
After IUPAC Commission on Isotopic Abundances and Atomic Weights, 2019

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1 H	2 He											3 B	4 C	5 N	6 O	7 F	8 Ne
3 Li	4 Be											9 Al	10 Si	11 P	12 S	13 Cl	14 Ar
5 Na	6 Mg	7 Sc	8 Ti	9 V	10 Cr	11 Mn	12 Fe	13 Co	14 Ni	15 Cu	16 Zn	17 Ga	18 Ge	19 As	20 Se	21 Br	22 Kr
19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr
37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe
55 Cs	56 Ba	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	72 Hf
73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn	87 Fr	88 Ra	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	104 Rf	105 Db	106 Sg	107 Bh	108 Hs
109 Mt	110 Ds	111 Rg	112 Cn	113 Nh	114 Fl	115 Mc	116 Lv	117 Ts	118 Og								

31.4 cubit 7th Period: Fluted Lip of Bowl (Red)

- This is the wider top brim of the bowl.
- This fluted lip was hand-worked into the shape of lilies on the MS.
- The brim was 10 cubits diameter across. Using π , circumference = 31.4 cubits approx.
- Each cubit represents one occupancy, one atom.
- As shown in **red**, 31.4 cubits fill up 5f orbital on PTOE → 32 elements?
- The full model, as shown completely filled in, represents Oganesson, Og, the largest element discovered
- The orbitals of superheavy elements such as Oganesson are subject to relativistic effects. Relativistic effect: **length contraction**.
- To "fit" 32 elements into 31.4 cubits of occupancy would require 0.98 contraction. Theoretical velocity around 0.19c
- Thumbnail calculation of Og outer shell velocity, using Fine Structure Constant is about 0.12c.
- These elements are mostly synthetic, man-made. Only the first 6 are naturally occurring. Similar to the idea that the brim is hand-worked.
- This completes the 7th period, and **completes the full PTOE!!!**



Periodic Table of the Elements (PTOE)
After IUPAC Commission on Isotopic Abundances and Atomic Weights, 2019

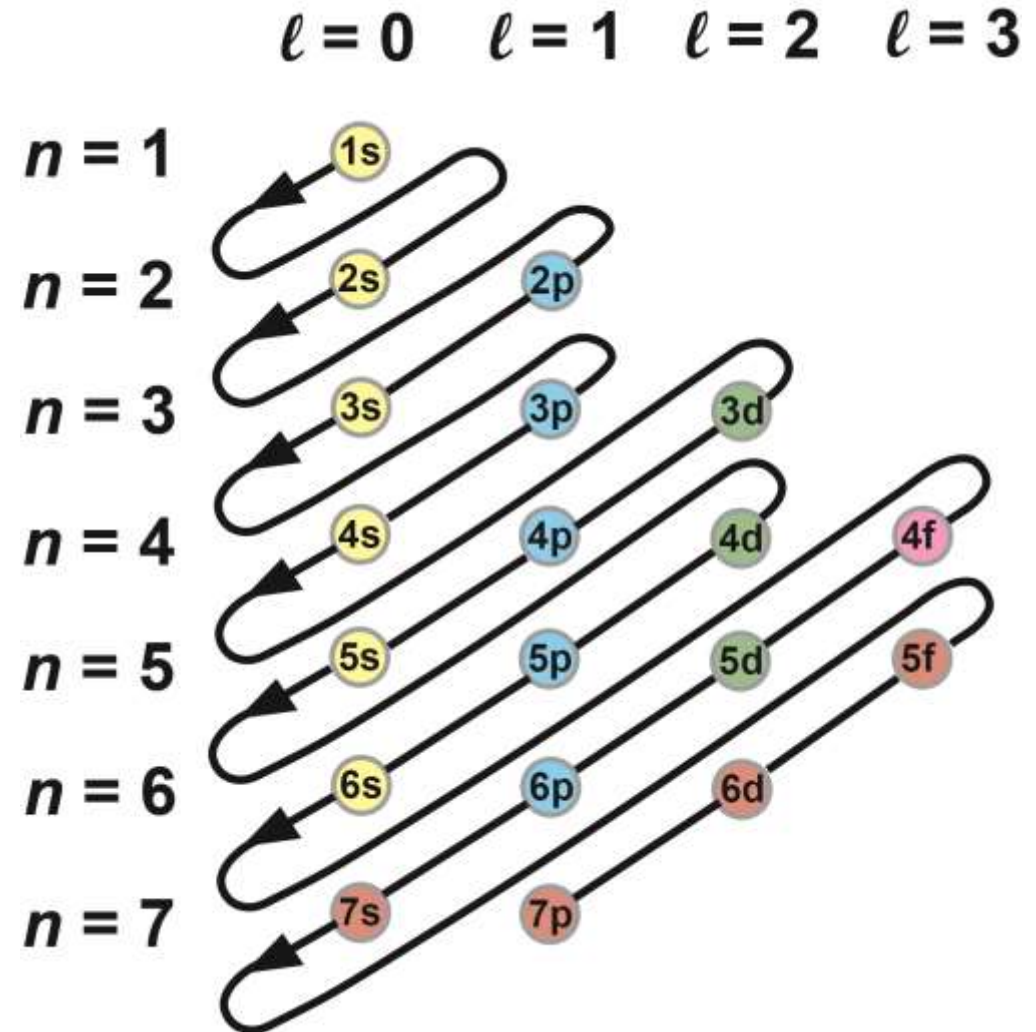
1																	18															
1	H																	He														
2	Li	Be											B	C	N	O	F	Ne														
3	Na	Mg	3	4	5	6	7	8	9	10	11	12	Al	Si	P	S	Cl	Ar														
4	K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr														
5	Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe														
6	Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Ra														
7	Fr	Ra	Ac	Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg	Cn	Nh	Fl	Mc	Lv	Ts	Og														
																			Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
																			Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr

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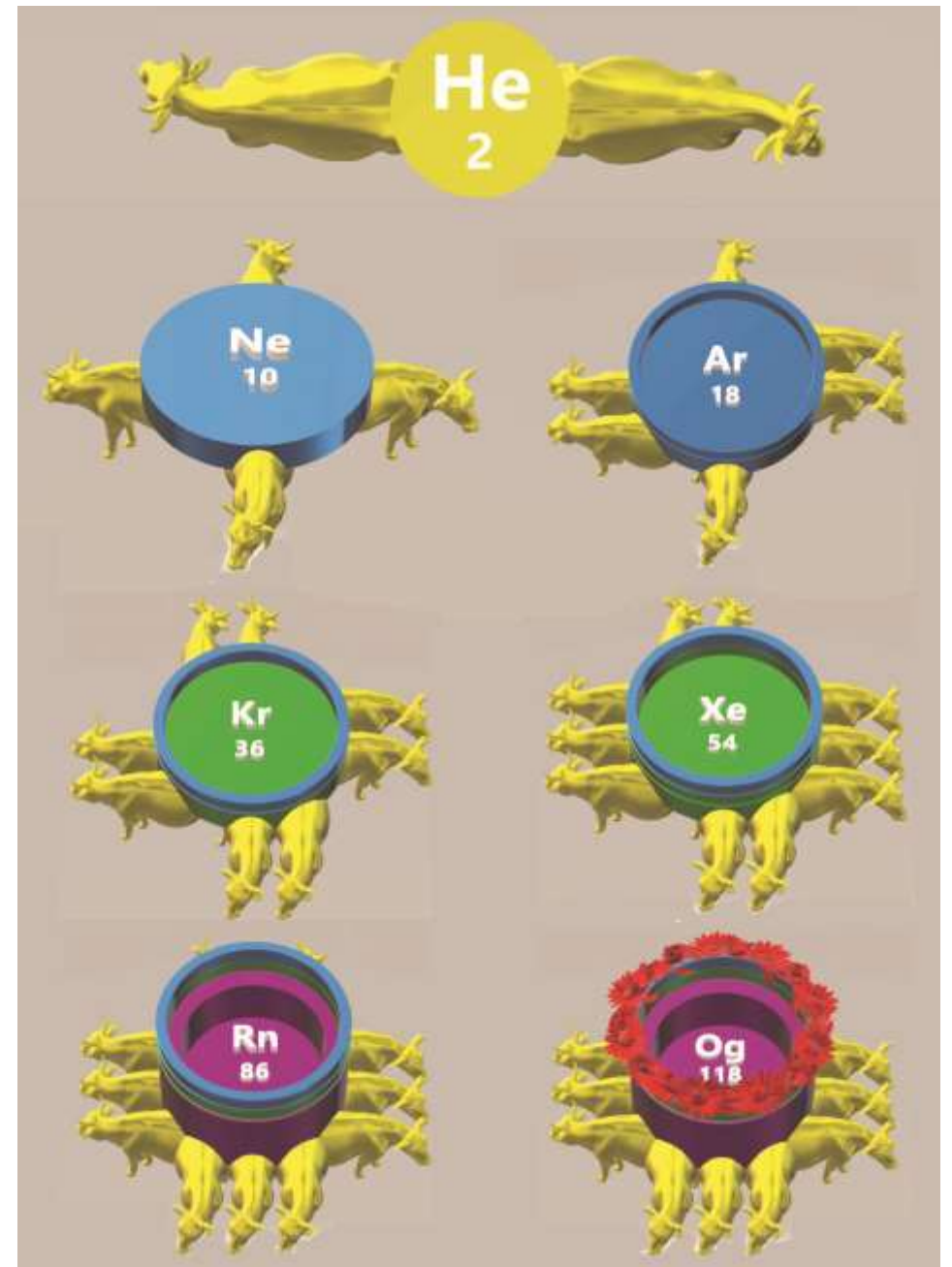
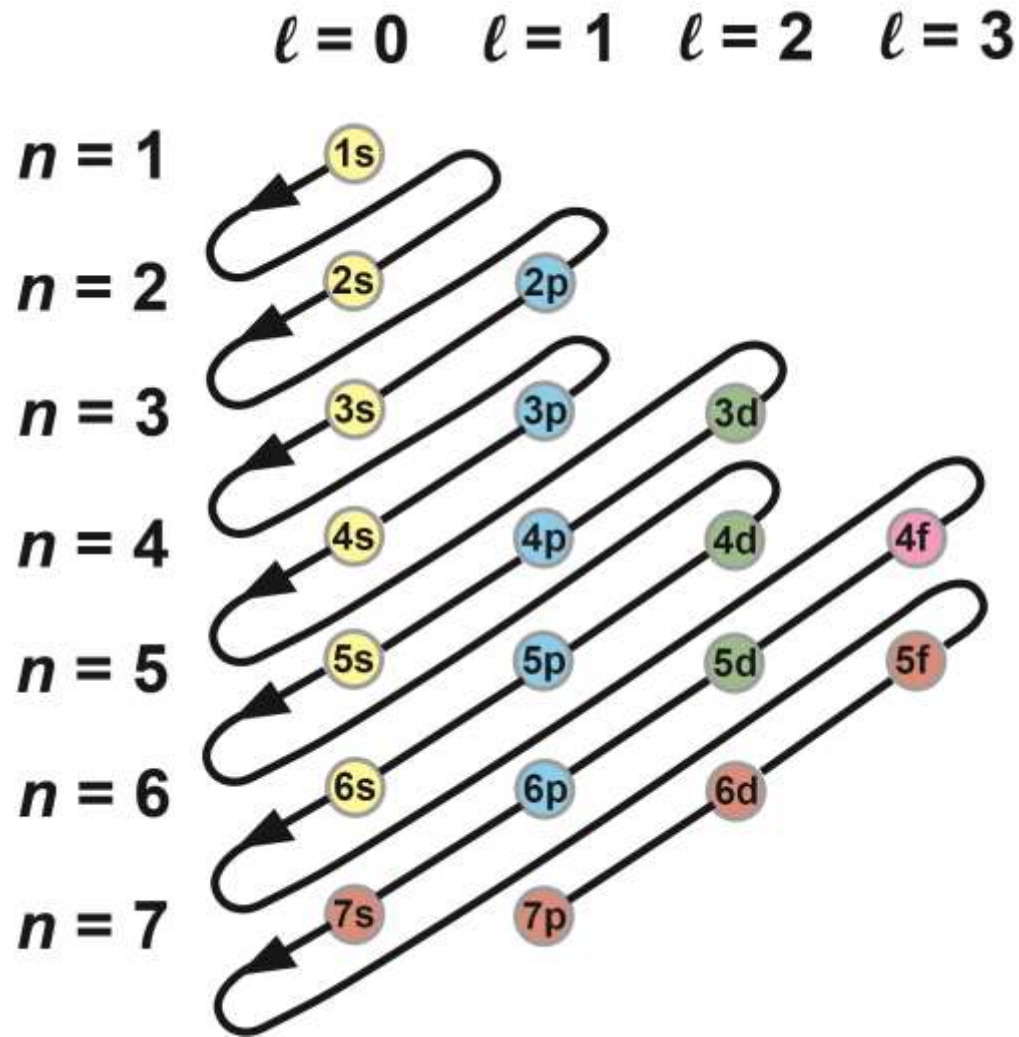
The Aufbau (Build-up) Principle



- Electrons “aufbau” or “build up” orbitals based upon their energy levels.
- Lowest energy filled first.
- Applied to model:
 - 1) Oxen, s-orbital
 - 2) First Ring, p-orbital
 - 3) Second Ring, d-orbital
 - 4) Bowl, f-orbital
 - 5) Lip, 7th Period



The Aufbau (Build-up) Principle



COG Book: The Daniel Image Periodic Table

