ORBITS
WITHIN THE NUCLEUS

BY PAUL VANRADEN

History of Orbits and Atoms

- In ~250 BC, Aristarchus of Samos published that the earth and planets orbit the sun instead of everything else orbiting the earth.
- In 1543, just before he died and 30 years after he drafted his book, Nicolaus Copernicus published that the earth and planets orbit the sun instead of everything else orbiting the earth.
  - By 1600, about 15 astronomers had accepted the theory.
  - In 1633, Galileo Galilei was convicted of heresy for "following the position of Copernicus, which is contrary to the true sense and authority of Holy Scripture“, and was placed under house arrest for the rest of his life.
  - In 1687, Isaac Newton published how gravity can explain the orbits.
- In 1913, Neils Bohr published that electrons circle a nucleus.

The best discussion I found on the internet

- quantum mechanics - Why don't electrons crash into the nuclei they "orbit"? - Physics Stack Exchange
- Final comment on Mar 5, 2014 at 23:31 from user41827:
  - “Let me clarify. What I am saying is that the answer will not be found by examining the quantum physics of the electrons. It is not the electrons that regulate this process. It is the quantum physics of the nucleus, which has been very much ignored in these previous answers”.
- Physics of the nucleus can now be explained 113 years after Neils Bohr explained that electrons orbit a nucleus. The slides that follow are Paul VanRaden’s reply to user41827, who deserves some credit for my ideas presented here.

MOTIVATION

The Helium nucleus must have a hollow space in its center for that 2nd orbit

Helium is the most stable atom: it does not react with itself or other elements

Helium’s nucleus has weight of 4, explained by 4 bodies of equal mass

Stable nuclear orbits for helium and the other elements are easy to compute

STABLE ORBITS IN HELIUM'S NUCLEUS

Helium's nucleus may have a stable orbit with:

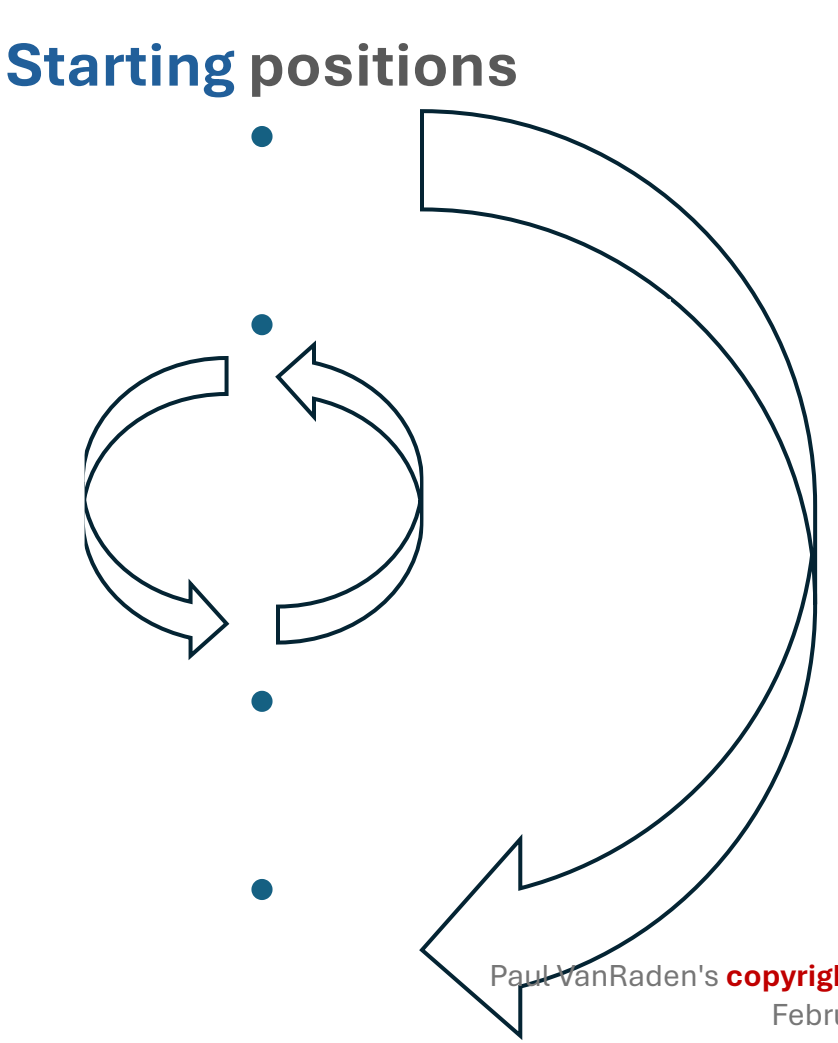
- 2 bodies in a clockwise inner orbit
- 2 bodies in a counterclockwise outer orbit of twice the time length

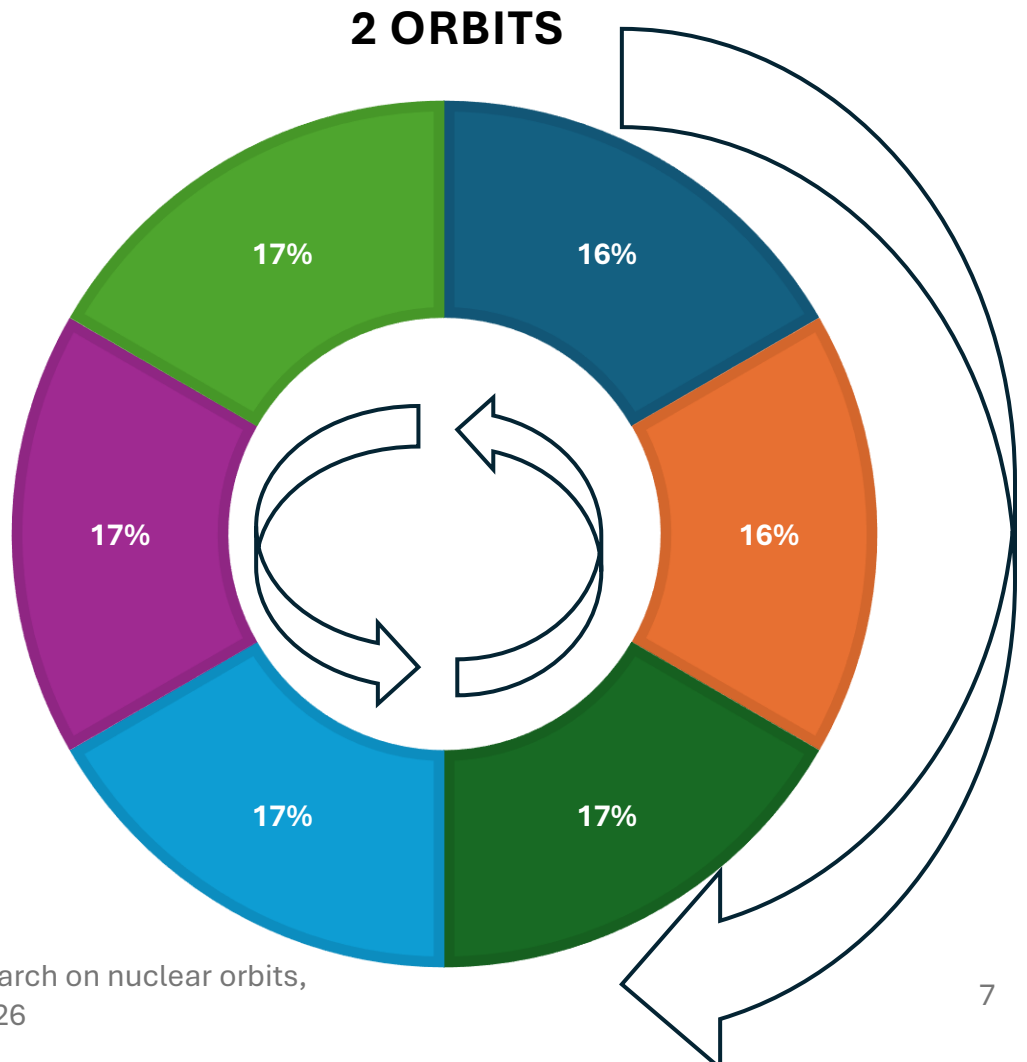
Bodies in the inner and outer orbits approach and pass each other at 6 equidistant points in the orbits, like a hexagon

They slightly accelerate and then decelerate each time they pass

Harmonic orbits are more stable than discordant orbits

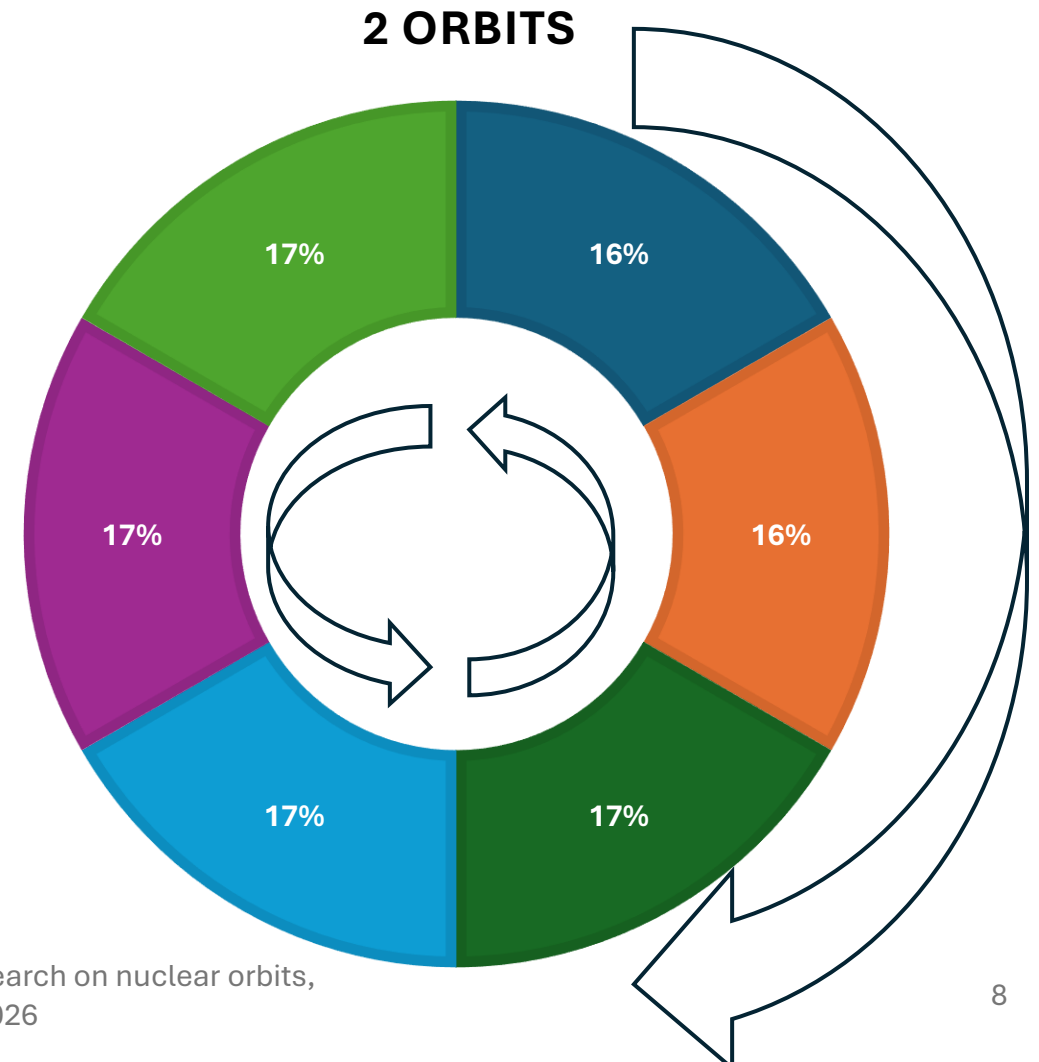
Helium 4 orbit: starting positions of 4 bodies





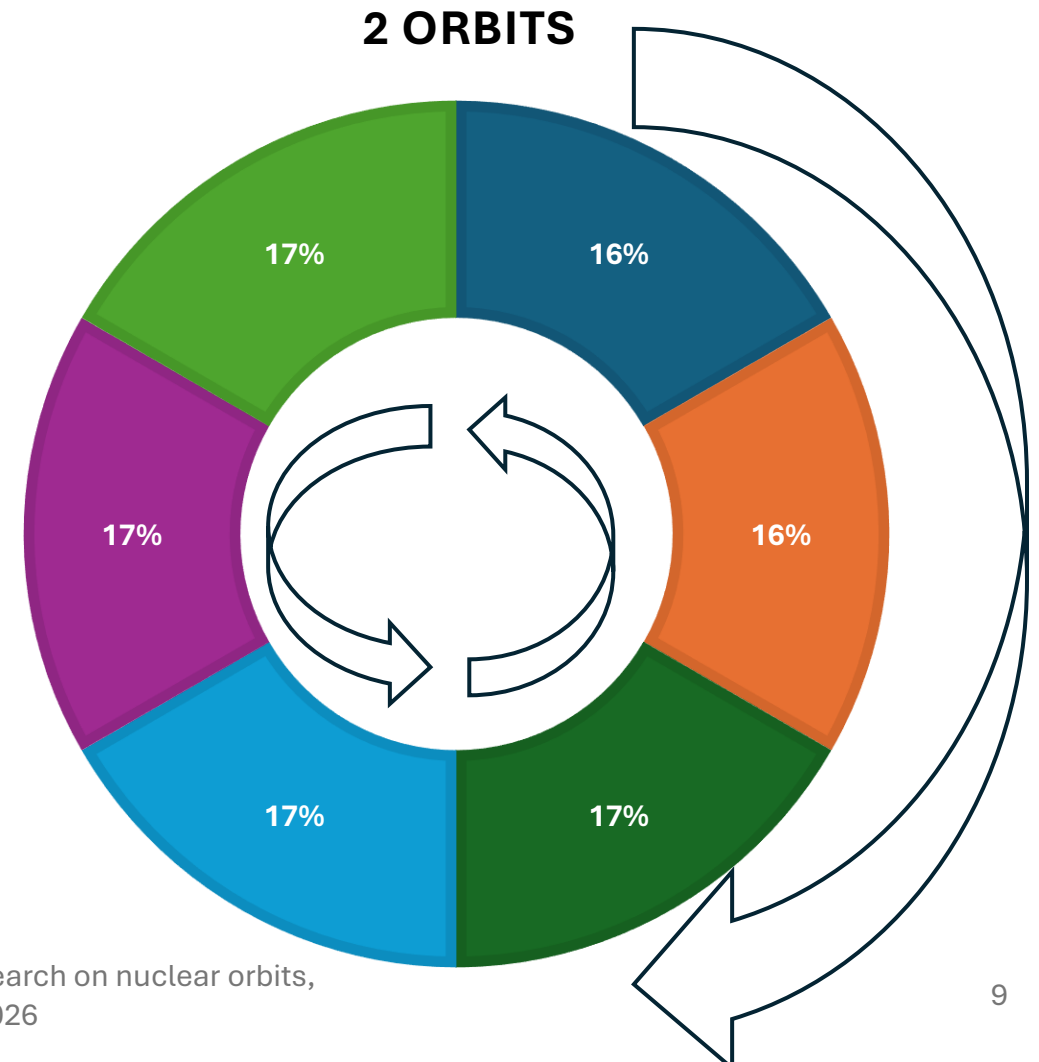
Next position where all 4 bodies line up

1st meeting position



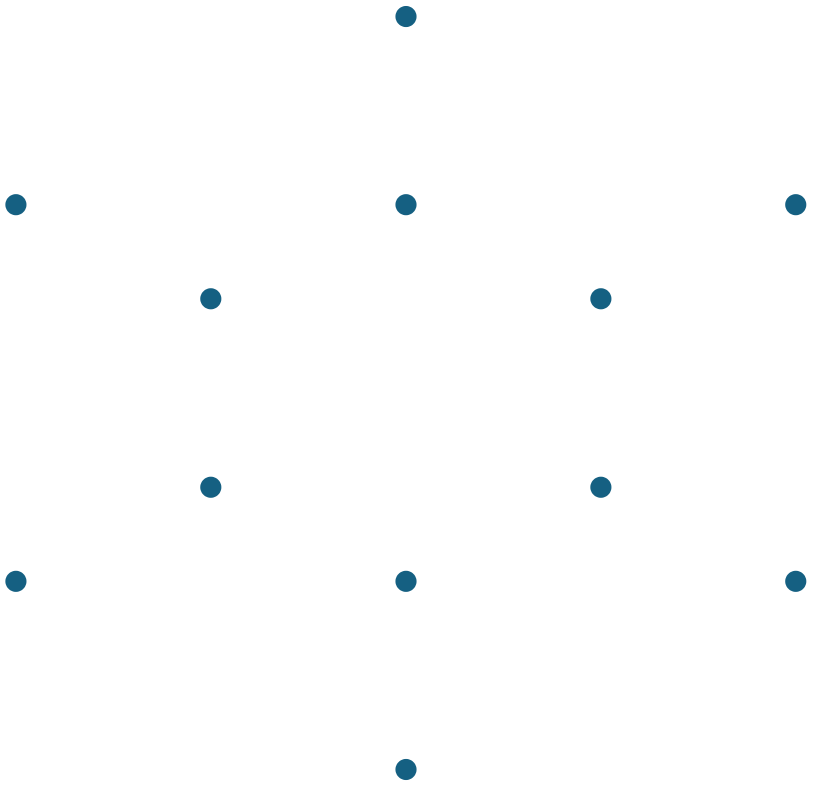
Next position where all 4 bodies line up

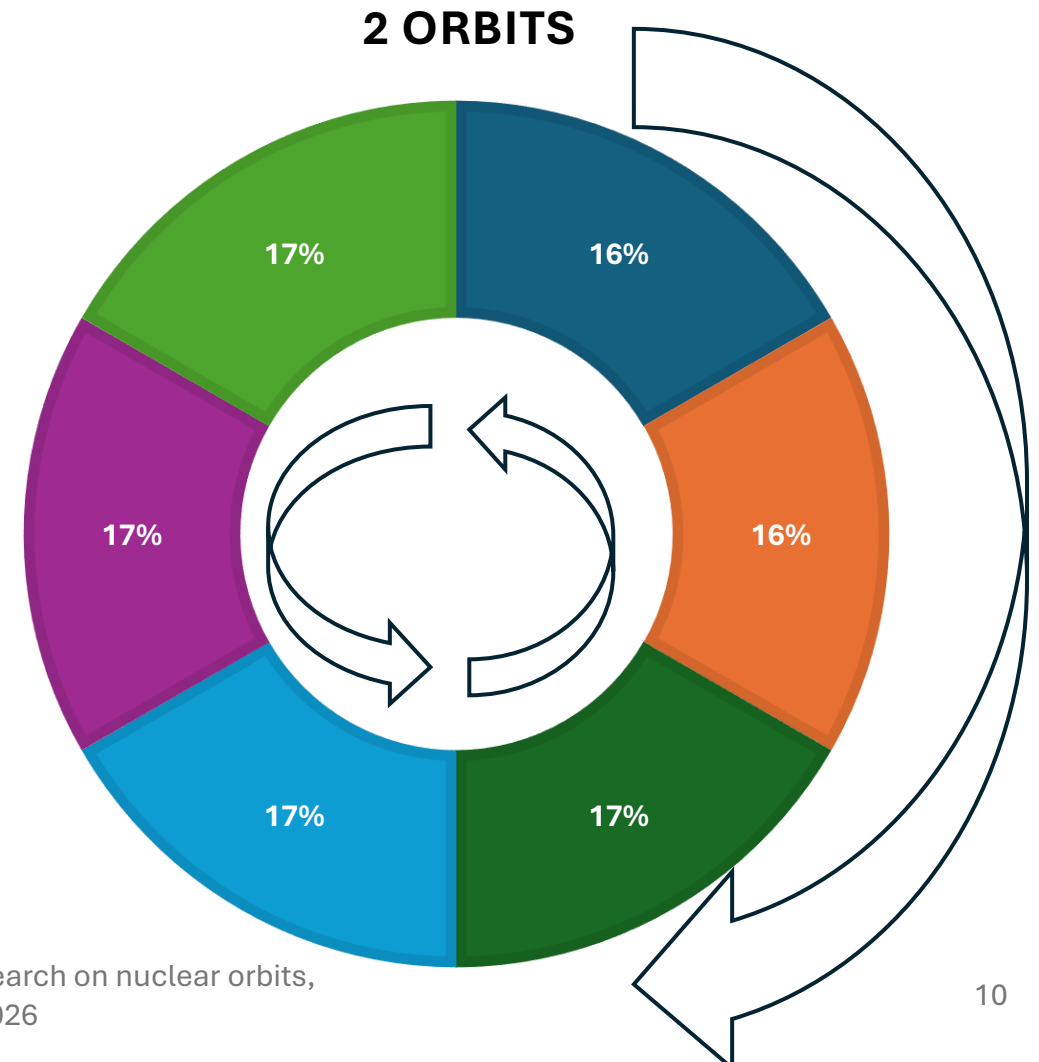
2nd meeting position



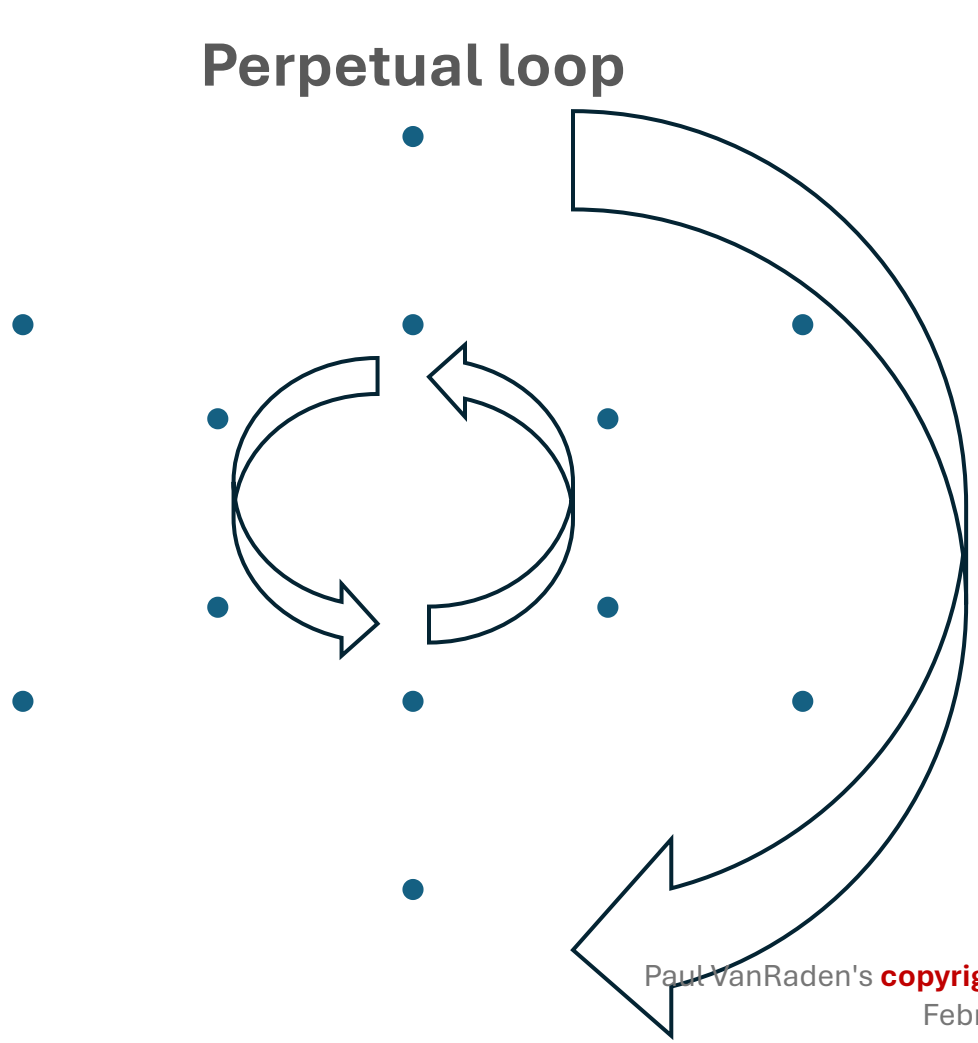
Meeting positions: All 4 bodies lined up

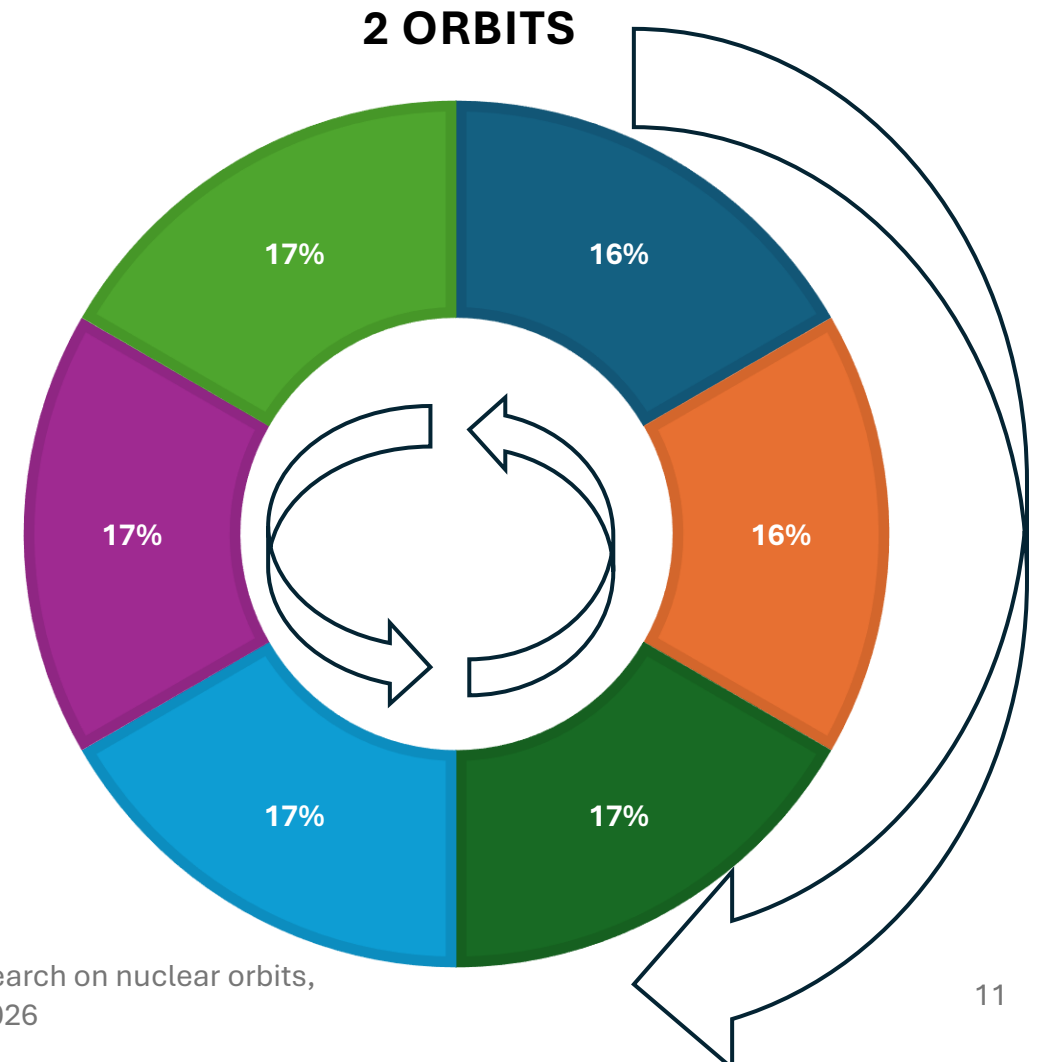
All meeting positions





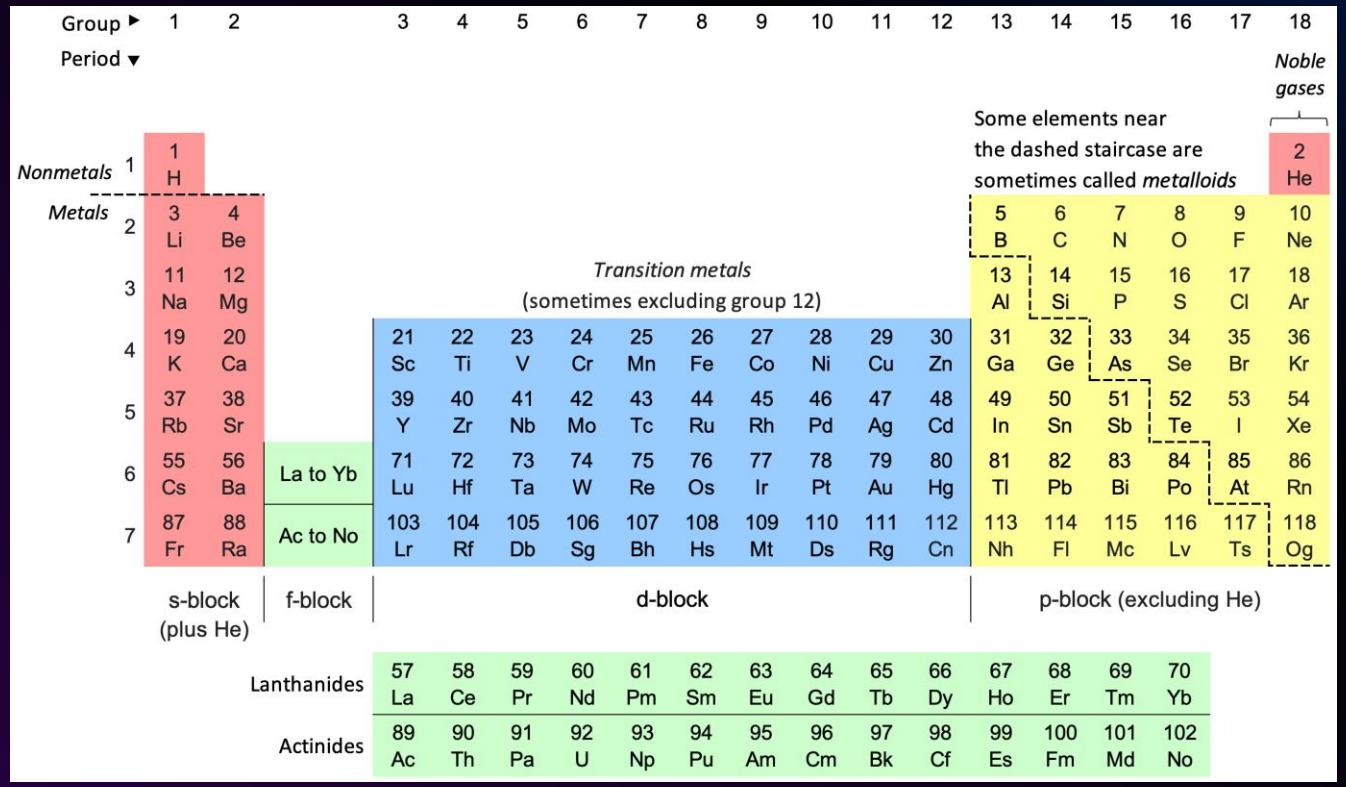
Helium orbits continue for millions of years





PERIODIC TABLE OF ELEMENTS

1. H2 and He have weights 2, 4
2. Ne has weight 20 after the nucleus adds 8 more pairs
3. Ar has weight 40 after the nucleus adds 8 more pairs
4. Bonds for elements C, N, and O often form hexagon patterns
5. Paired nuclear orbits can explain these patterns



WHICH THEORY IS CORRECT?
PAIRED HARMONIC OPPOSITE ORBITS, YES!
QUANTUM MECHANICS, NO!

Quantum mechanics theory offers no physical explanation of motion

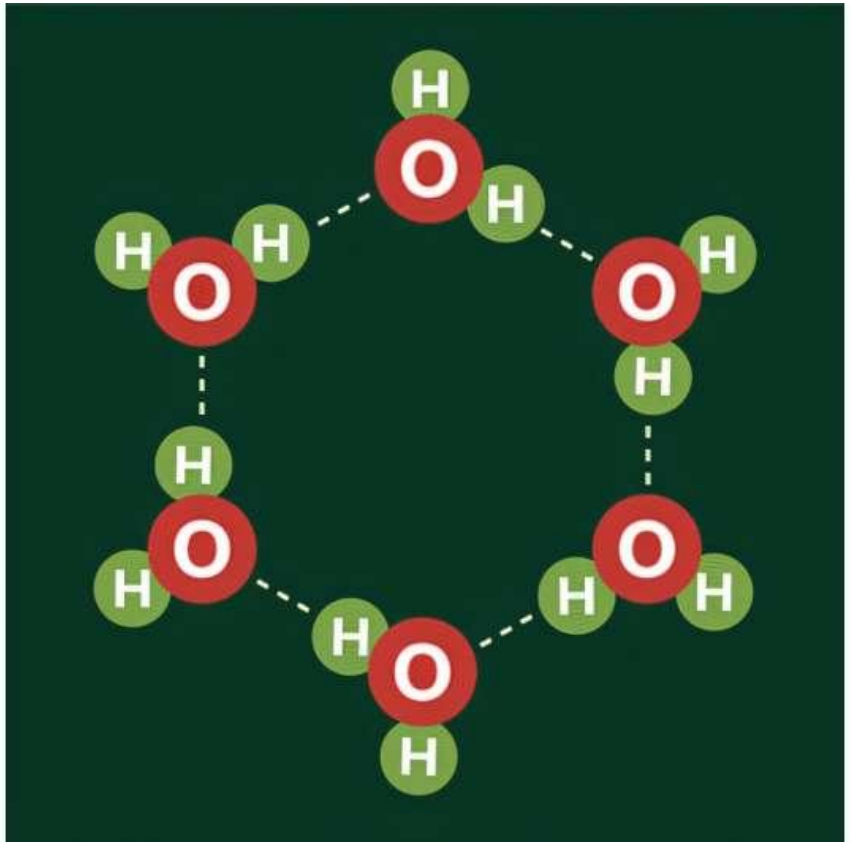
Paired, harmonic, opposite-spin orbits seem much more sensible

Their nuclear orbits are shaped like the hexagons common in chemical bonds among carbon, nitrogen, oxygen, and DNA

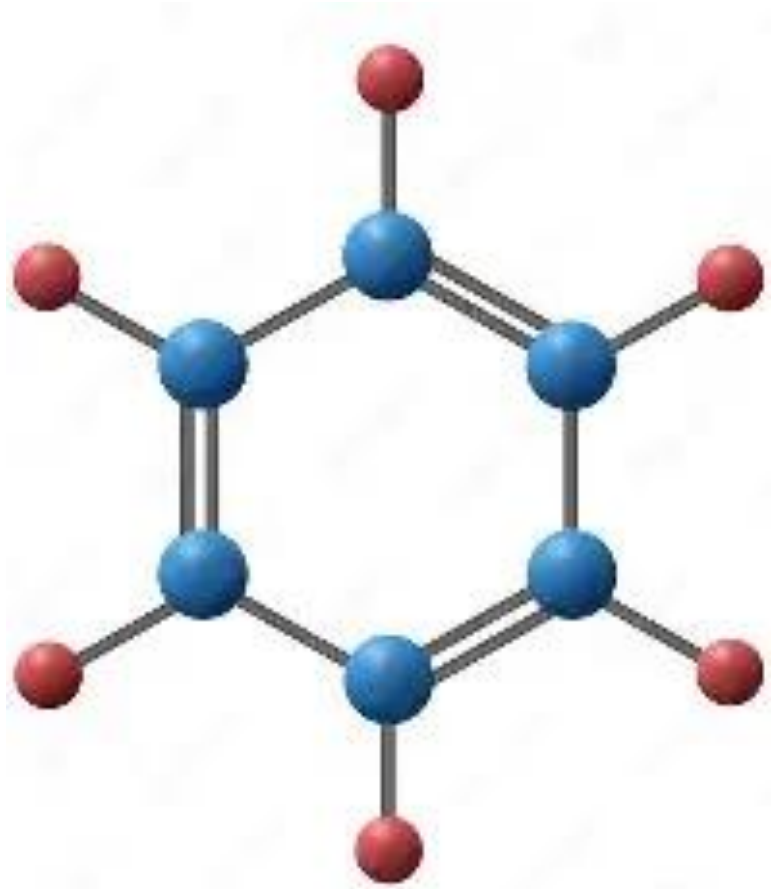
Even snowflakes are 6-sided hexagons

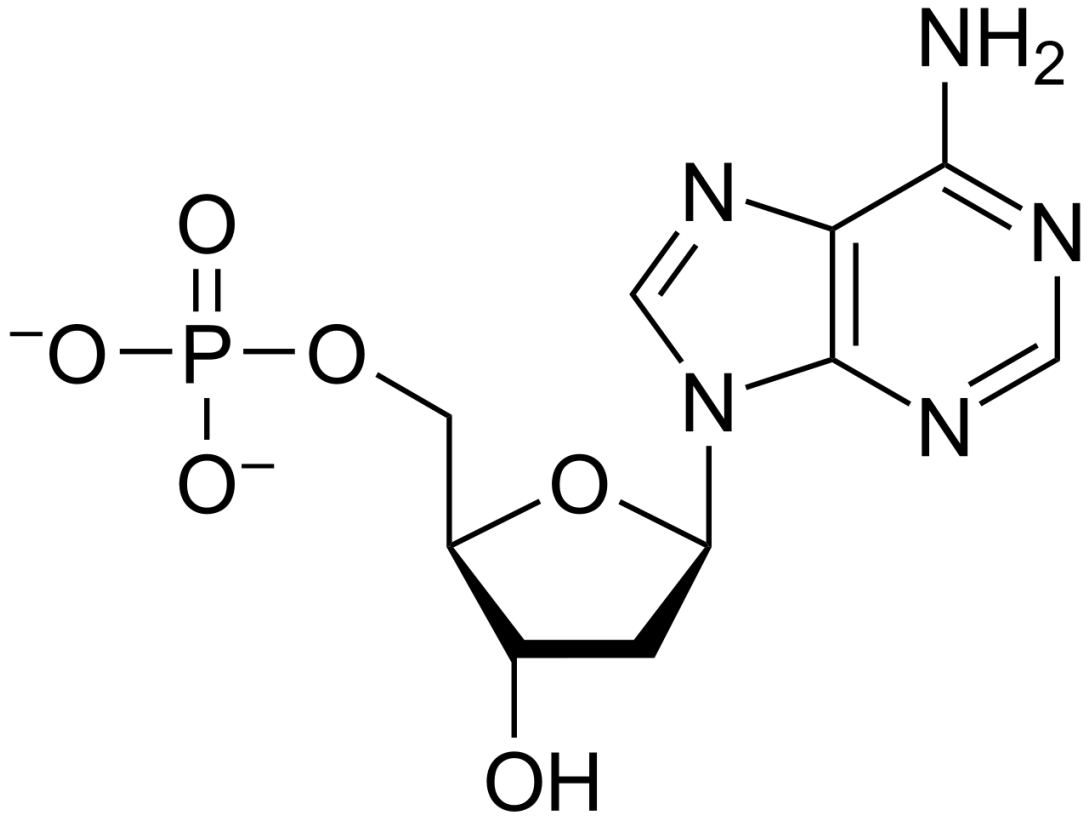
6 water molecules at center of snowflake

- Water is liquid H_2O but can freeze as its motion slows
- The H_2O molecule can form a 3rd 120-degree angle bond with another H from a nearby H_2O and that bond will stick.
- When 6 molecules by chance form a hexagon ring, all nearby H_2O can quickly join that 1st ring and make a snowflake



Other 6-sided molecules: Benzene (C_6H_6) and DNA nucleotides





Carbon nucleus starting points

Carbon 12

Orbits 1 and 2 same as Helium

Orbit 3 has 4 bodies instead of 2

Opposite spin of orbit 2

Orbit 4 also has 4 bodies

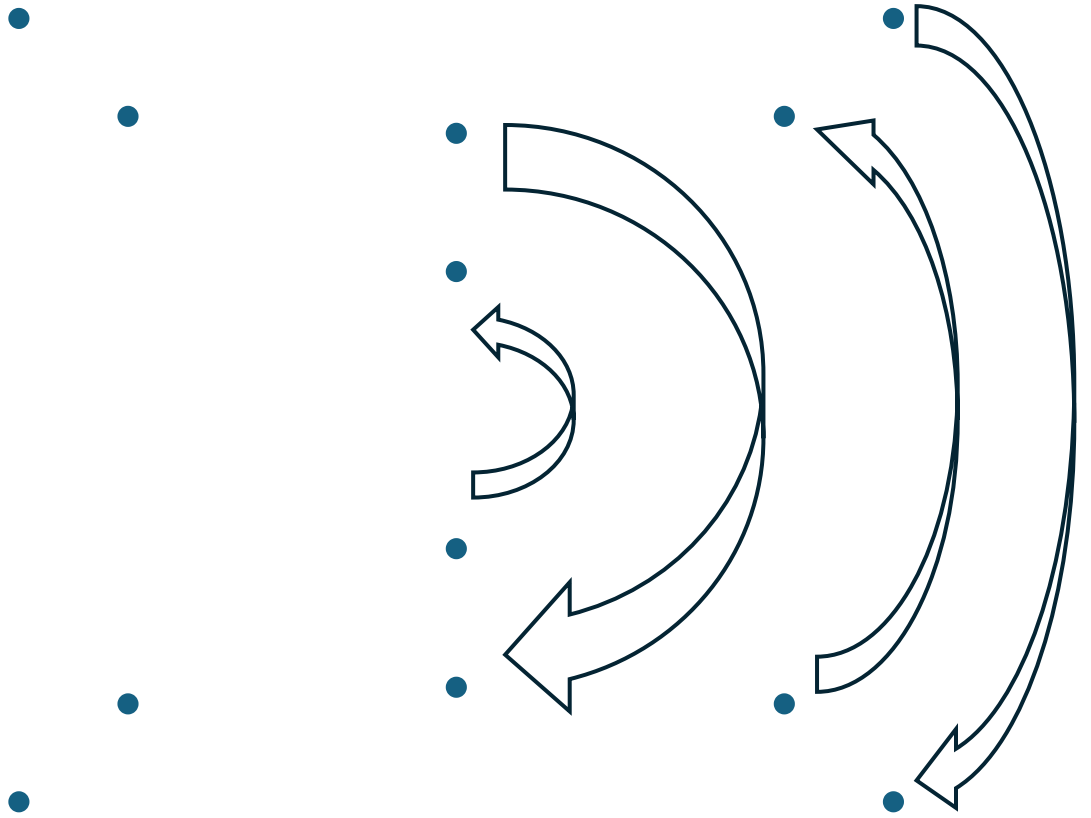
Opposite spin of orbit 3

Total bodies = 12

Carbon 12 has weight of 12

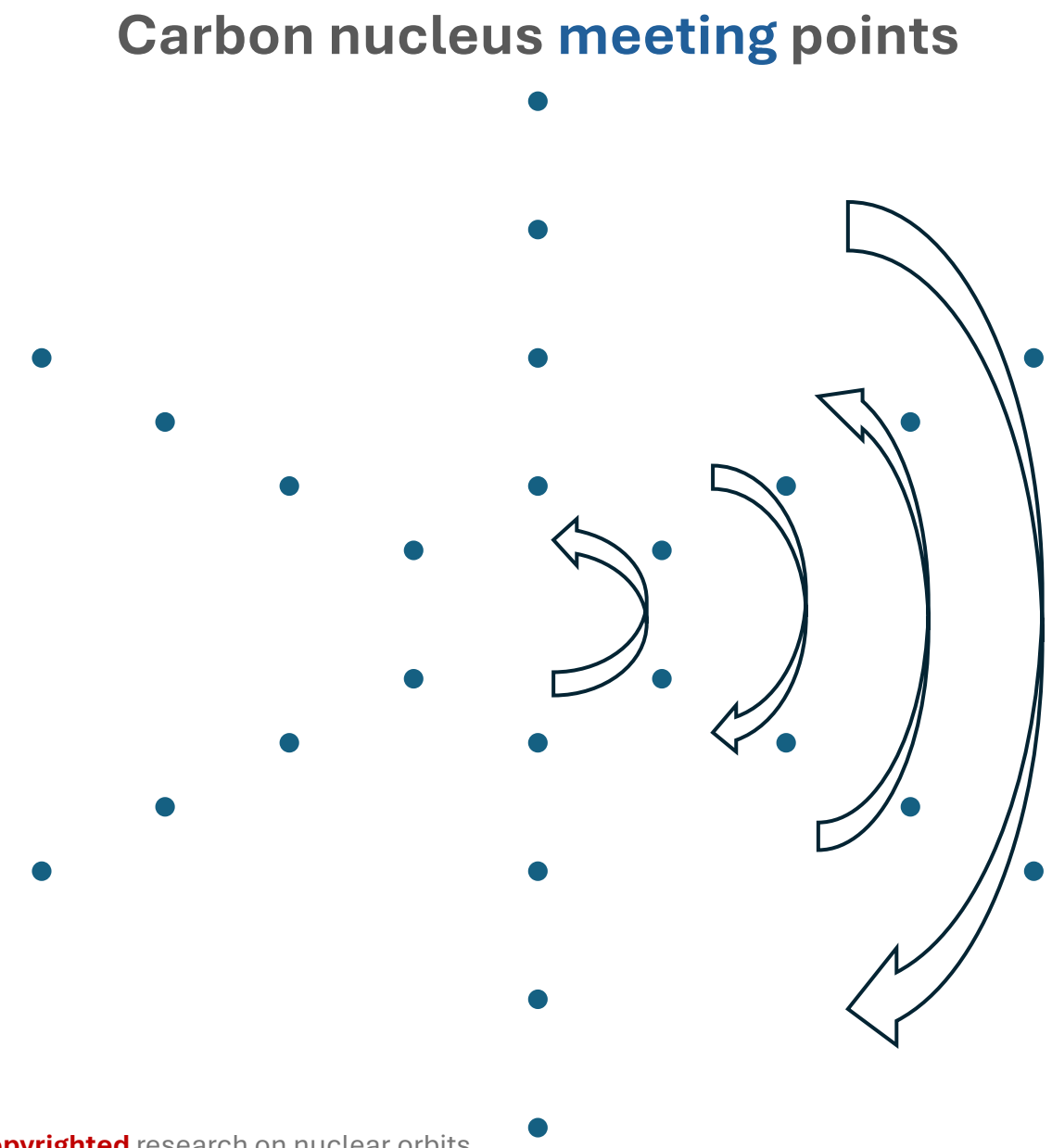
Neon has 4 bodies in each of 2 more orbits with opposite spins

Neon has 20 bodies and weight 20

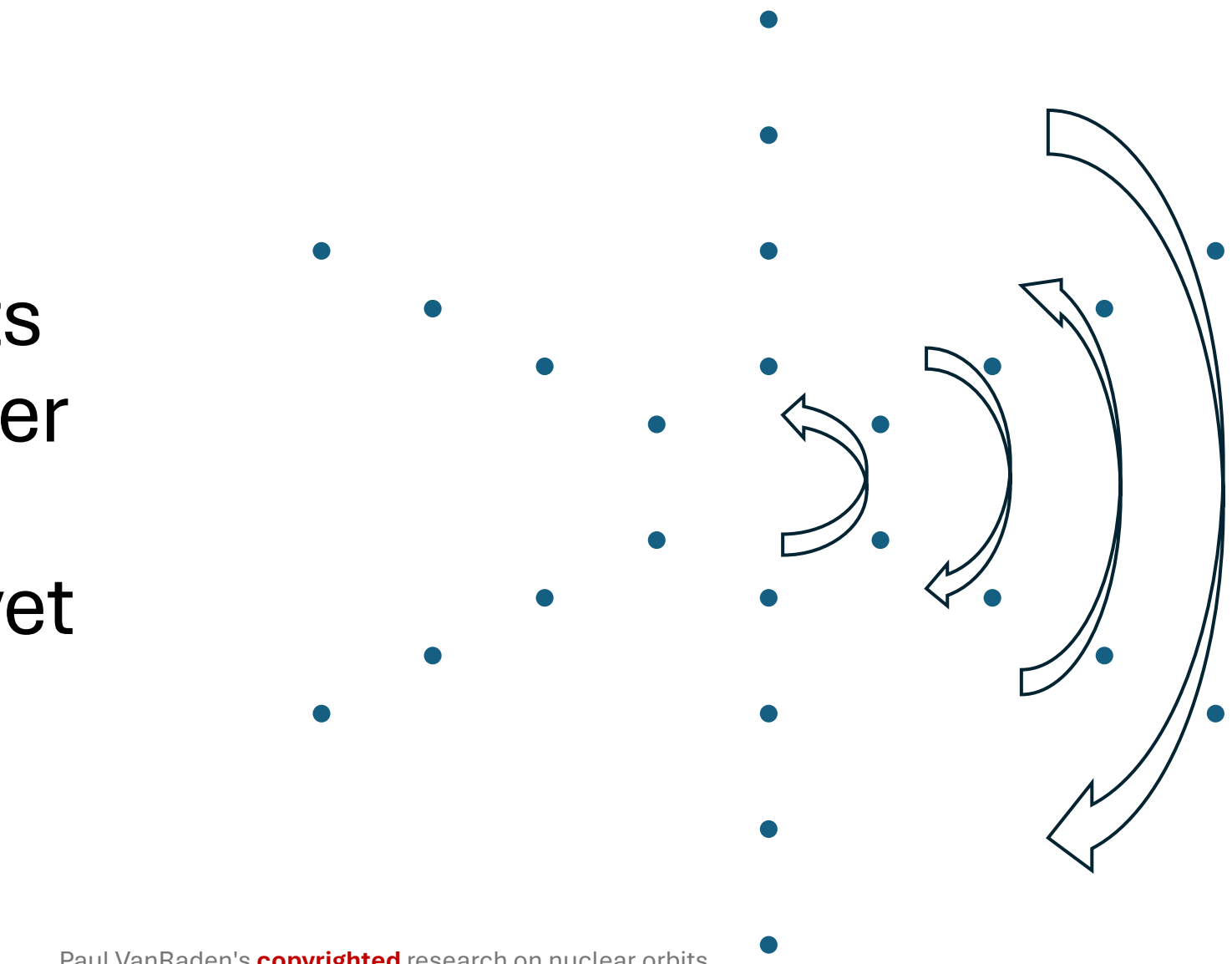


Carbon

The outer orbits meet the inner orbits at these points but not together. The outer orbits meet each other at more points shown next



Carbon nucleus meeting points



Carbon

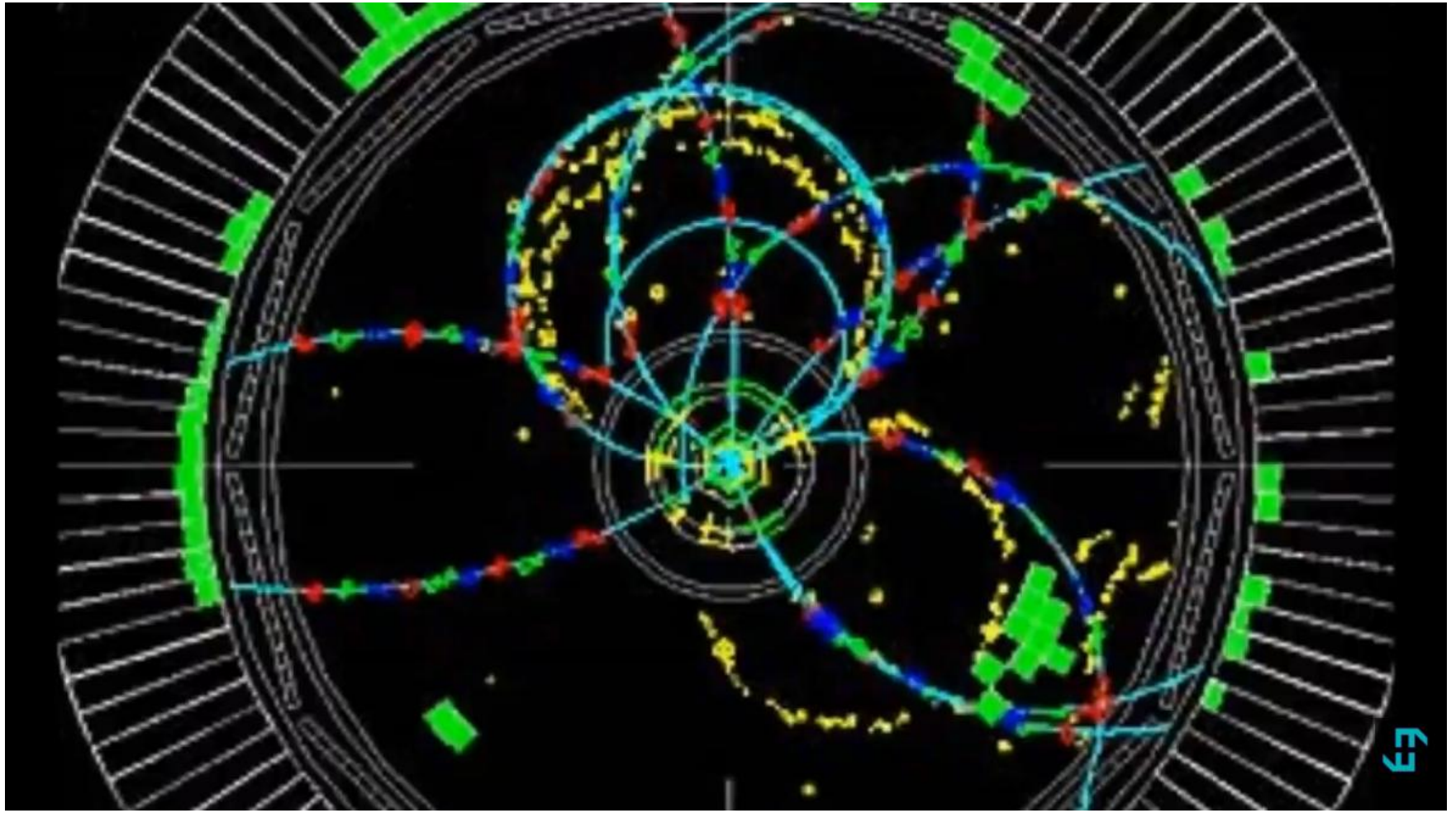
The outer orbits meet each other at additional locations not yet shown here, **sorry**!

Table of meeting points in degrees for each body

1	2	3	4	5	6	7	8	9	10	11	12	Bodies
Orbit 1		Orbit 2			Orbit 3				Orbit 4			Orbits
+	+	-	-	+	+	+	+	-	-	-	-	Spins
360	360	180	180	120	120	120	120	120	120	120	120	Speed
0	**180**	**0**	**180**	**45**	**135**	**225**	**315**	**45**	**135**	**225**	**315**	**Start**
0	180	0	180	60	180	240	0	0	120	180	300	Meet
120	300	300	120	120	240	300	60	300	60	120	240	
240	60	240	60	180	300	0	120	240	0	60	180	
0	180	180	0	240	0	60	180	180	300	0	120	
120	300	120	300	300	60	120	240	120	240	300	60	
240	60	60	240	0	120	180	300	60	180	240	0	
0	180	0	180	60	180	240	0	0	120	180	300	

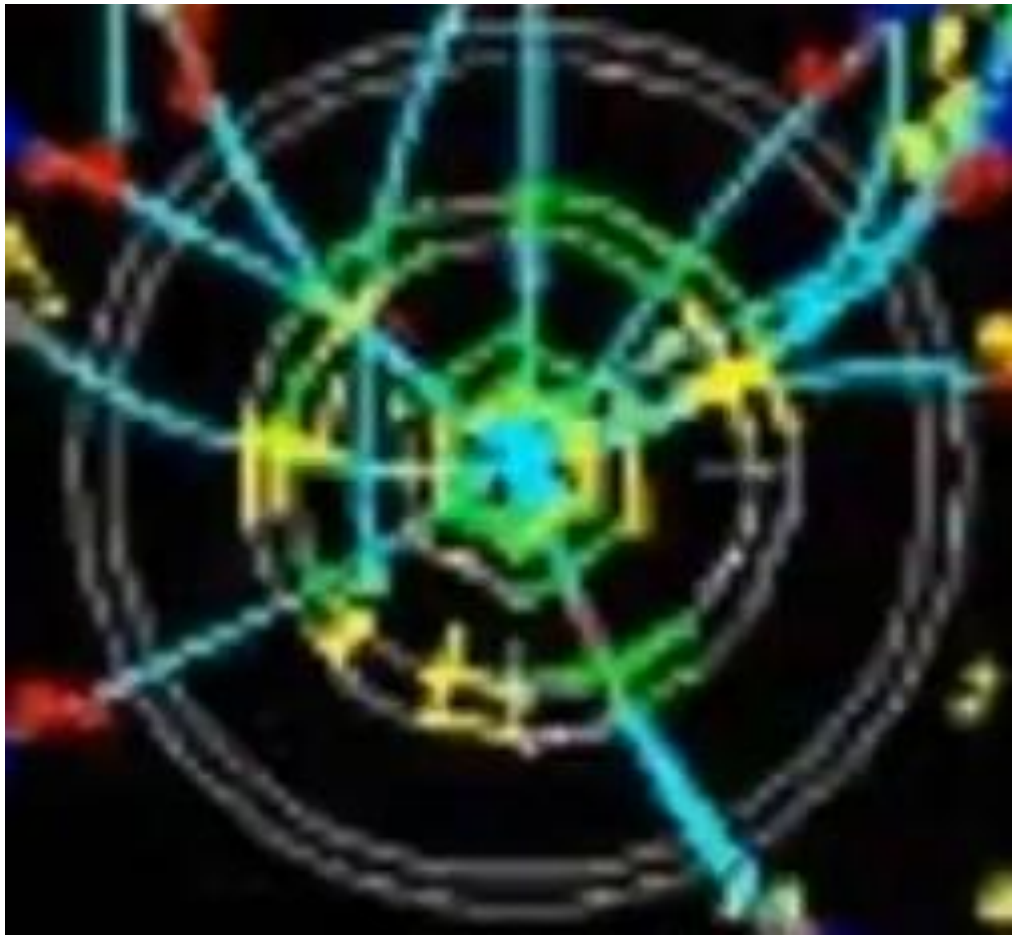
1973 lecture by Richard Feynman:

Story of Particle Physics, *at minute 7:17 below*



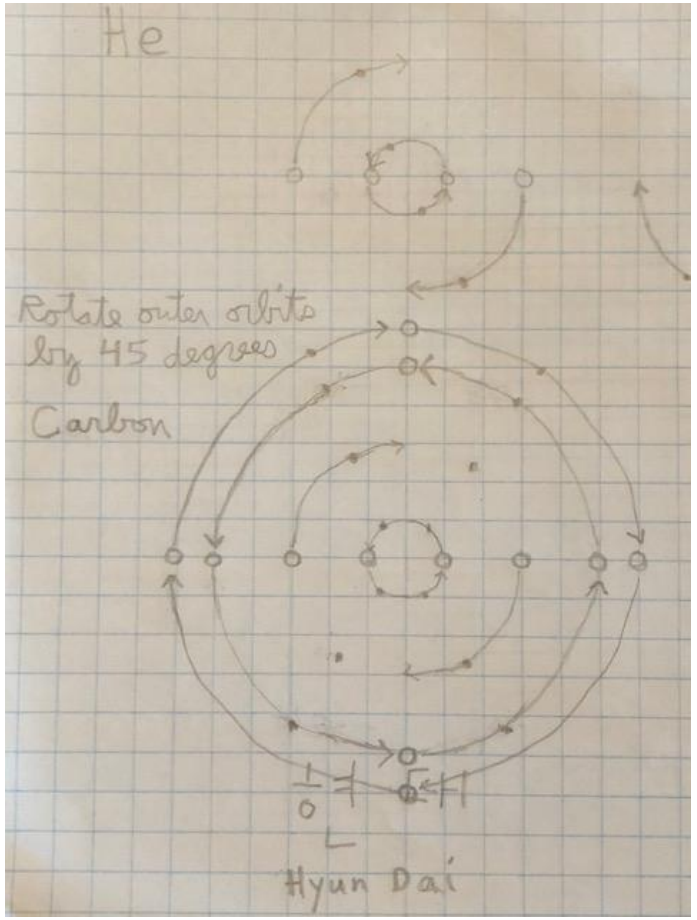
Closeup of Feynman's picture from 1973

- The 2 central hexagon-shaped rings are the pair of 2-body orbits in helium's nucleus
- The 2 middle rings are the next pair of 4-body orbits in carbon's nucleus
- The 2 outer rings are the next pair of 4-body orbits in neon's nucleus
- Just like I had already graphed by hand using math days before seeing this picture!



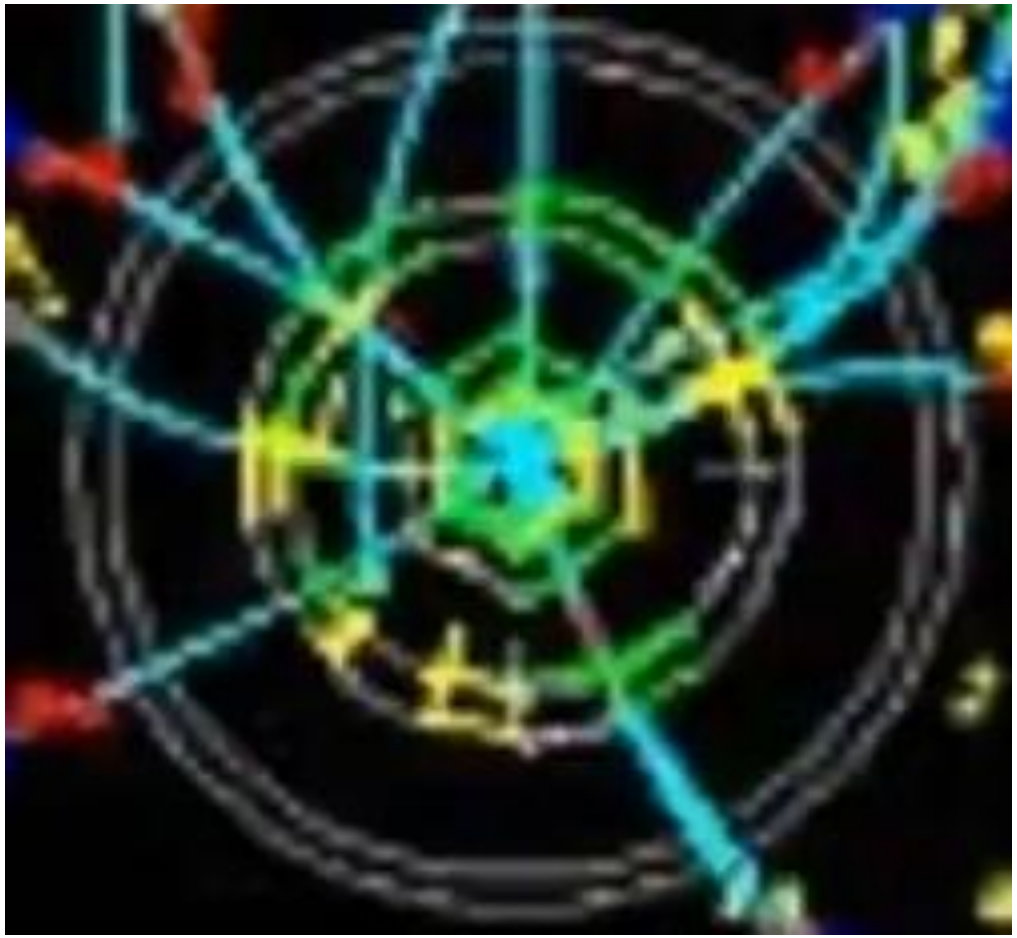
My prior hand drawings for helium and carbon

- Helium showing the 1st set of meeting points
- Carbon showing the 2 extra rings of 4 extra masses and their meeting points
- I needed to rotate those orbits 45 degrees to get best timing
- We were debating how to say Hyundai and I had used Korean letters to explain that (sorry)

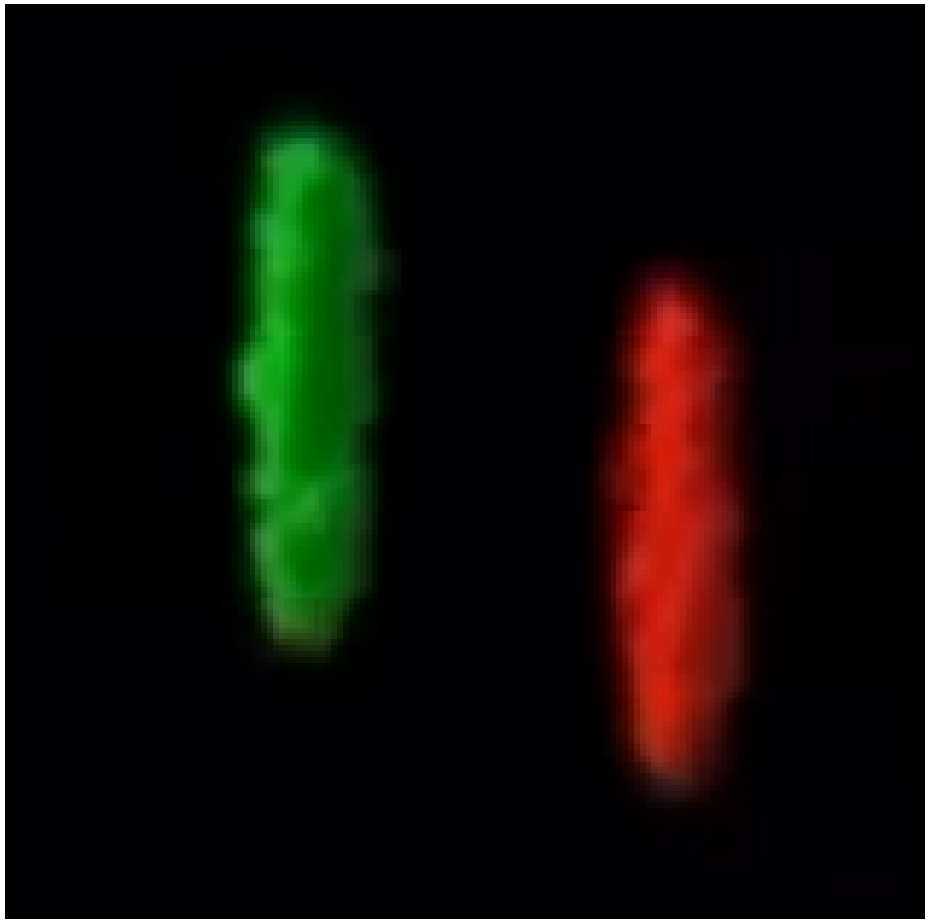


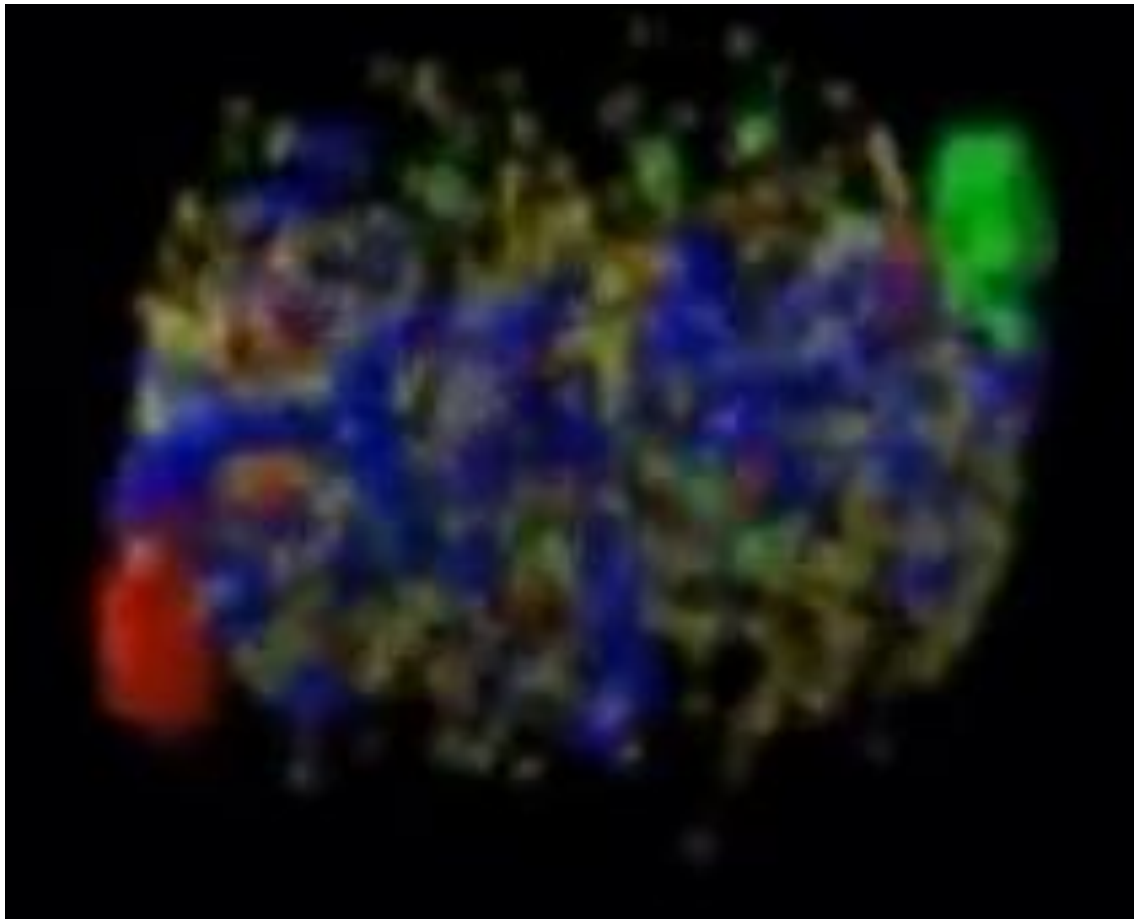
Bigger than carbon nucleus, could be neon

- Last week I was only 90% sure that paired harmonic orbits of opposite spin correctly explain the nucleus.
- After seeing this 1973 photo of the nucleus, I am now 99.99% sure.
- It looks like a neon atom because its 5^{th} and 6^{th} rings seem full but is a little too blurry to be sure.
- I still have no clue why scientists in particle physics never bothered to derive the simple orbits that match this pretty picture from a lecture by the 1965 Nobel prize winner.



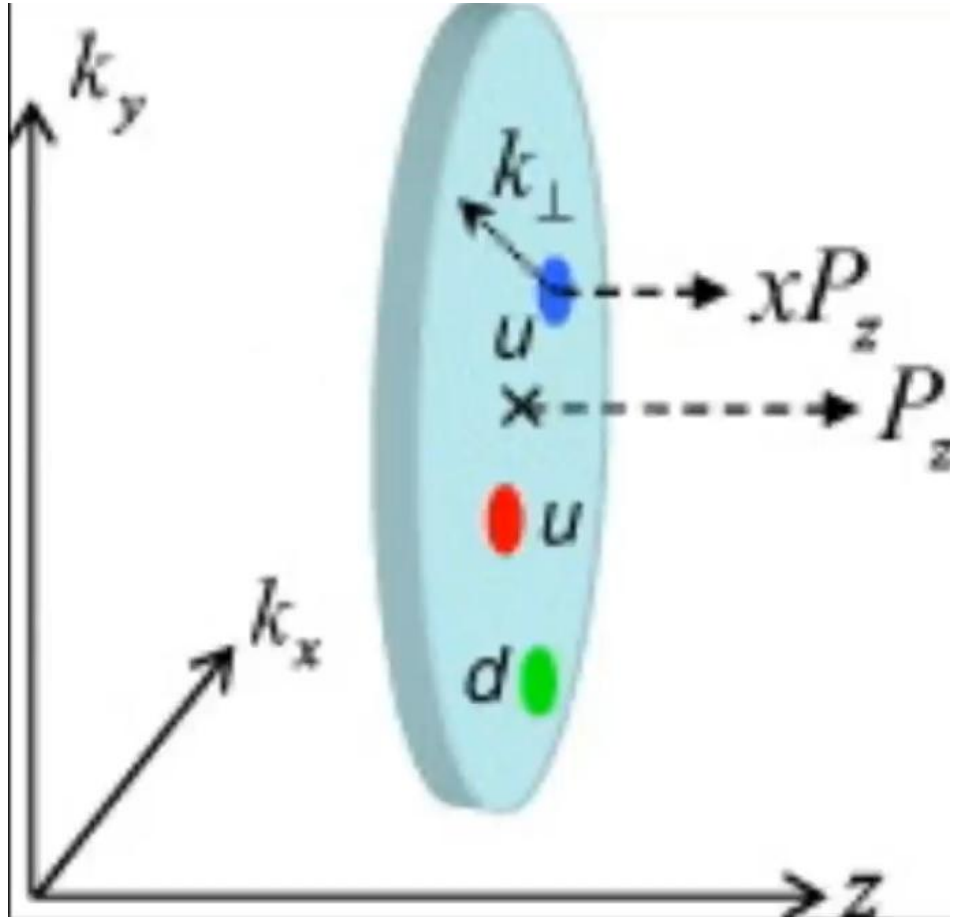
Feynman's particle collision video *from minute 11:33* shows 2 flat nucleuses with evenly spread protons





Another diagram from Feynman showing a flat nucleus *at minute 25:27 and minute 30:00*

- Strong and weak nuclear forces in past theory assumed protons were in the center
- But they are not in the center, they orbit an empty center
- I am testing the orbital math applying only 1 common force to the nucleus and electrons
- It may be just gravity



Protons, neutrons, or new name?

- Protons are hydrogen nucleus **with** an electron circling
  - They have a wavelength
- Neutrons are hydrogen nucleus **without** the electron circling
  - They have **no** wavelength.
- An analogy is Earth with a moon circling vs. Mars with no moon
  - Earth is like a proton
  - Mars is like a neutron
- Exact masses of protons, neutrons, and electrons may vary
- Average mass of helium exactly 4 times hydrogen because the sun constantly converts 4 hydrogen atoms into 1 helium atom

Particle selection vs. natural selection

- Helium has a complex orbit that happens very rarely by chance
  - Deuterium, tritium, and less stable orbits do not last long
  - But helium orbits can cycle for billions of years if left undisturbed
- Long DNA strands are complex and happen rarely by chance
  - Most living things die quickly compared to helium atoms
  - But DNA can make fresh copies of itself with some slight differences
  - Plants and animals can evolve for billions of years if left undisturbed
- The effects of gravity sort atoms and molecules by their masses
  - Metals in the core, Si on the shore, H_2O in the sea, N_2 above me
- DNA replication sorts life by species

MOLECULAR BONDING

Electrons can be in circular x-y orbits around the nucleus (like planets around the sun) or in a perpendicular, linear z orbit up and down thru the empty center (donut hole)

Helium has 1 of each electron orbit

Elements share their electrons of either type when bonding into molecules

Electron orbits

- For best stability, the electrons in x-y orbits may be in harmony with the nuclear orbits
- Electrons in the linear z orbit also could be in harmony with the nucleus but that may be less likely
- As distant atoms get closer, their electrons are attracted to not only their own nucleus but also the nearby atom
- The x-y orbits shift to ovals or ellipses
- The z orbit also gets longer in the direction of any other atom above or below.

Orbits of the 2 electrons in Helium

- Helium's nucleus must look like a donut
- Its 1st electron orbits around the nucleus (donut)
- Its 2nd electron goes up and down (thru the donut hole)
- Planes of the nucleus and 1st electron orbit may be tipped at an angle, or conversely the 2nd orbit tipped vs the 1st

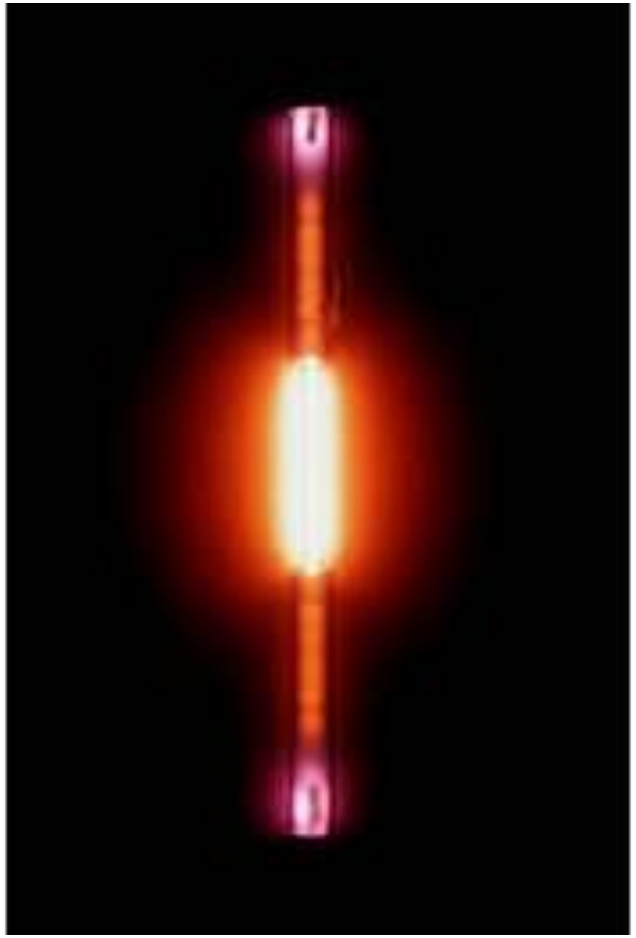
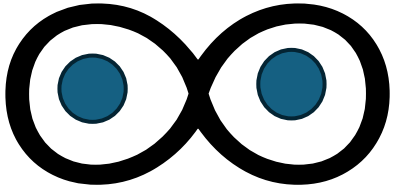


Figure 8 orbit of

- When atoms get close, their outer electrons can switch to a shared figure 8 x-y orbit
- The left nucleus no longer needs to pull electrons back to the left, the right one does that
- The electrons mostly pull each nucleus toward their outer side, keeping the left and right atoms apart

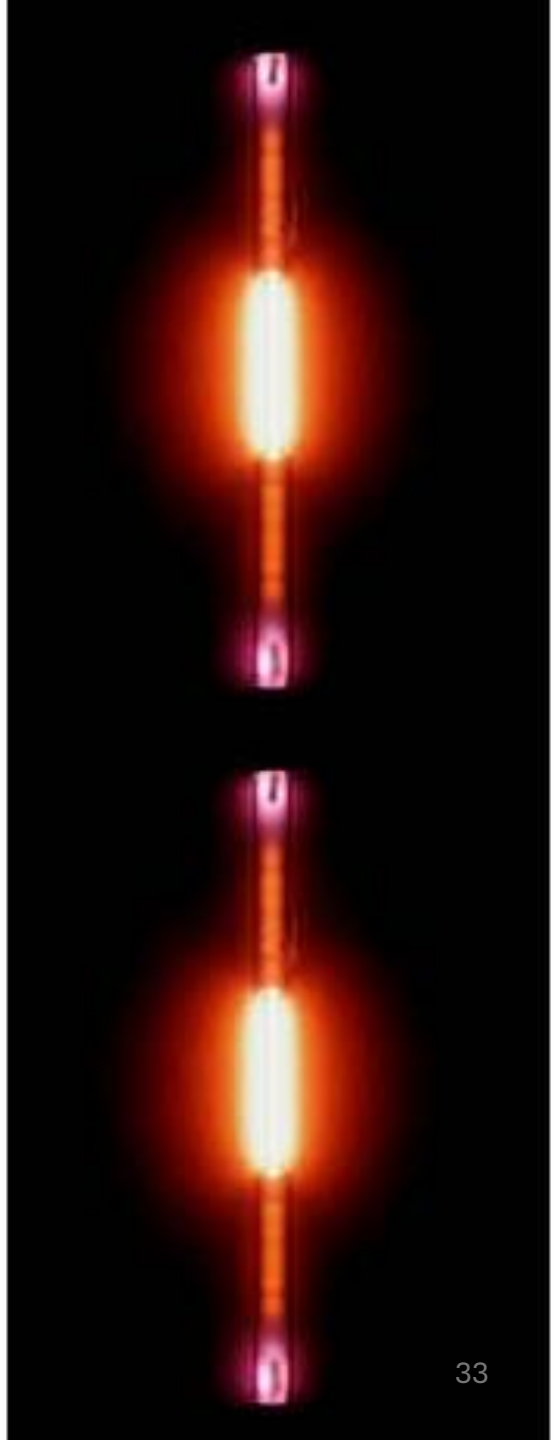


Molecular bonds

- Hydrogen atoms have 1 electron in an x-y circle and no linear z orbit to protect them, so they react with atoms above and below
- However, frozen hydrogen molecules (H_2) form hexagon shapes, but that also happens for round balls when packed together
- Hydrogen molecule H_2 may have a figure 8 orbit whereas the H isotope Deuterium might have both x-y and z orbits, or vice versa
- In larger elements, extra outer rings pull the inner rings outward, enlarging the donut hole.
- Helium, neon, argon, and krypton are the most perfectly balanced due to their full outer orbits.

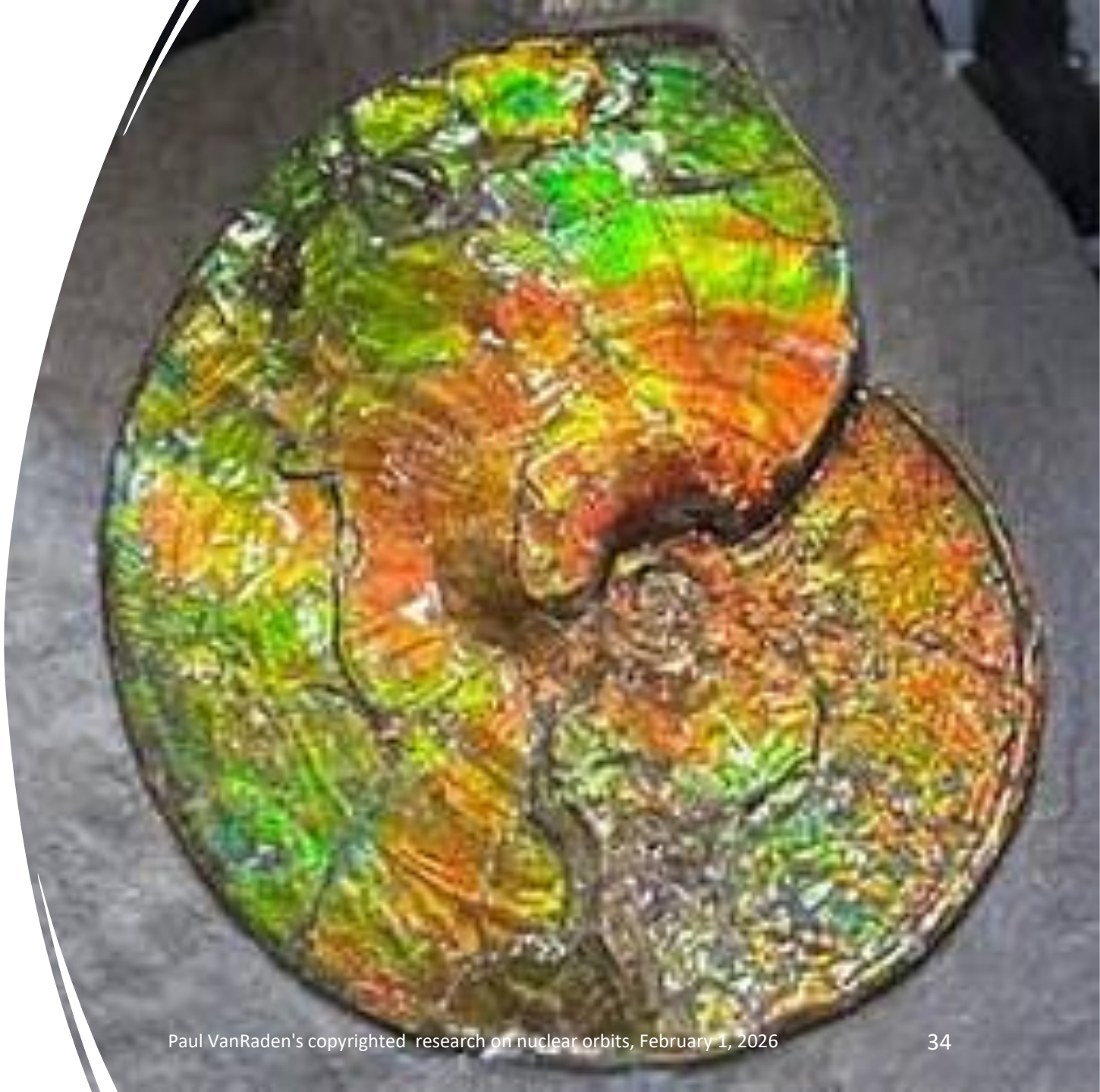
Shared perpendicular orbits

- The perpendicular orbits can be shared by 1 upper and 1 lower atom
- Holes in the nucleus must be aligned well (like a donut hovering above another donut)
- The upper atom pulls the electron back down, and the lower atom pulls it back up, keeping their nucleuses apart



Helium

- Helium ice is flexible
- “In supersolid helium, the particles forming the Bose-Einstein condensate are probably not the helium atoms but the lattice vacancies, he says.” MosesChan, Penn State
- Maybe not, if Helium’s nucleus is a flat hexagon, like a 6-sided wheel.



CONCLUSIONS

- Nuclear orbits have the same patterns shown in the atomic table of elements
- Clockwise inner and counterclockwise outer orbit pairs generate stable, hexagon shaped paths of nuclear travel
- Helium’s nucleus has 2 protons in each of 2 orbits
- Larger elements fill additional pairs of orbits that each contain 4 protons until Argon, then 8 protons per orbit after that

Next steps

- Protons and neutrons do not differ (neutron is a hydrogen ion)
- They are like the 2 halves of a double star solar system
- Use a new term or keep using just the term proton, or just neutron?
- Atomic bonds can now be simulated directly
  - Computer programs from astronomy should work just fine
  - I am writing my own Fortran code to verify that the orbits work as shown, based on SAS code I wrote to compute graph the moon's wobbly path around the sun for my calendar
- How and where to formally publish and present the nuclear orbits?
- I have no affiliation, no employees, no support, just me

My qualifications

- I took General Chemistry 101 in spring semester 1979 and General Chemistry 103 in spring semester 1980 at University of Illinois, Urbana, and got A's in both.
- I got a PhD in animal breeding in 1986 from Iowa State University, Ames, but I never took Organic Chemistry because genetics was all about math, statistics, and economics, so I took those instead.
- I retired from the U.S. Department of Agriculture in 2025. My goal is to do important research that nobody else is doing.
- I did particle physics research for 2 weeks. Now I need to choose a new topic to research next week. Life is short, with many problems yet to solve.

Other paired rings with opposite spins

- From 2018-2025 I lived 2 blocks outside the Capitol Beltway. It has a radius about 10 miles (16 km) around Washington, DC. The cars on its inner loop go clockwise and on its outer loop go counter-clockwise, driving past each other every hour, every day, every year, but few collide. Paired orbits with opposite spin seem almost magical, too good to be true, on the road and in the nucleus.
- Since May 2025, my 6 bike routes each include some circular streets. I bike 3 times per week and go clockwise for 2 weeks, then counter-clockwise for 2 weeks. My routes might mimic nuclear orbits but with a much wider radius and fewer revolutions per week. I always pedal on the right side of the street and almost never collide with other bodies traveling in the opposite direction.

Final thoughts on quantum mechanics

- Quantum mechanics reminds me of 8 blind scientists researching an elephant as closely as possible:
  - 4 scientists think the elephant feels like a tree trunk.
  - 4 scientists think the elephant does not touch the ground: 2 report it is smooth, 1 reports long with a hairy end, and 1 that it twists all around.
- Step back a ways and discuss how the whole elephant may be connected and related to other things that you understand.
- The earth goes around the sun, but nobody ever guesses that on their first try, maybe not even Aristarchus or Copernicus.
- Nuclear orbits are my best guess of how the pieces fit together.

Acknowledgments

- Thank you to the audience who previewed these slides and asked interesting questions:
  - Dr. Mark VanRaden, Miriam McKenna, Deb Noordhoff, and Judy Winship
- Thank you to Dr. Tom Lawlor and Dr. Ignacy Misztal for useful comments and questions. In response I added further guesses about molecular bonding.
- Review of Nuclear Orbits documents the review process.
- Discussions with my next-door neighbor Dr. Atsutoshi Ikeda revealed that electron flow in superconducting alloys cannot yet be simulated by computer, which surprised me.

Further reading

- Discovery Alert: Watch the Synchronized Dance of a 6-Planet System - NASA Science
- Saturn's Hexagon in Motion - NASA Science
- “A stable geometric arrangement of the polygons can occur on any planet when a storm is surrounded by a ring of winds turning in the opposite direction to the storms itself.
- A Proof of the Existence of the Figure-8 Orbit using Actions and the Shape Sphere | Henry Yip
- Fundamental, Identical Particles Don’t Have The Same Masses As Each Other - Big Think