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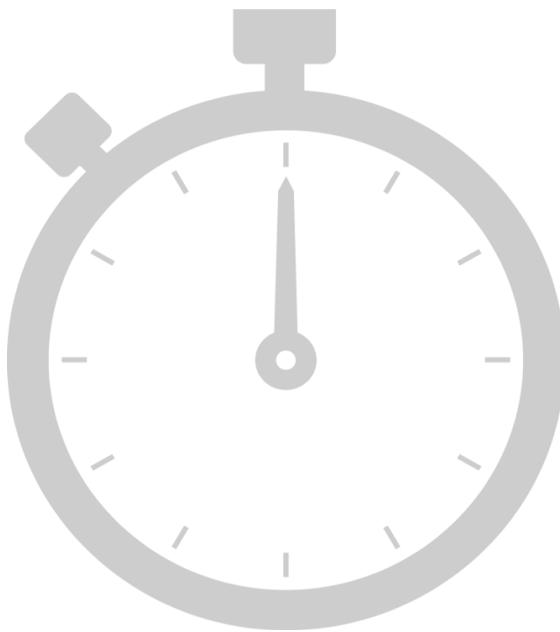
2024 Postdoctoral
Fall Symposium

The Office of Postdoctoral Affairs
The Graduate School | Florida State University

FSU

The Office of Postdoctoral Affairs

Presents:



FIVE MINUTE RESEARCH

POSTDOC COMPETITION



Florida State University



THANK YOU TEAM!

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Application Developer, Designer

Francis Ebuara
Graduate Assistant - Office of Postdoctoral Affairs

Jakub Hruby
Postdoctoral Scholar MagLab

Keith McCall
Acting Director Office of Graduate Awards & Fellowships

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THANK YOU JUDGES!

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VP for Research Office*

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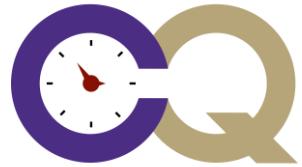
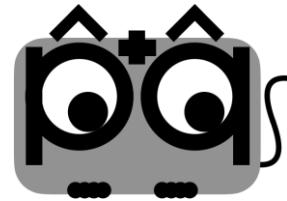
Stephen Yuwono

Department of Chemistry & Biochemistry

How Electrons Dance When Things Go Heavy and Fast

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It takes a village!



DePrince Group and Alums:

Prof. Eugene DePrince

Dr. Rain Li

Dr. Lauren Koulias

Dr. Brandon Cooper

Dr. Nam Vu

Dr. Marcus Liebenthal

Dr. Varuna Pathirage

Justin Philips

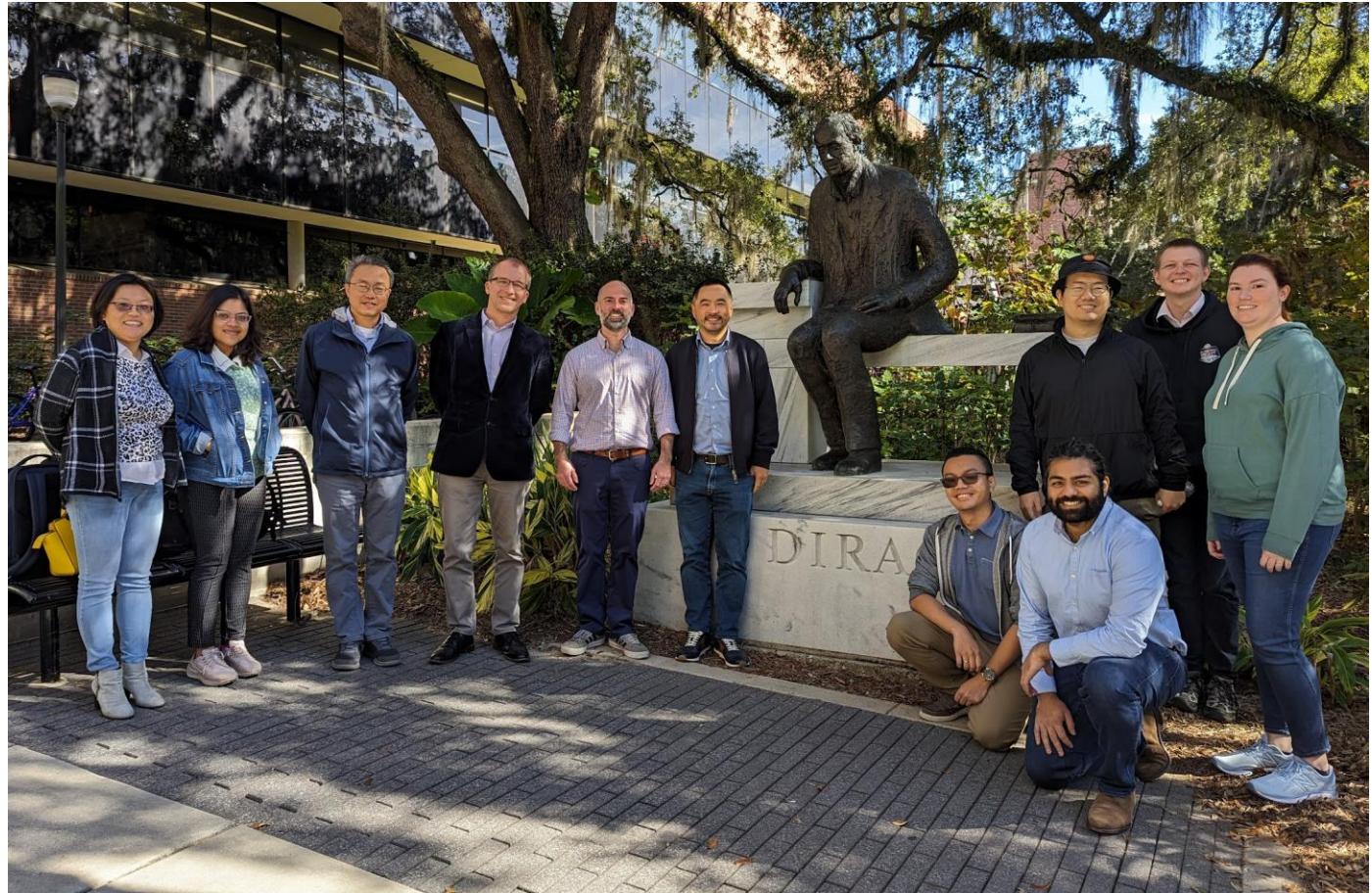
James Gray

Li Group @ Univ. of Washington

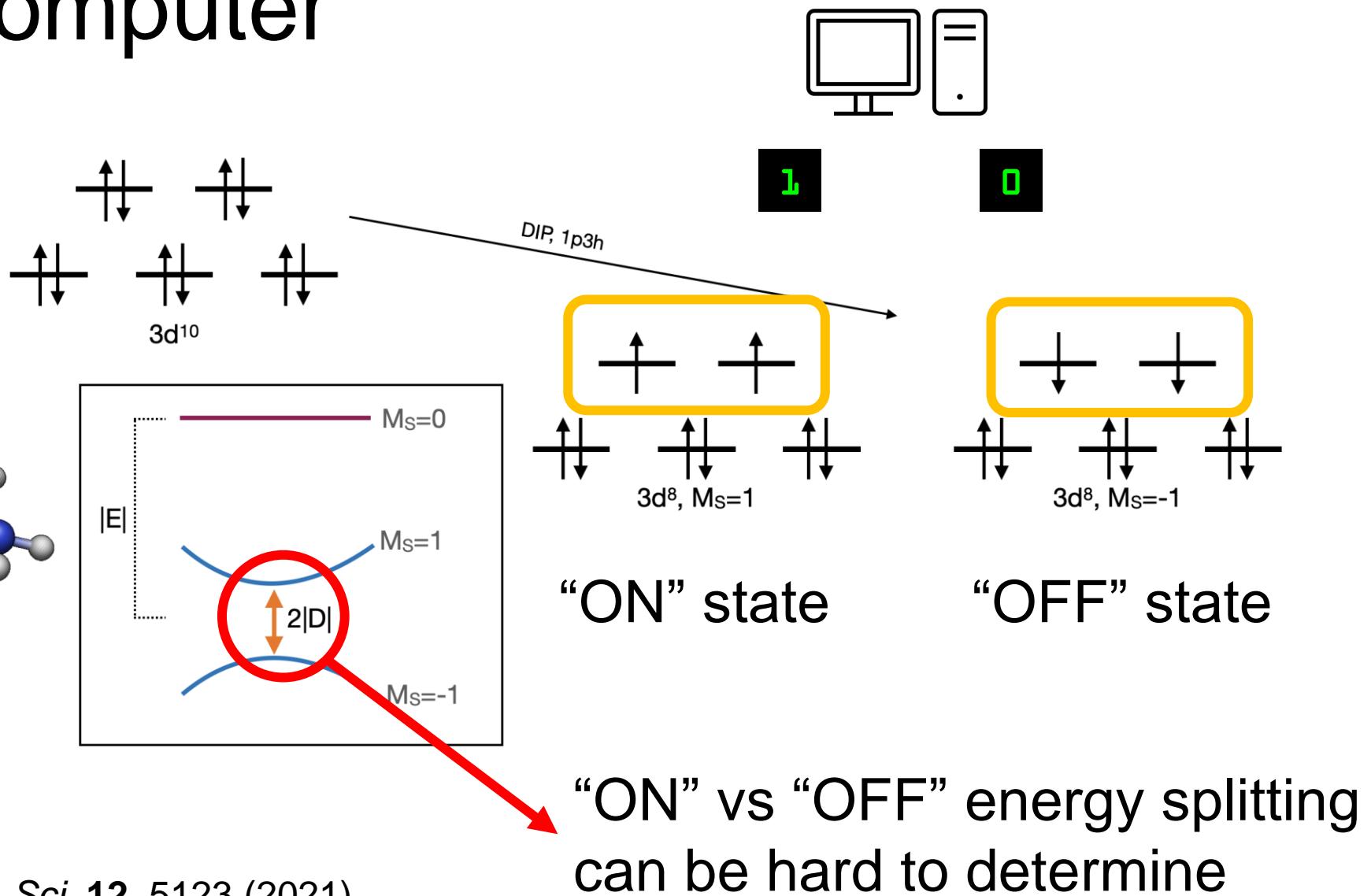
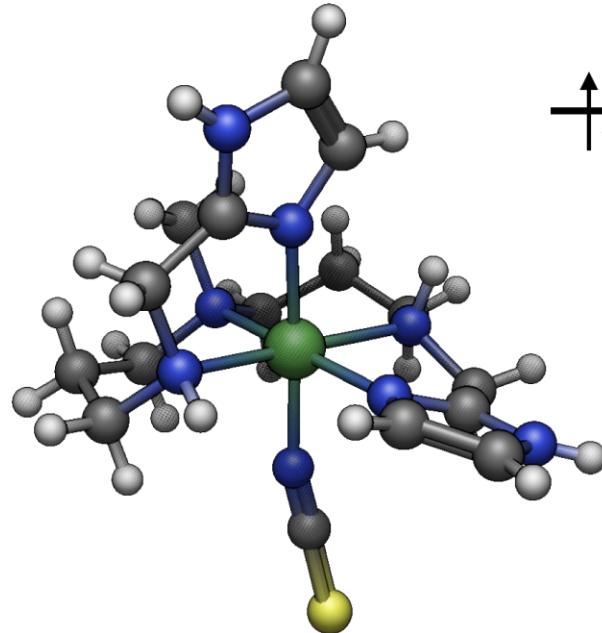
Valeev Group @ Virginia Tech

Dr. Chao Yang @ LBNL

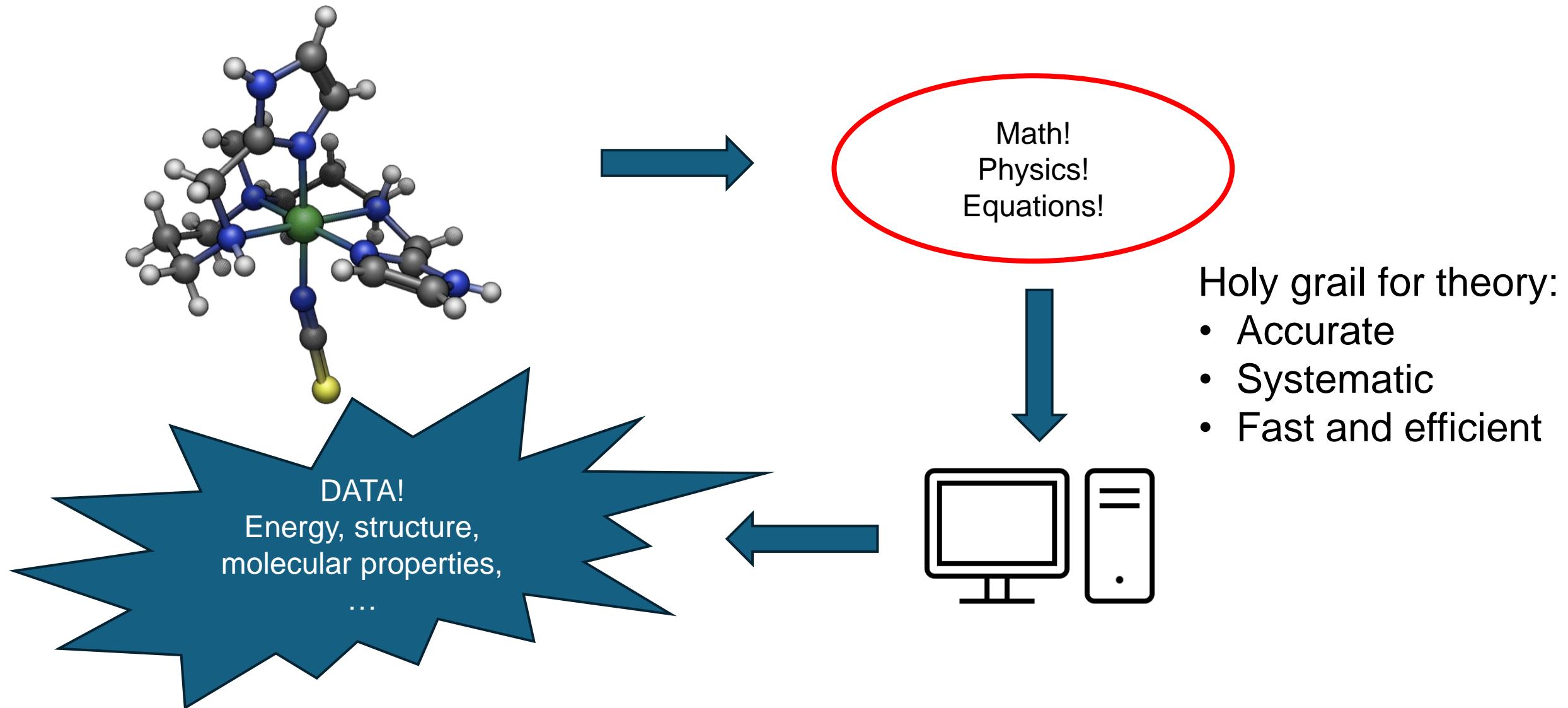
**Dr. David Williams-Young @
LBNL**



(one of the) goal: help design material for quantum computer



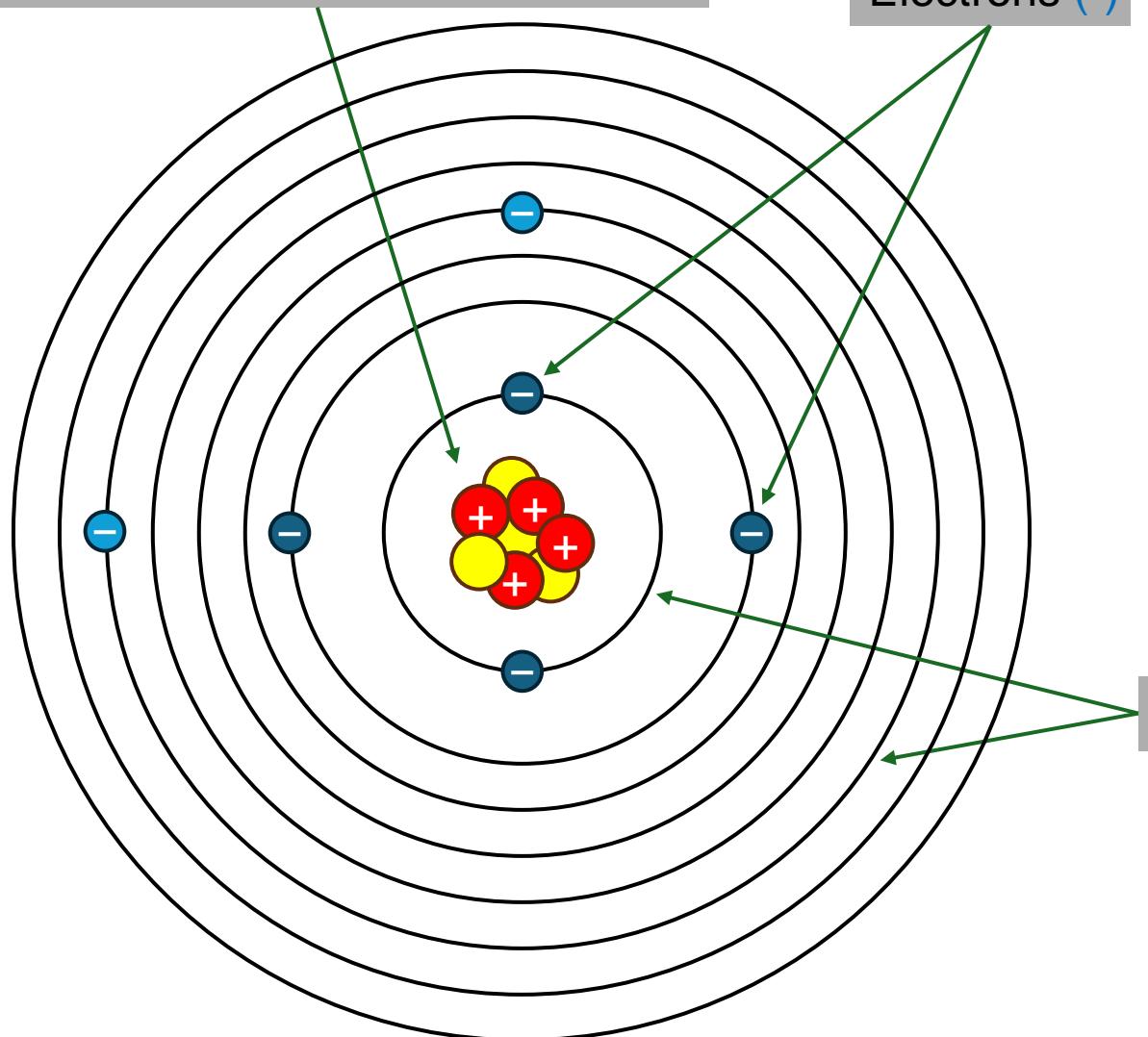
My work: molecules in the quantum world



A crash course in many-body theory

Nucleus: Protons (+) and neutrons (0)

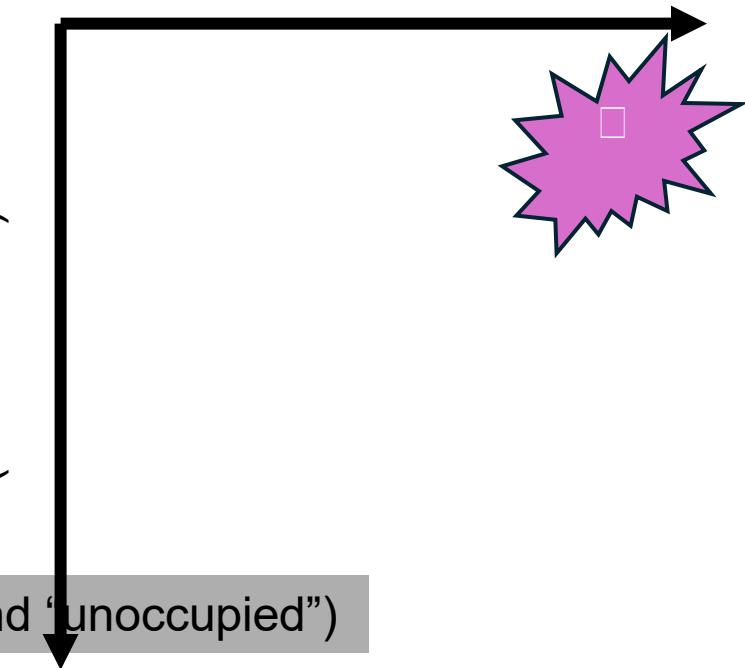
Electrons (-)

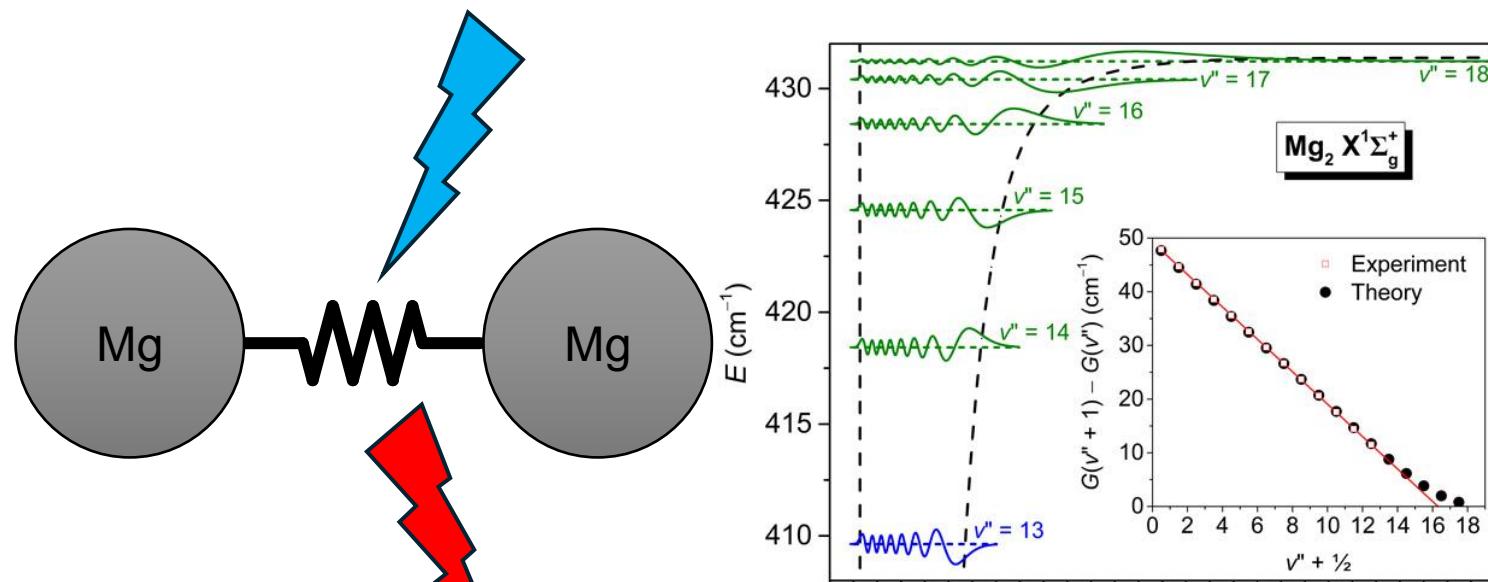


of moves
("correlation level")

of orbitals
("basis size")

Orbitals ("occupied" and "unoccupied")



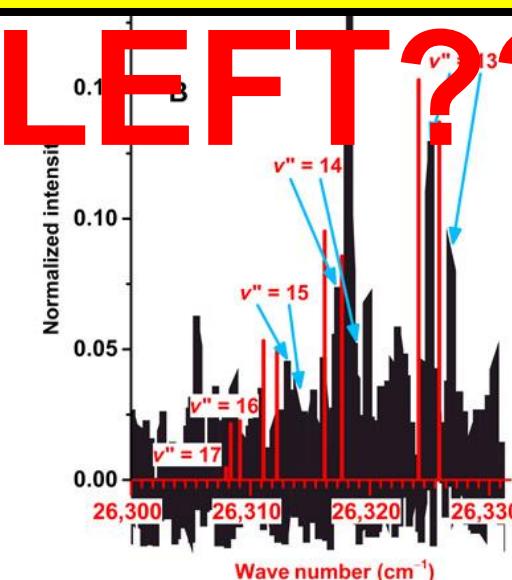
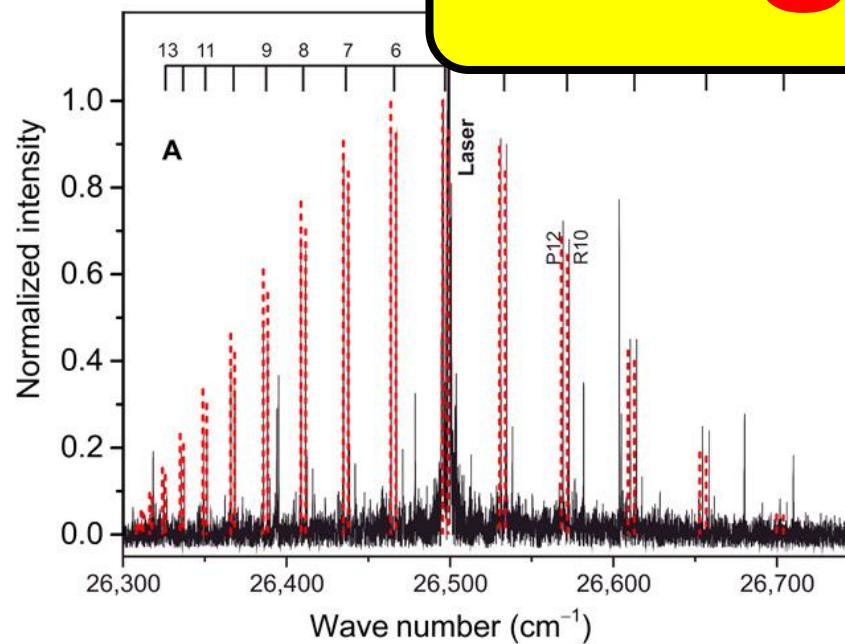


of moves
("correlation level")

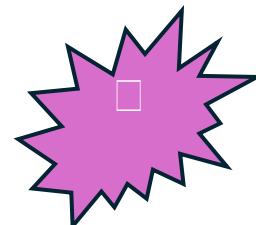
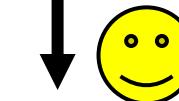


SO, WHAT'S

LEFT???

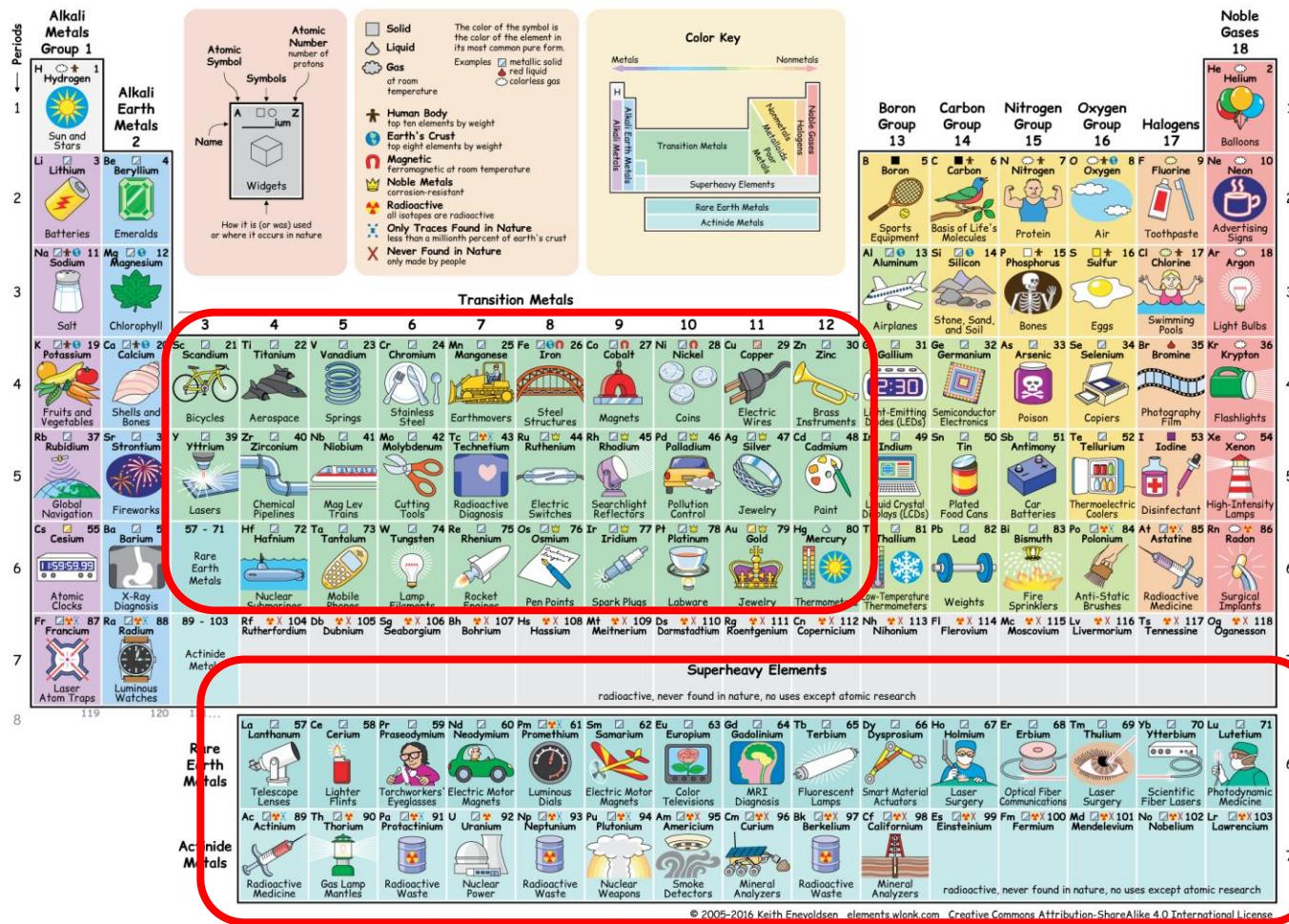


of
("bas")



Relativity: when things go heavy and fast

The Periodic Table of the Elements, in Pictures

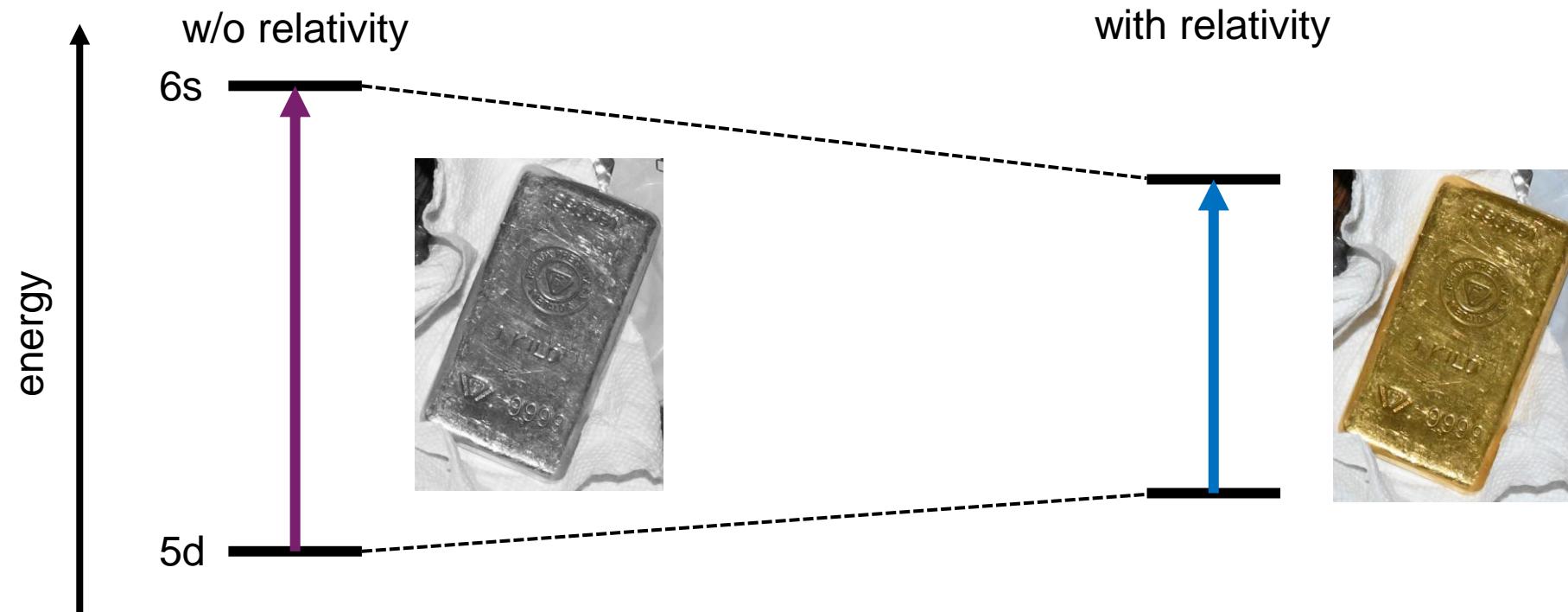


The **heavier** the element, the faster the electrons move.

“... I’m travelling at the speed of light ...”

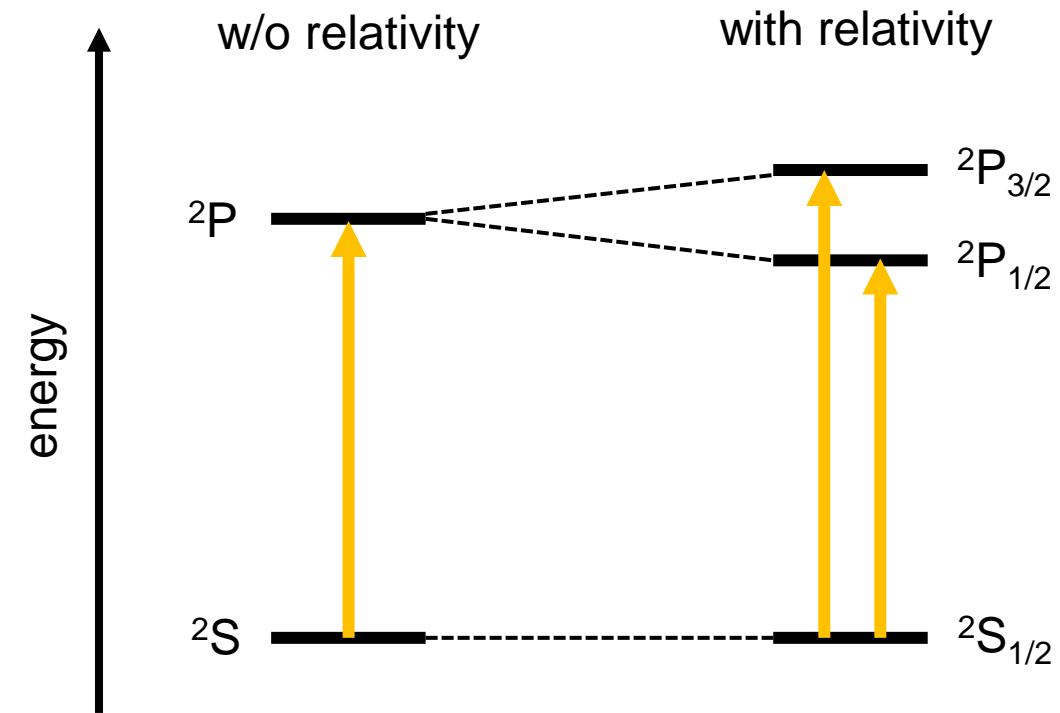
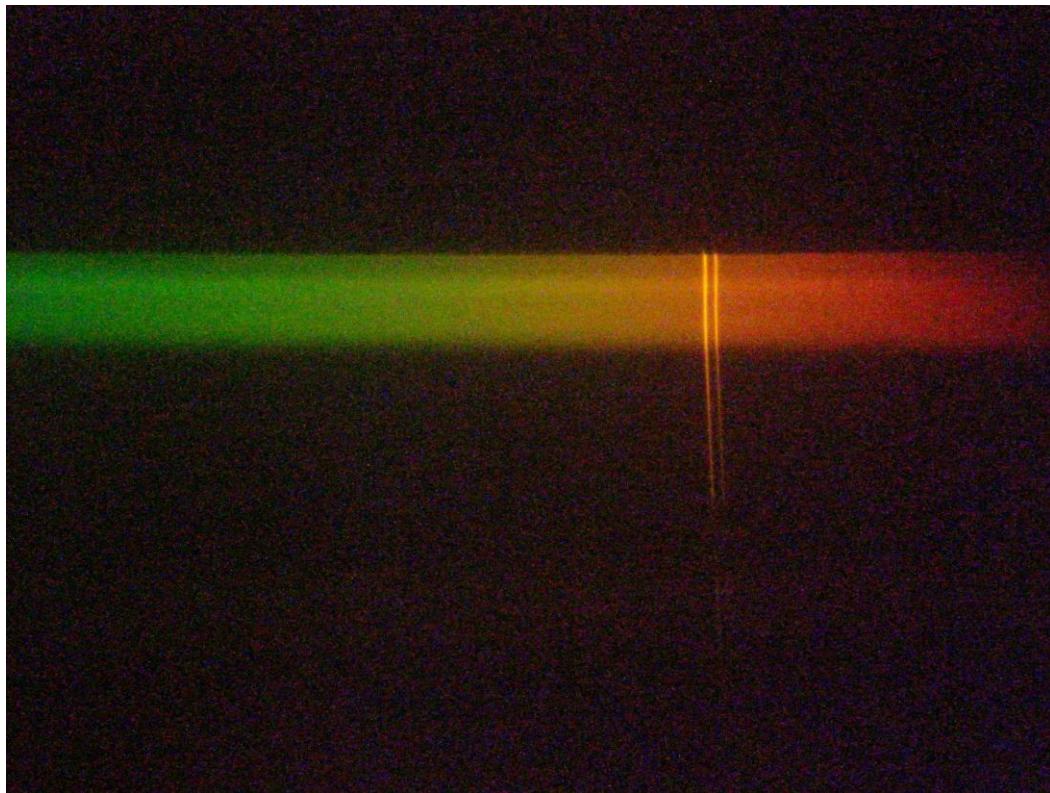
– *Don’t Stop Me Now* by Queen

Relativity: when things go heavy and fast



Gold's yellow hue is because of relativity!

Relativity: when things go heavy and fast



Sodium emits two closely lying lines!

Image: photo by user Dinesh.dhankhar on Wikimedia Commons

(https://commons.wikimedia.org/wiki/File:Quantum_Mechanical_Spin_Orbit_Coupling_in_a_candle_flame.jpg)

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Relativity: when things go heavy and fast



Non-relativistic: $+0.39\text{ V}$ ☹

Relativistic: $+2.13\text{ V}$ ☺

Experiment: $+2.107\text{ V}$ ☺

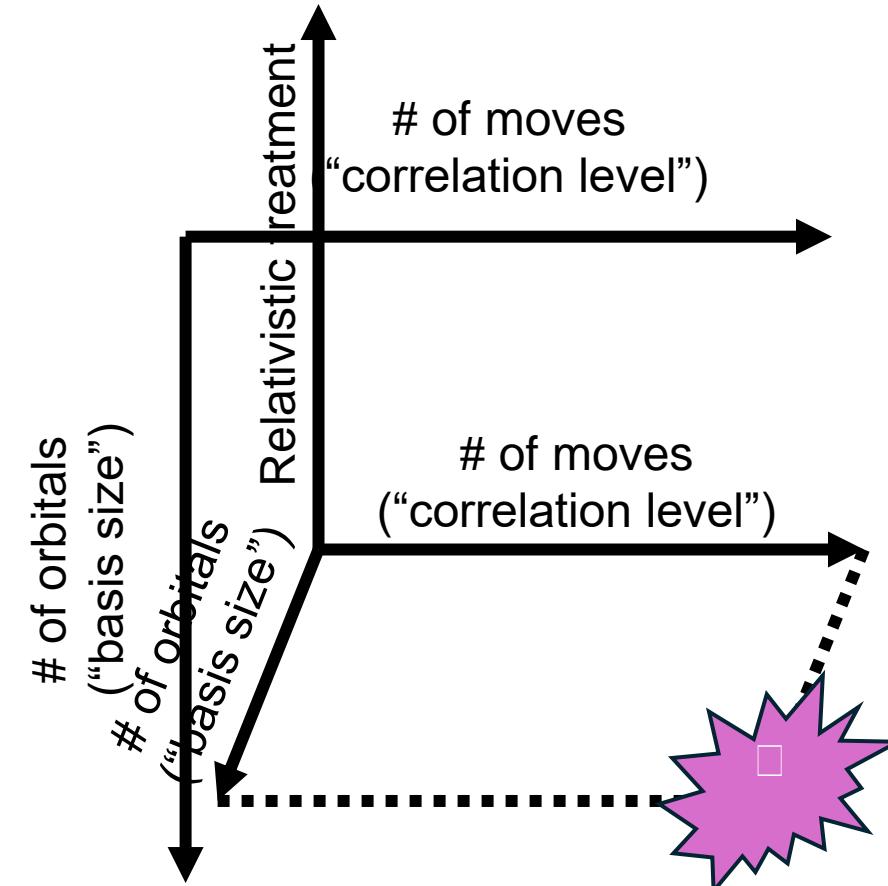
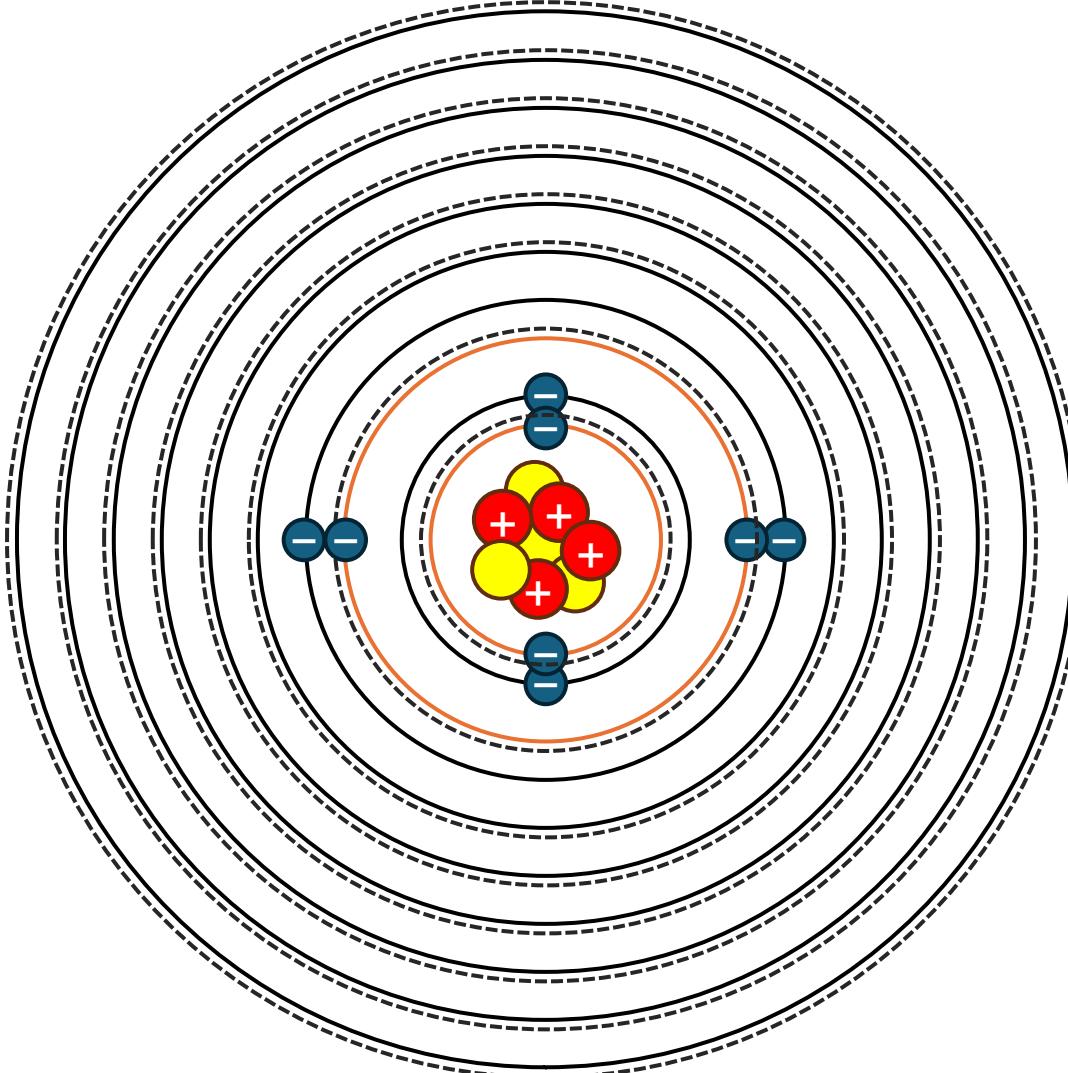
“Finally, we note that cars start due to relativity.”[1]

Image: Wikimedia Commons (public domain).

[1] R. Ahuja, A. Blomqvist, P. Larsson, P. Pyykkö, and P. Zaleski-Ejgierd, “Relativity and the Lead-Acid Battery,” *Phys. Rev. Lett.* **106**, 018301 (2011)

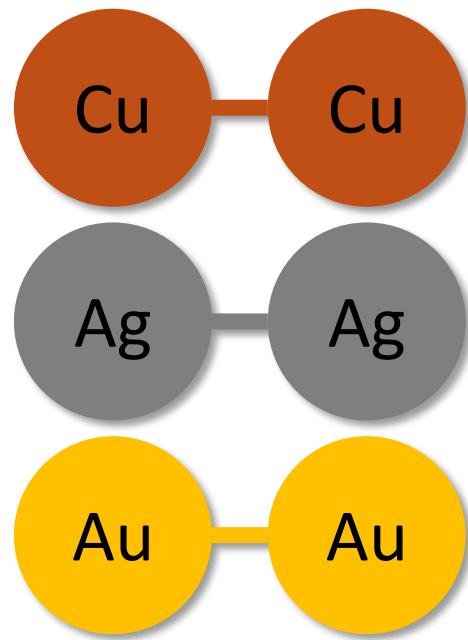
A crash course in many-body theory

- now with relativity!



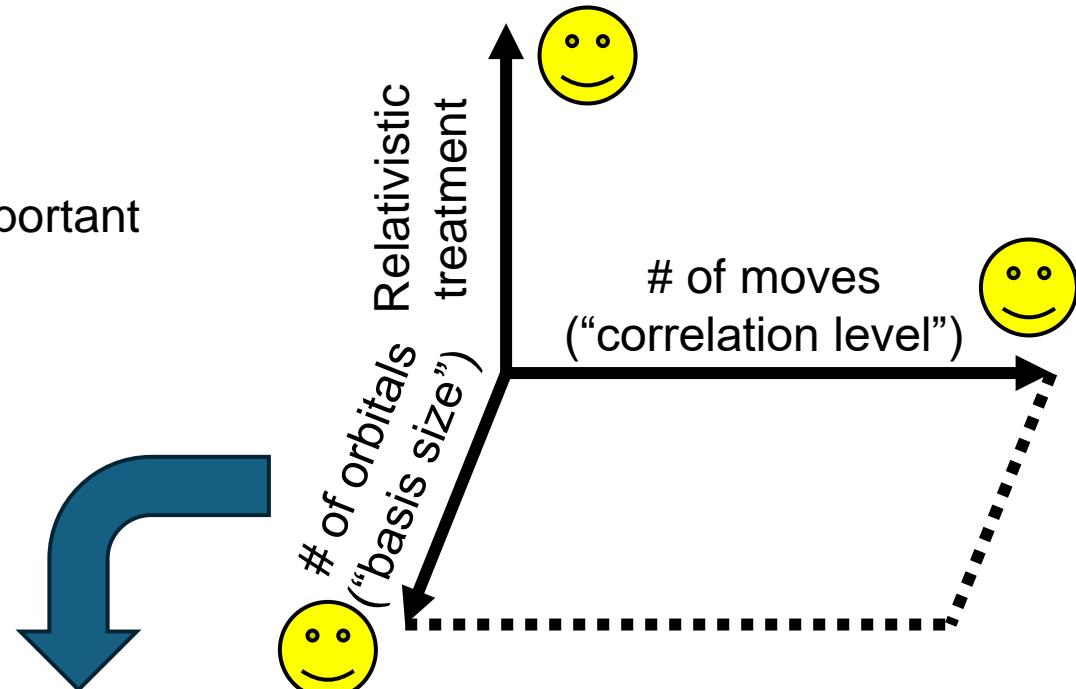
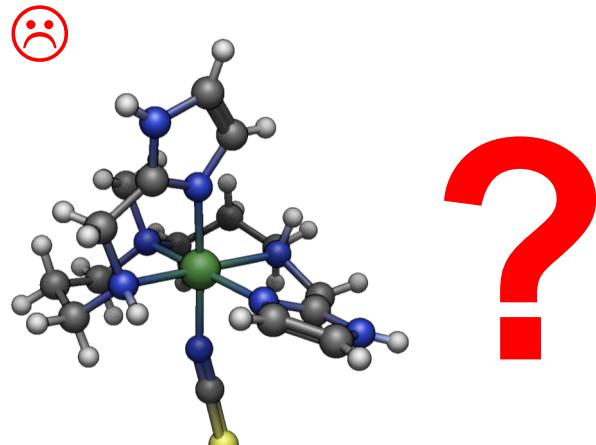
Bottom line: balancing cost vs accuracy

(in all three axes: no. of moves, no. of orbitals, relativistic treatment)

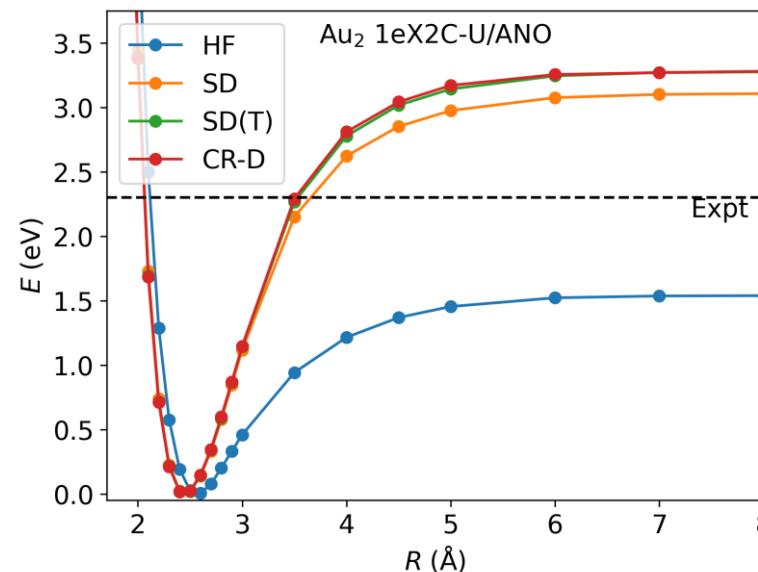


Relativity becomes more important

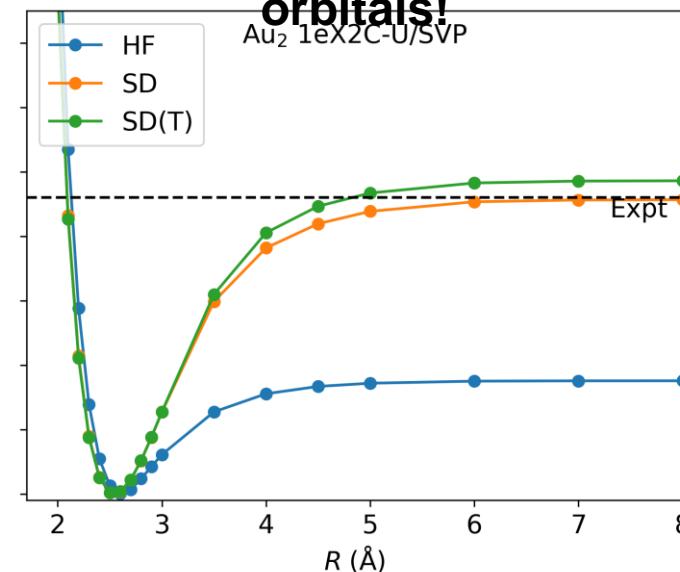
Only 2 atoms!

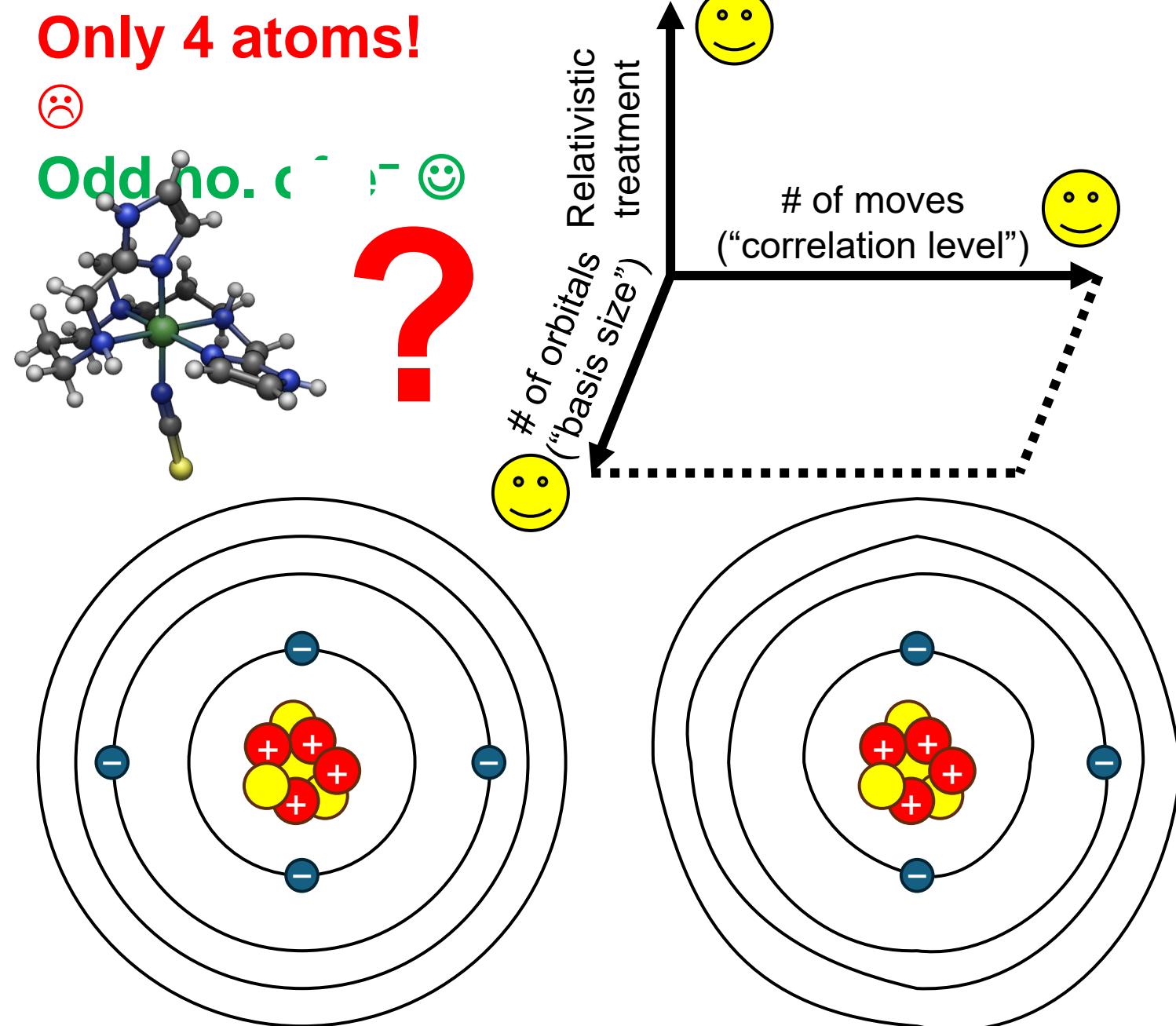
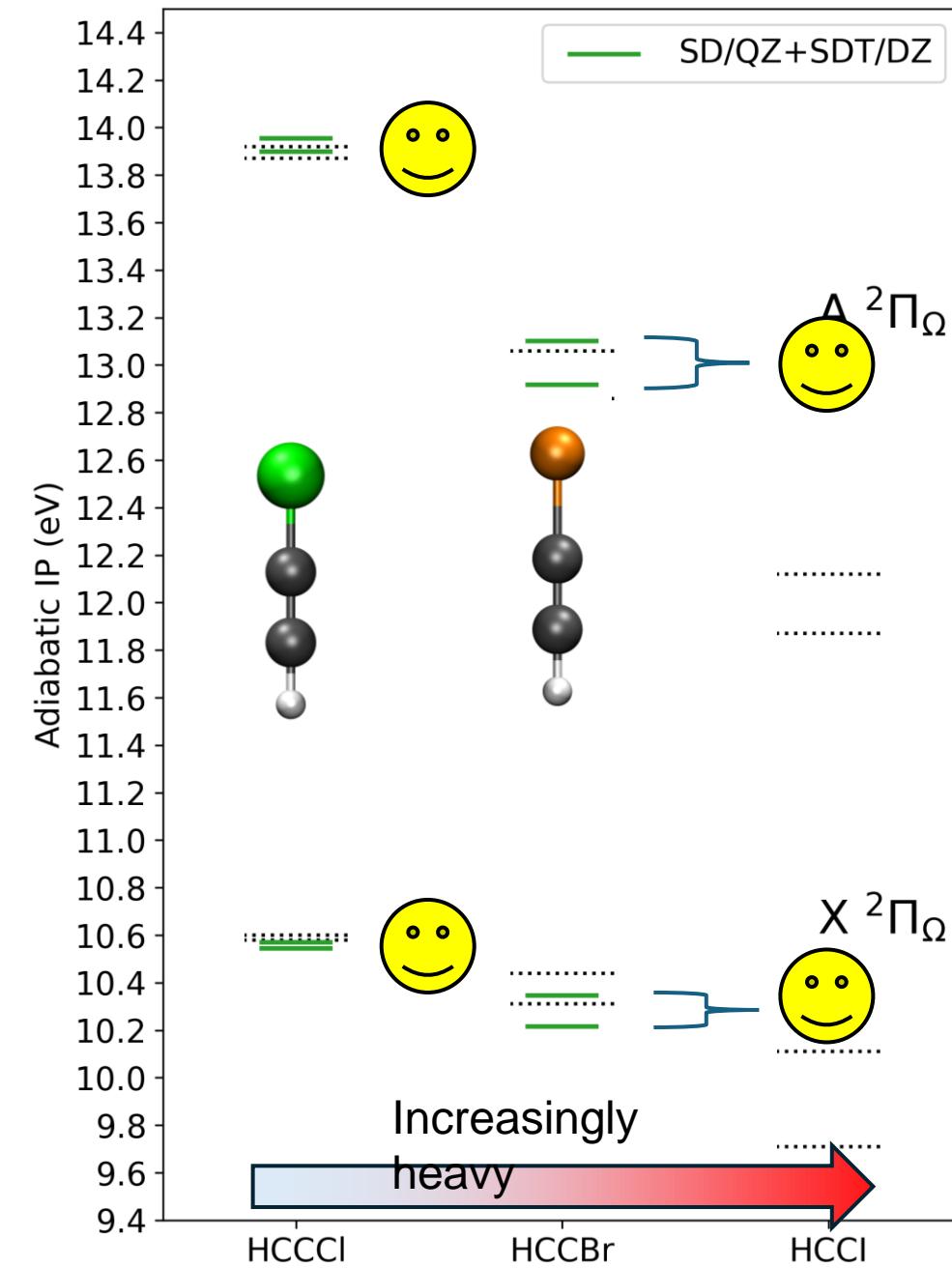


Bad relativistic orbitals!

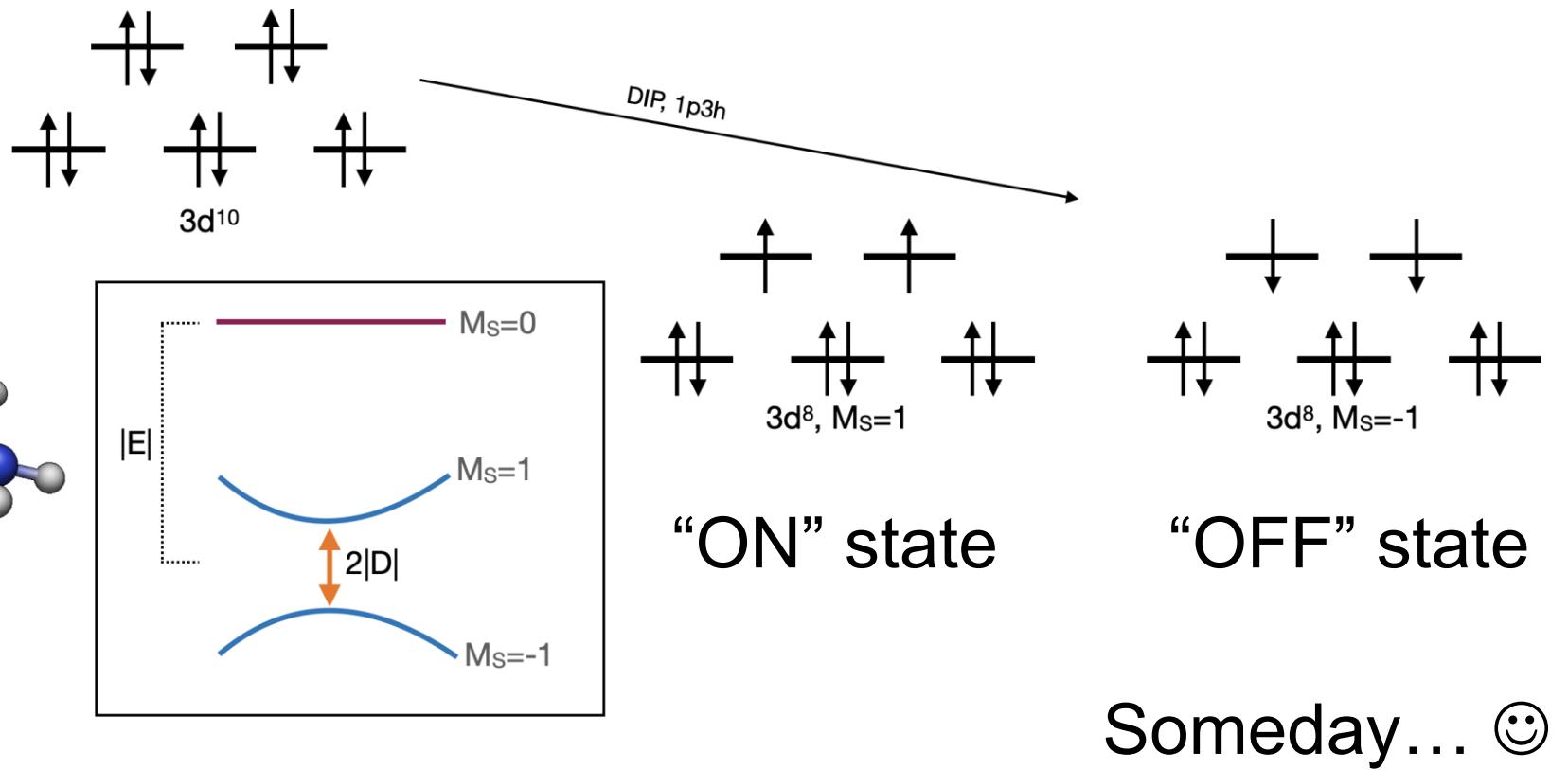
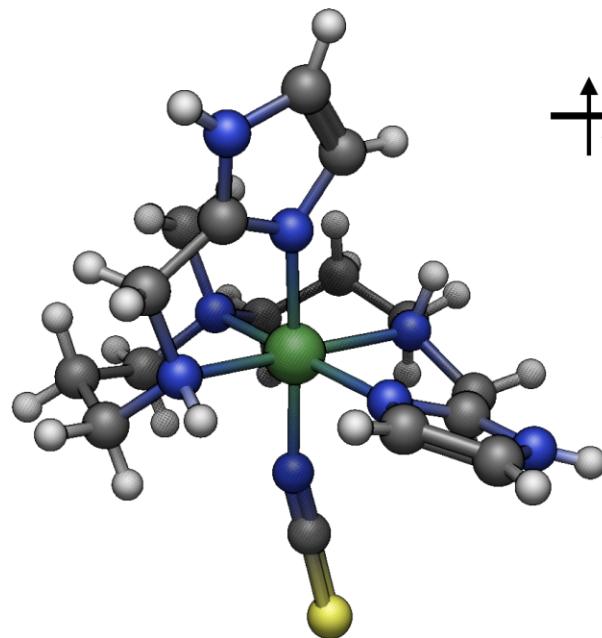


Good relativistic orbitals!





(one of the) goal: help design qubit material



Thank you!

Acknowledgements



Jing Wang
Dean and Professor
PhD, MPH, RN, FAAN



Hye Jin Park
Associate Professor
PhD, RN



Hongyu Miao
Professor, Director of Brain
Science & Symptom
Management Center
PhD



Dan Song
Postdoctoral Scholar
RN, PhD



Chengdong Li
Data Scientist



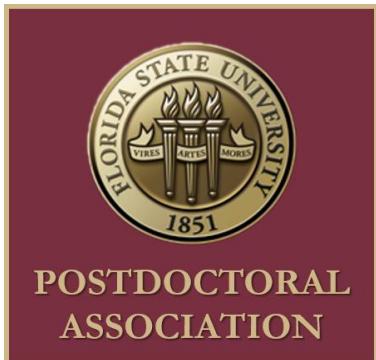
Buna Bhandari
Postdoctoral Scholar
MPH, PhD



Setor Kofi Sorkpor
Assistant Professor
PhD, MPH, MSN, RN



Brittany Lane
Postdoctoral Scholar
PhD, MPH



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How Electrons Dance When Things Go Heavy and Fast

10 - Yijiong Yang

Addressing ADRD and COVID-19 Vaccination Hesitancy: Strategies for Enhancing Health Outcomes



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AWARDS & RECEPTION

Please join us for refreshments
and award presentations

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PROGRAM END

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