

**FSU**

**WELCOME**

# **2024 Postdoctoral Fall Symposium**

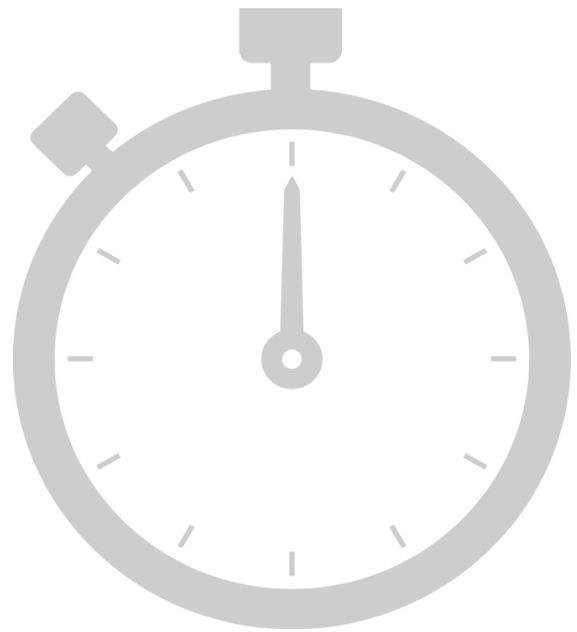
The Office of Postdoctoral Affairs

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*

Audrey Livingston  
*Graduate Enrollment Specialist*

Thais Pedrete  
*Postdoctoral Scholar in Chemistry  
Past Senior Advisor*

Joy Stein  
*Event Administrative Specialist*

Diana Paquette  
*College of Medicine Coordinator*

Geoset Studios!  
*Kyle Wilson*

Postdoctoral Association Leadership Team! - *Olivia Cook (President), Kasey Longley (Vice President), Betsy Mansfield (Senior Advisor), Luna Hiron (Past Senior Advisor), and Mohammad Nooranidoost (Past Senior Advisor)*

# THANK YOU JUDGES!

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VP for Research Office*

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Global Business Consultant*

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Mark Riley  
*Dean of the Graduate School & Robert Lawton  
Professor of Physics*

Jennifer Winegardner  
*RW Law Firm  
Civil Litigator*

# Stephen Yuwono

Department of Chemistry &  
Biochemistry

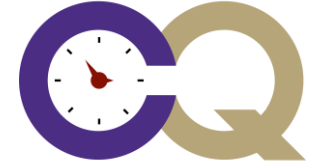
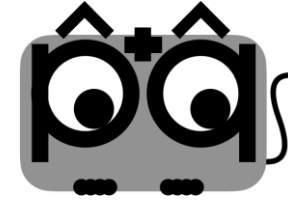
*How Electrons Dance When Things Go Heavy and  
Fast*

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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

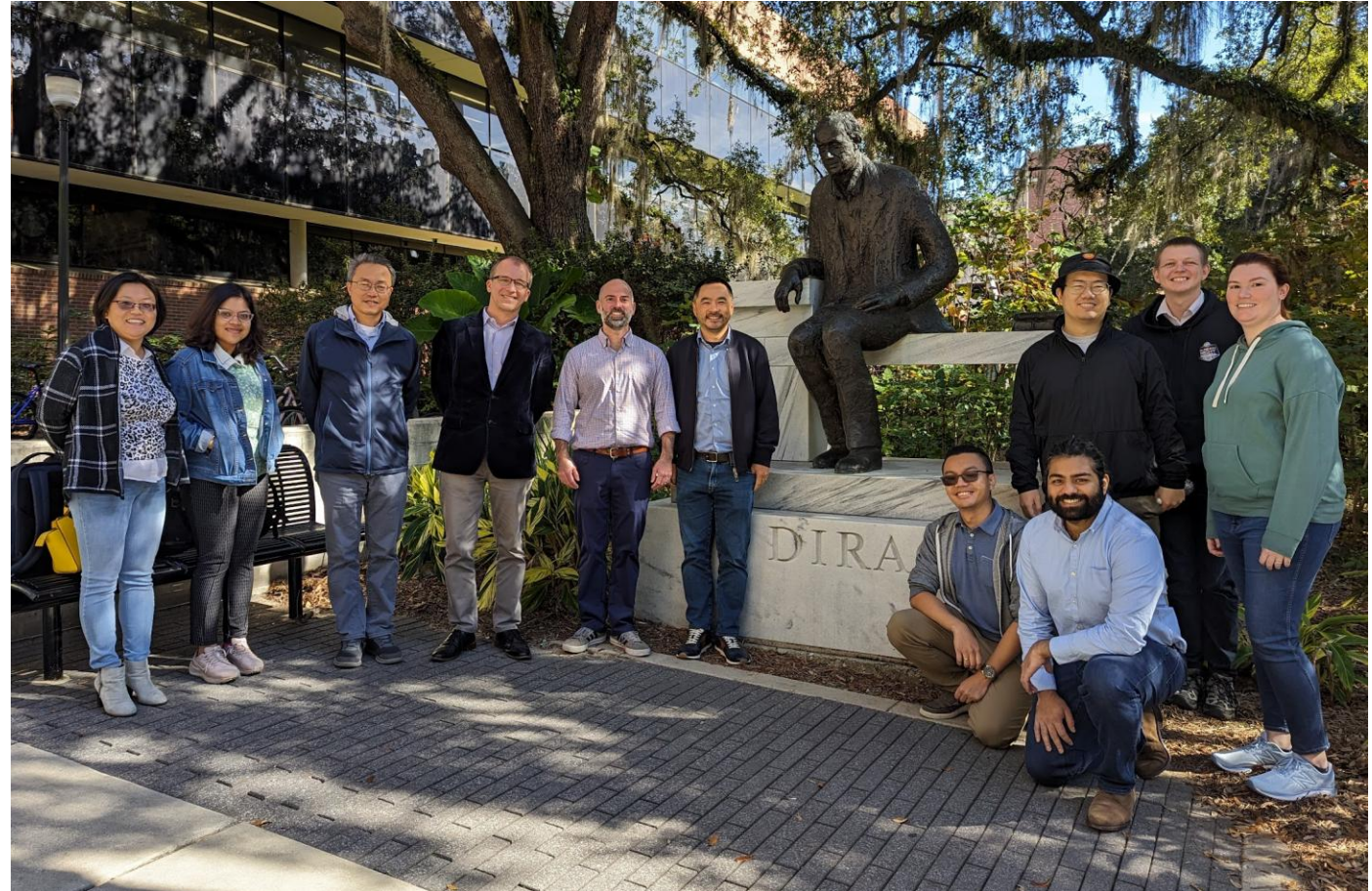
James Gray

**Li Group @ Univ. of Washington**

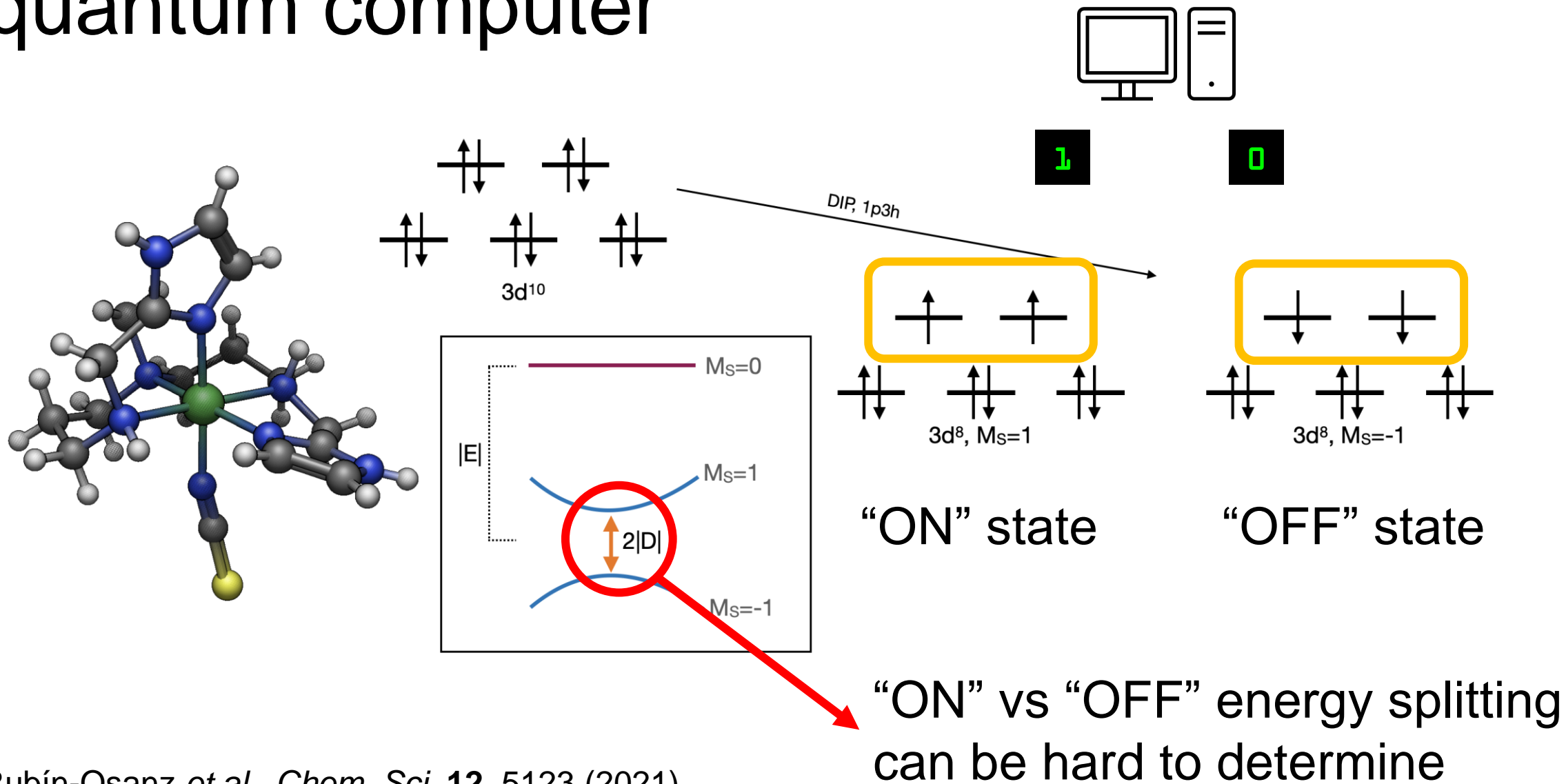
**Valeev Group @ Virginia Tech**

**Dr. Chao Yang @ LBNL**

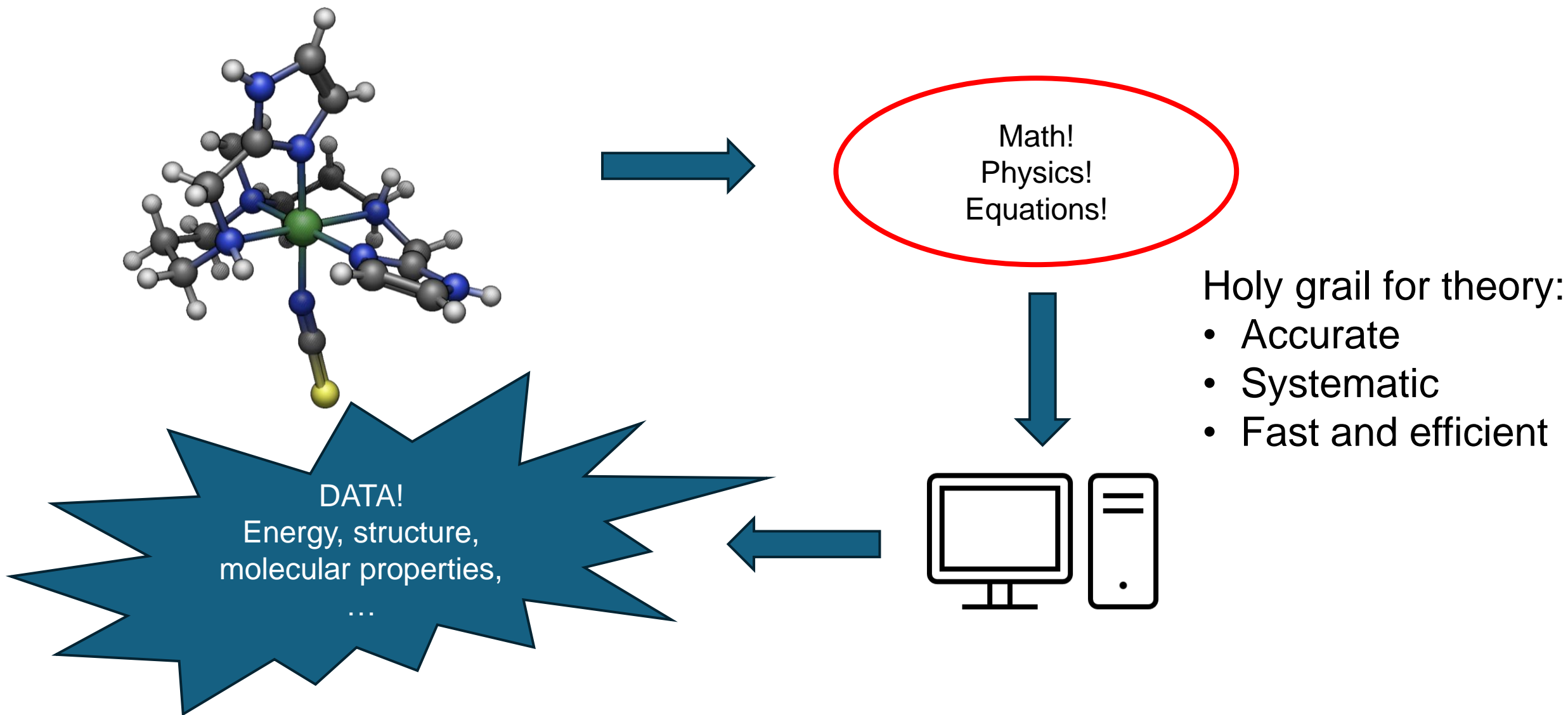
**Dr. David Williams-Young @  
LBNL**



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



# My work: molecules in the quantum world

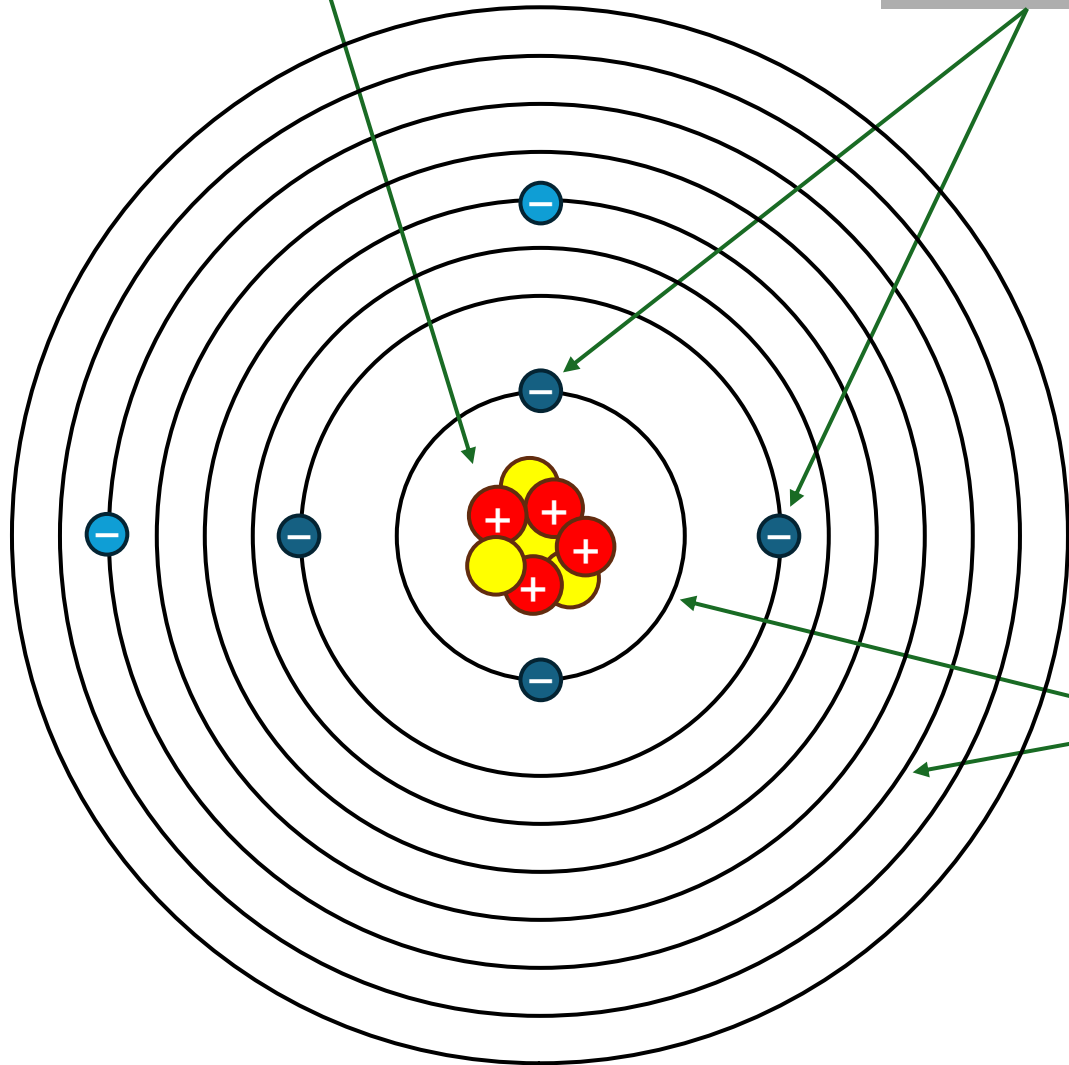




# A crash course in many-body theory

Nucleus: Protons (+) and neutrons (0)

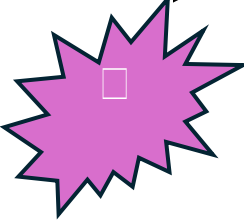
Electrons (-)

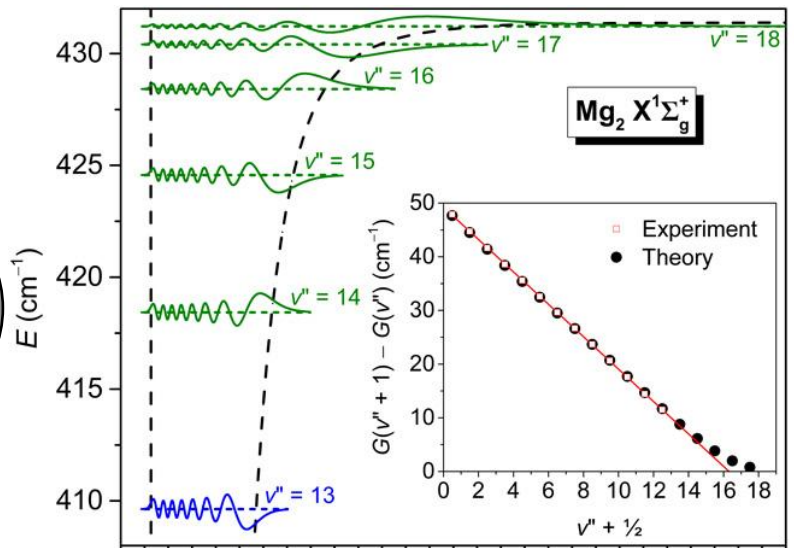
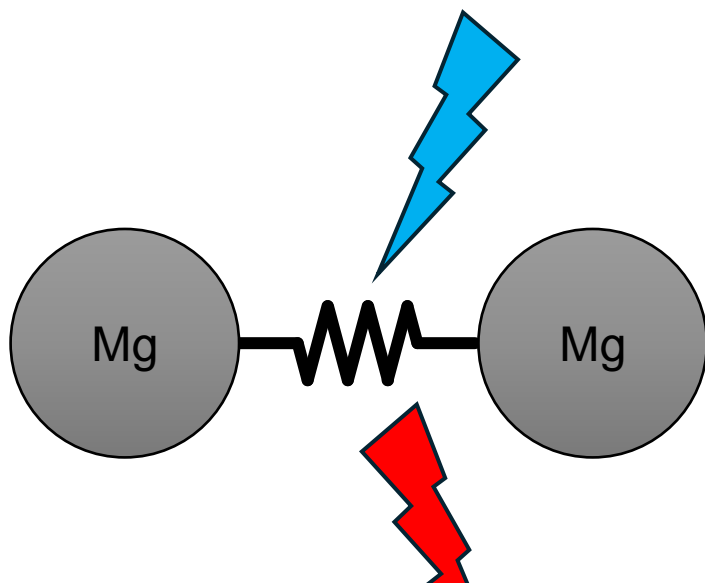


Orbitals ("occupied" and "unoccupied")

# of orbitals  
("basis size")

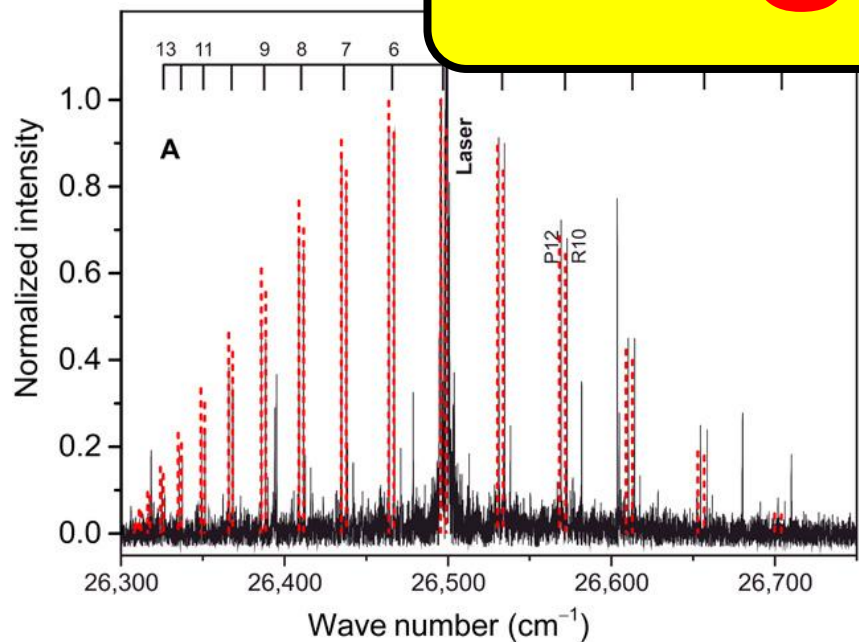
# of moves  
("correlation level")



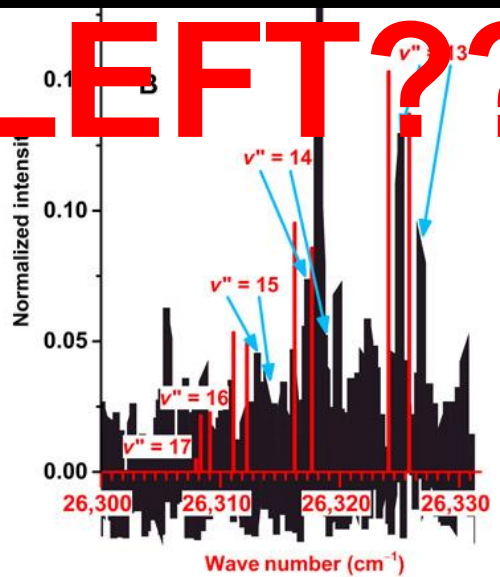


**SO, WHAT'S**

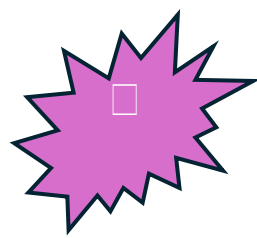
# of moves  
("correlation level")



**LEFT???**

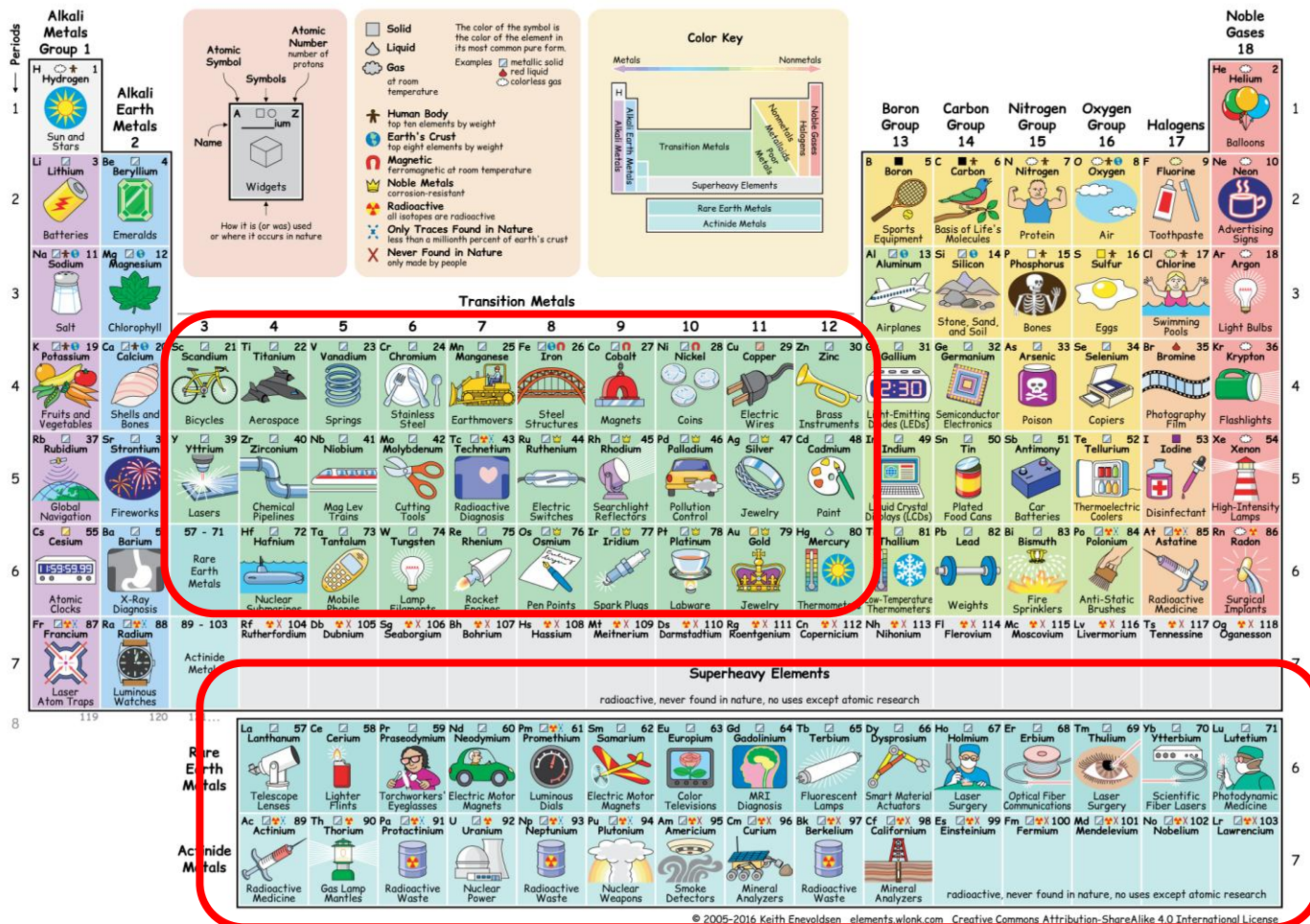


# of  
("bas")



# Relativity: when things go heavy and fast

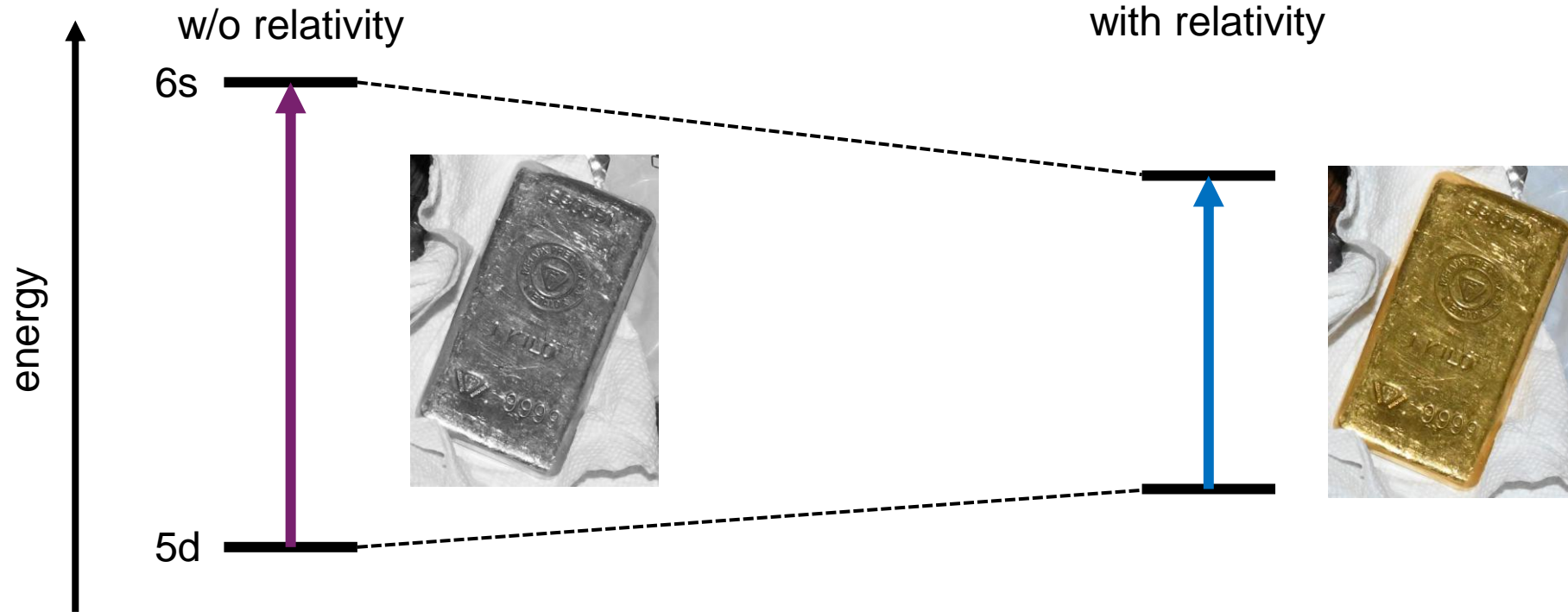
## The Periodic Table of the Elements, in Pictures



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

“... I’m travelling at the speed  
of light ...”  
– *Don’t Stop Me Now* by  
Queen

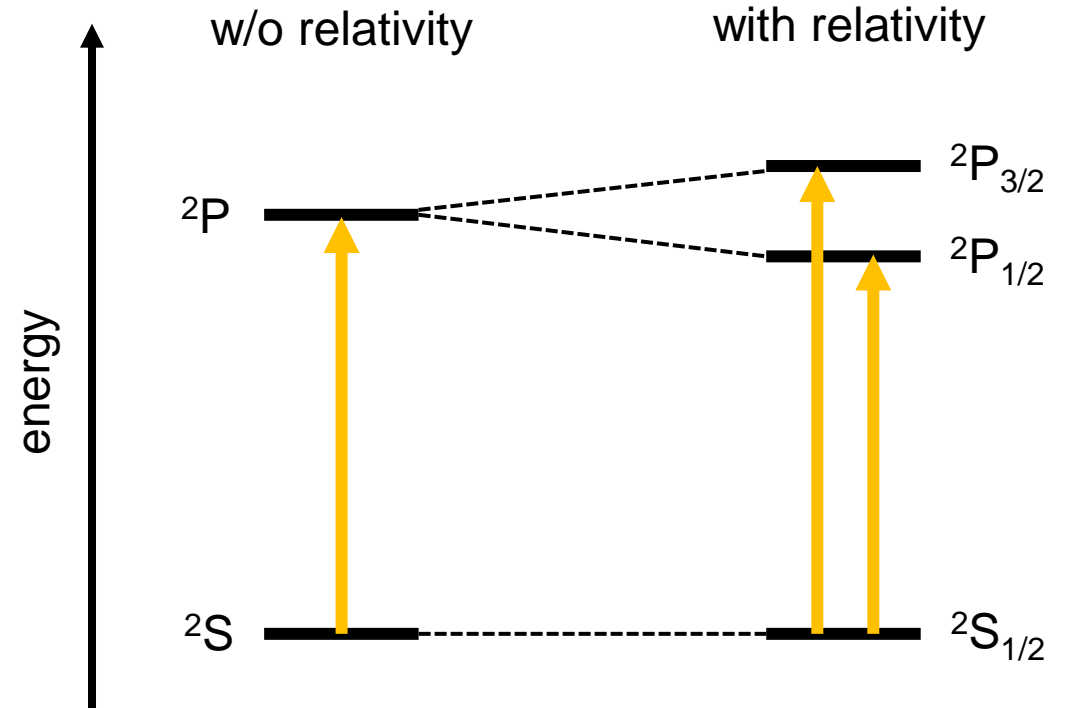
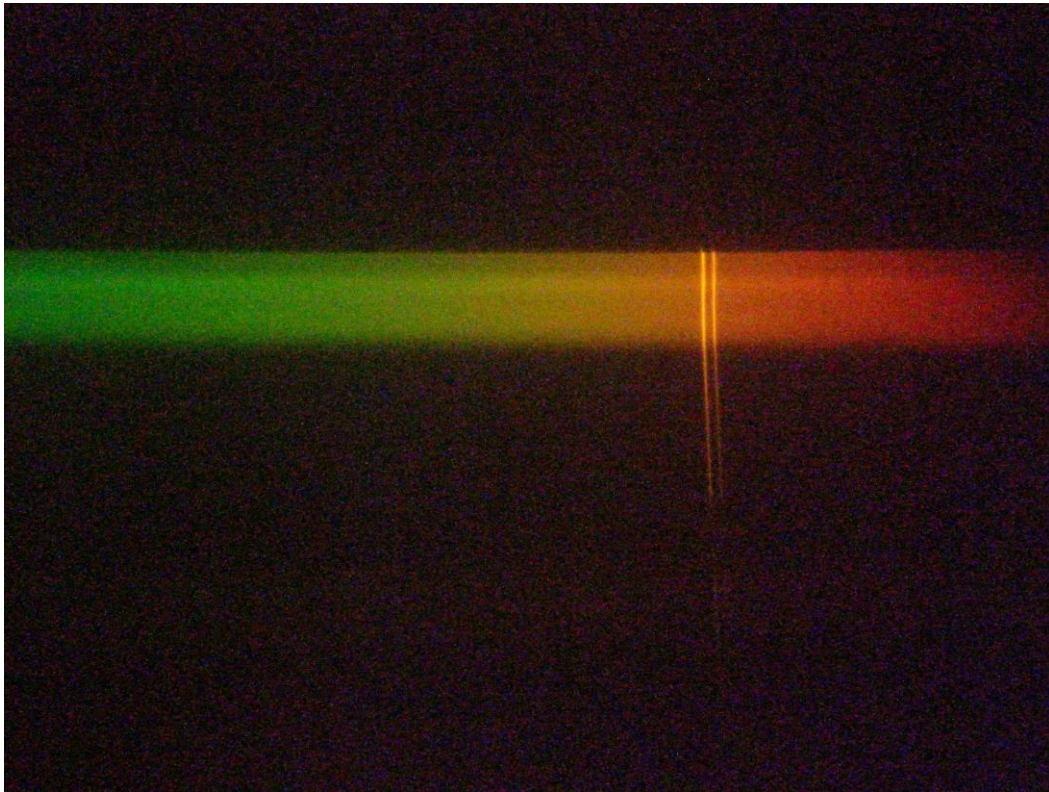
# Relativity: when things go heavy and fast



Gold's yellow hue is because of relativity!



# Relativity: when things go heavy and fast



Sodium emits two closely lying lines!



# Relativity: when things go heavy and fast



**Non-relativistic:**    **+0.39 V**    ☹️

**Relativistic:**        **+2.13 V**    😊

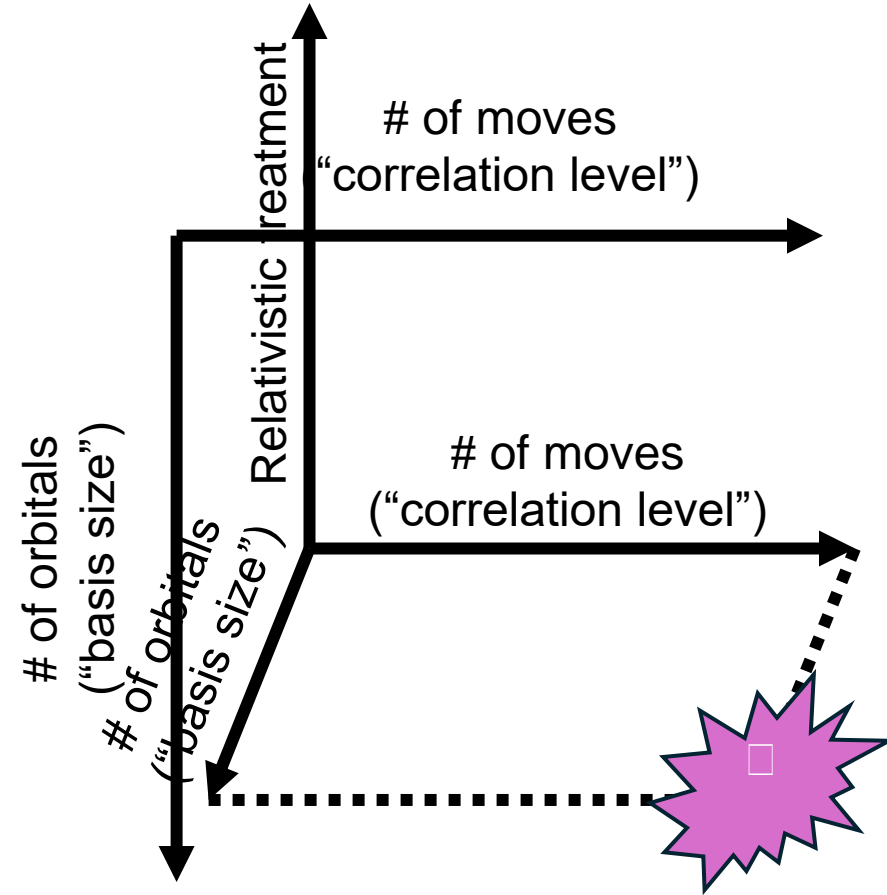
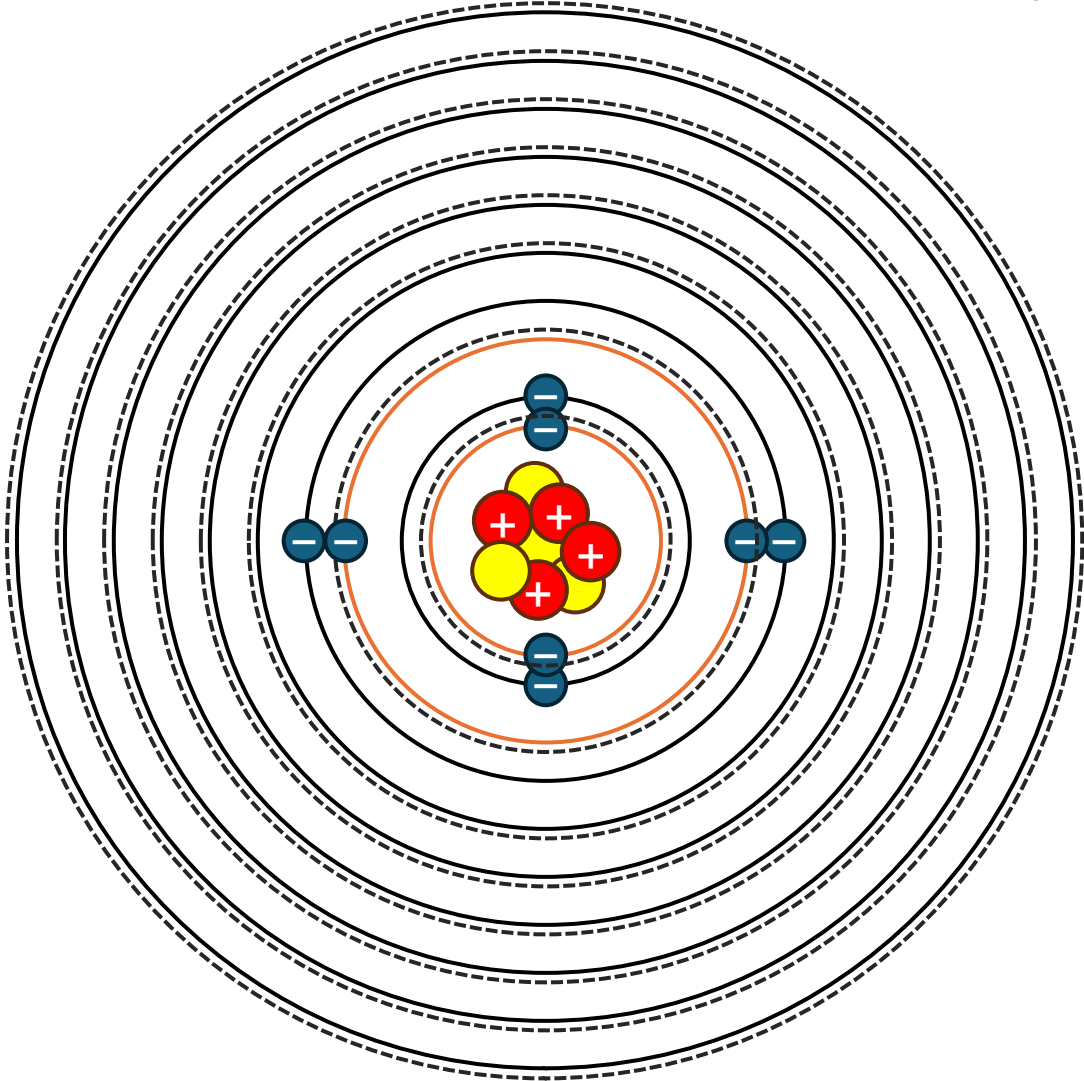
**Experiment:**        **+2.107 V**    😊

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

Image: Wikimedia Commons (public domain).

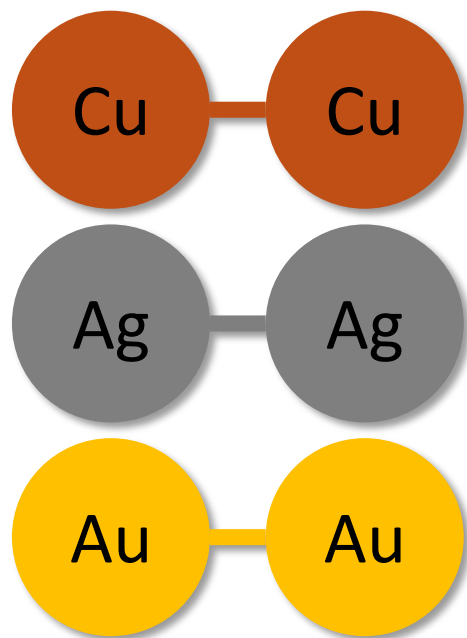
[1] R. Ahuja, A. Blomqvist, P. Larsson, P. Pyykkö, and P. Zaleski-Ejgierd, “Relativity and the Lead-Acid Battery,” *Phys. Rev. Lett.* **106**, 018301 (2011)

# A crash course in many-body theory - now with relativity!



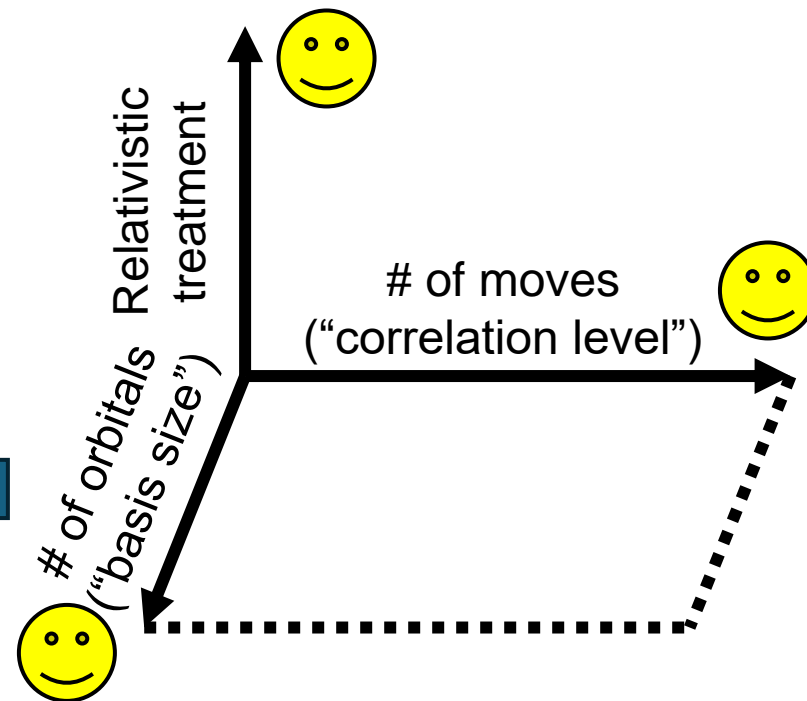
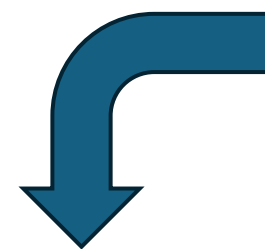
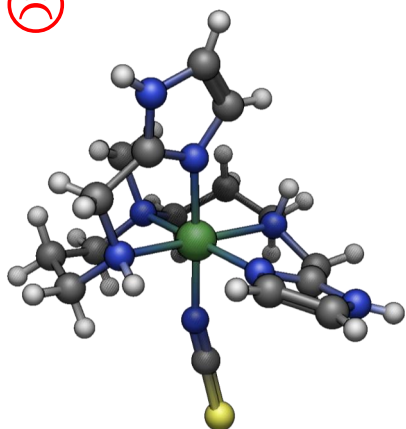
# Bottom line: balancing cost vs accuracy

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

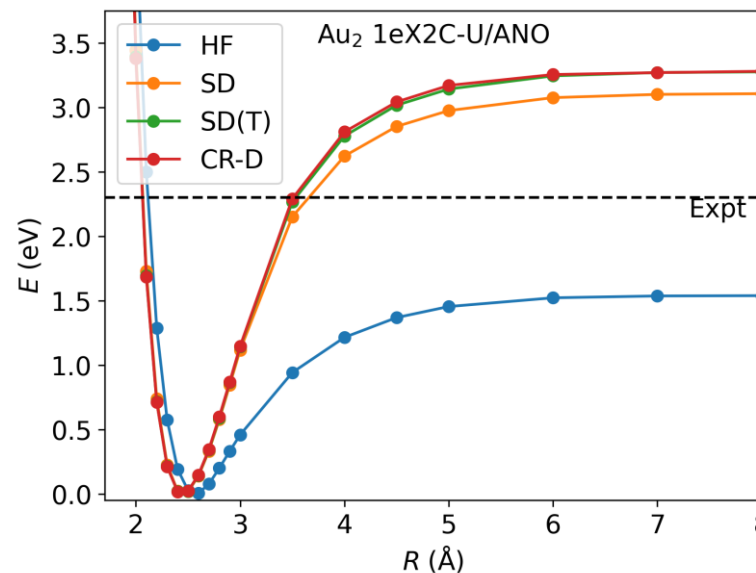


Increasingly heavy  
Relativity becomes more important

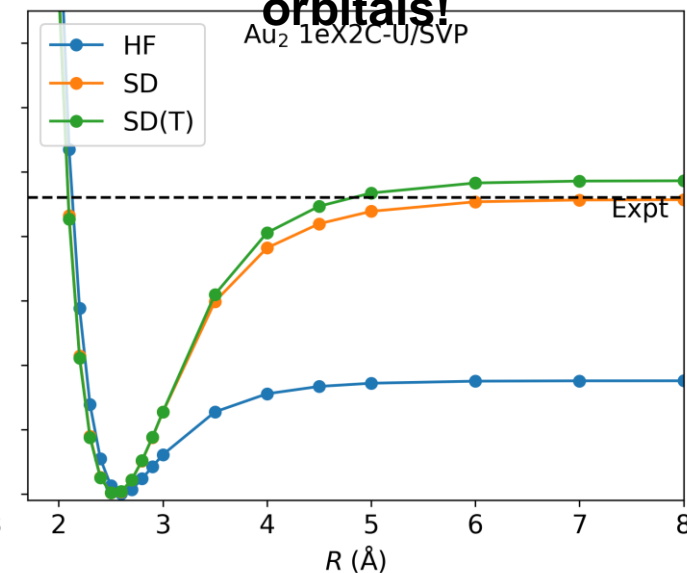
**Only 2 atoms!**

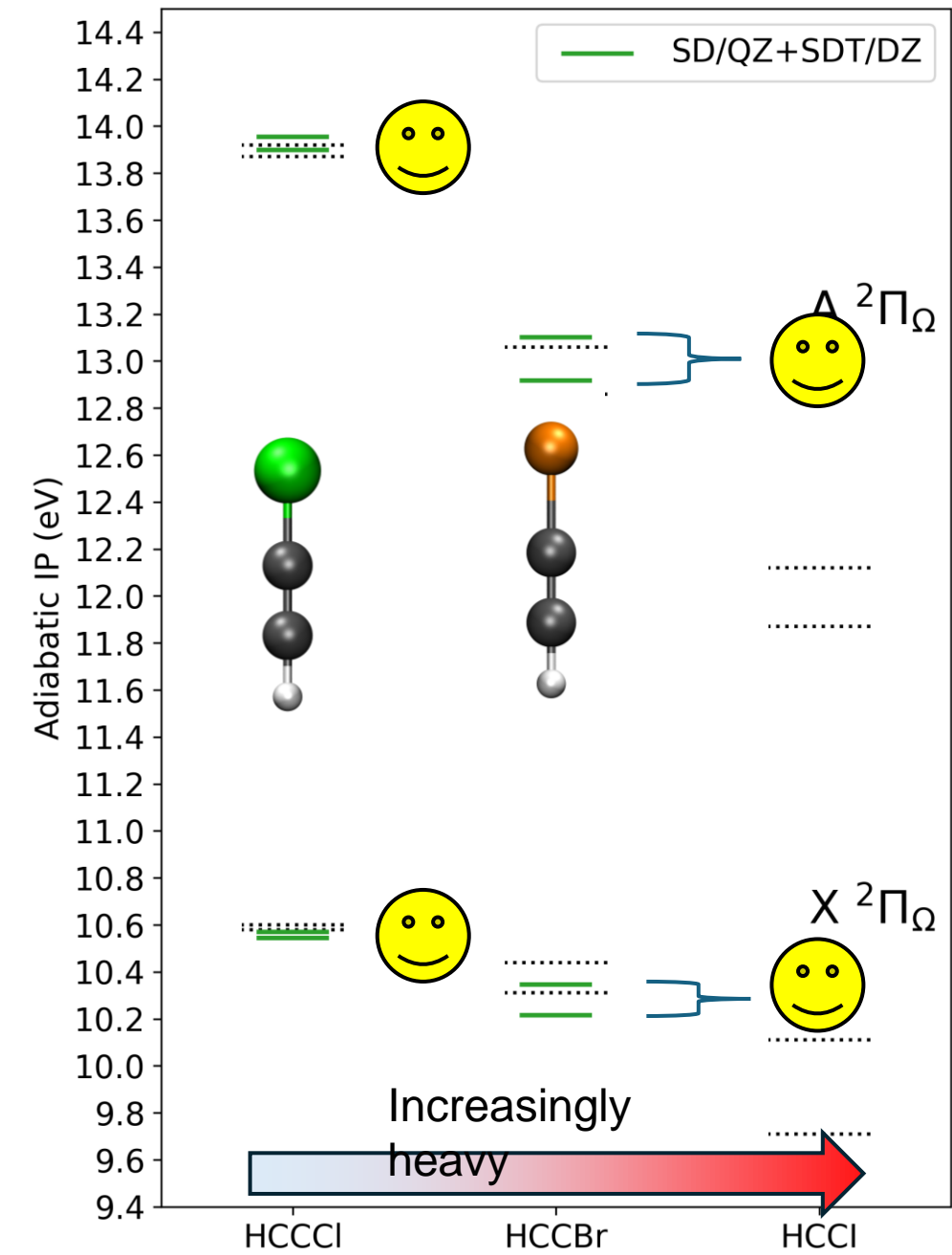


**Bad relativistic orbitals!**



**Good relativistic orbitals!**

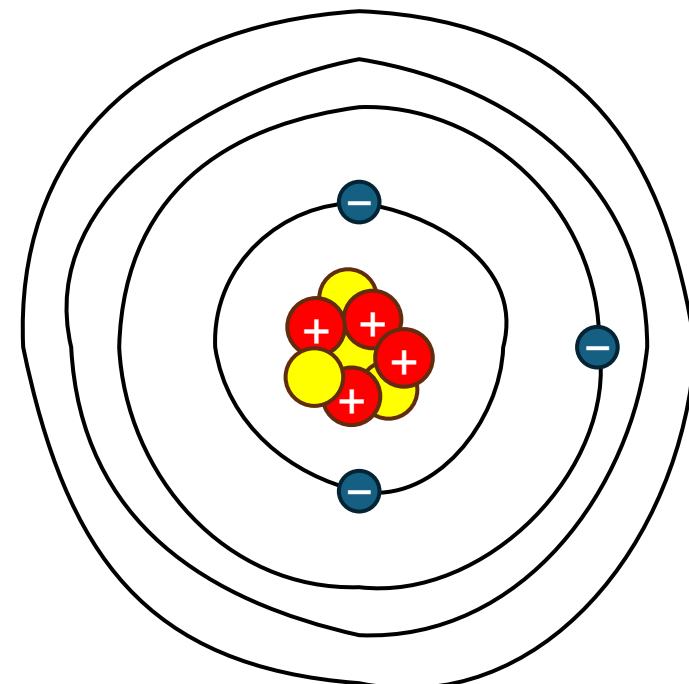
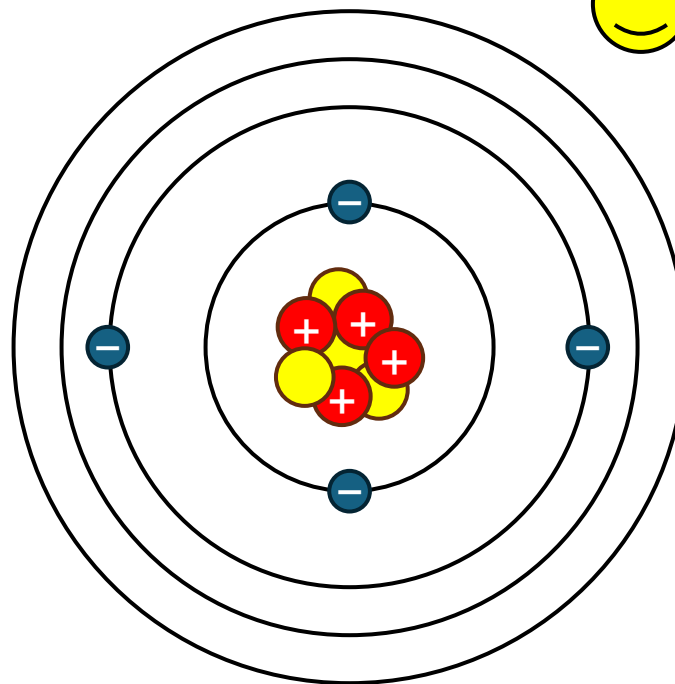
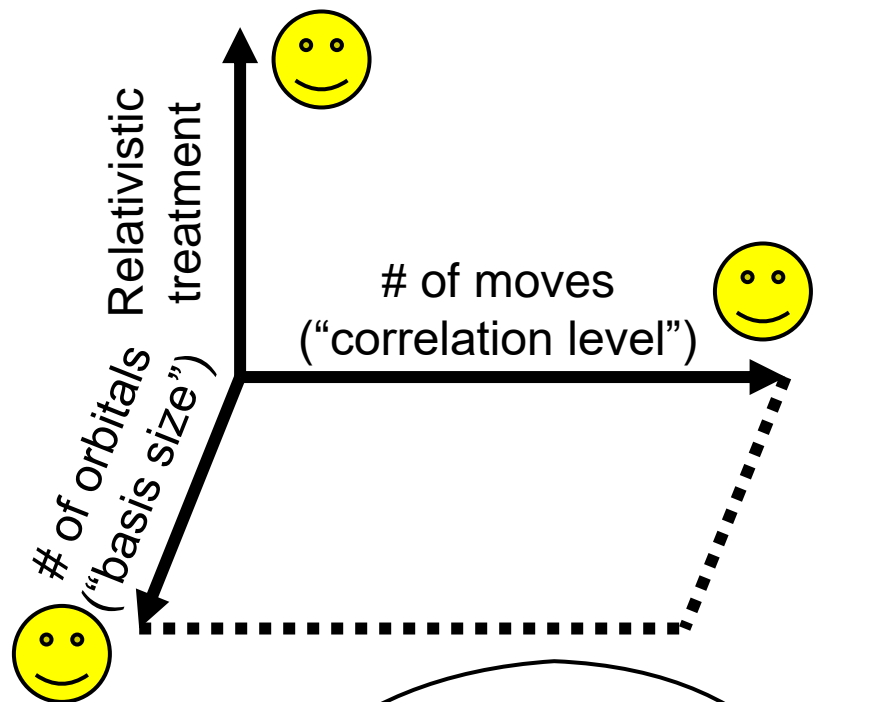
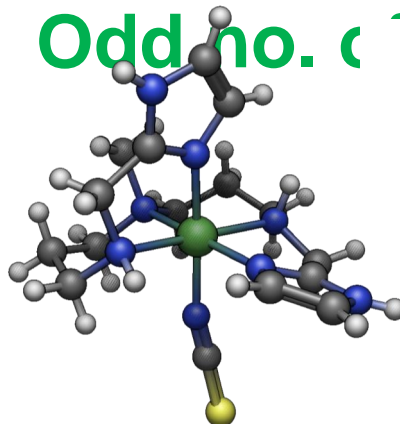




Only 4 atoms!



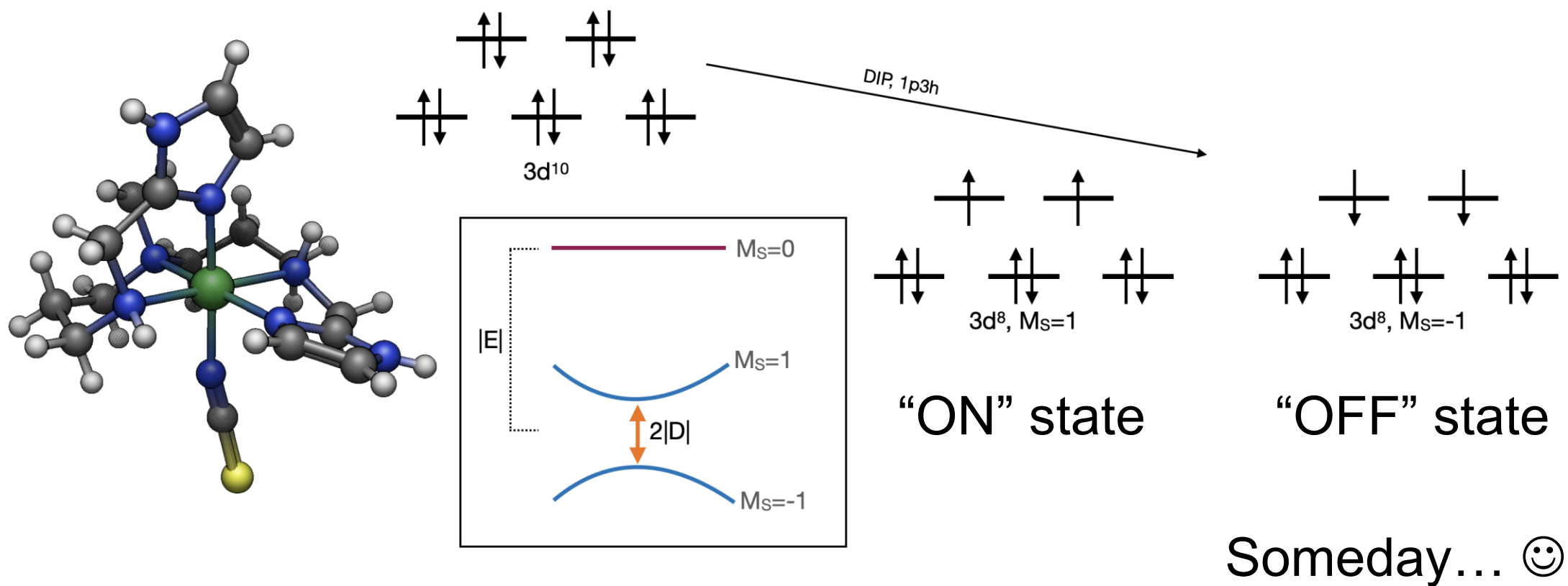
Odd no. of electrons



Work in progress...



# (one of the) goal: help design qubit material



Thank you!

# Acknowledgements



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



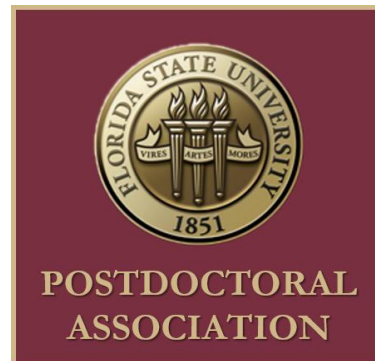
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PhD, RN



**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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# PEOPLE'S CHOICE AWARD

**Vote for your favorite  
presentation!**

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# PEOPLE'S CHOICE AWARD

**To Vote = Scan the QR Code and Then  
Click Your Favorite Number!**



**1 – Ahinsa Ranaweera**

*The HIV Capsid: A Promising Target for Anti-HIV...*

**2 – Behrouz Ghazi Esfahani**

*SPOT-RASTR: A Novel Method To Prepare CRYO-EM Samples*

**3 – Herschel Chawdhry**

*Particle Physics and the Quest for High Precision*

**4 – Kasey Longley**

*Caring for Grandparent Caregivers: Identifying Support Needs for Older Adults Raising their Grandchildren*

**5 – Katherine Odeggaard**

*A Matter of Taste: Unveiling the “New” Region in Taste Processing*

**6 - Li Guo**

*How Does Overnutrition Lead to Diabetes?*

**7 - Pearl Rivers Key**

*Mate Choice Under the Sea: Exploring the Genetic Blueprint of Reproduction in Sea Urchins*

**8 – Shannon Griffin**

*Engineering Superconducting Magnets via Structural Simulations*

**9 – Stephen Yuwono**

*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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