



UC Davis Overview

Daniel Cebra
UC Davis





People

The UC Davis team for EIC:

- Daniel Cebra
- Manuel Calderon
- Ramona Vogt (also LLNL)
- Zach Sweger (GS 5th)
- Saeahram Yoo (GS 5th)
- Mathias Labonte (GS 2nd)
- Andrew Liggett (GS 2nd)
- Ziyuan Zeng (GS 1st)

Soon to be joining:

Daniel



Manuel



Zach



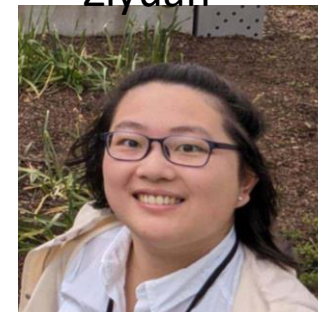
Saeahram



Mathias



Ziyuan



Other Senior Students

Matt Harasty (STAR)
Frank Gonzalez (CMS)

Group Policy
is that all
new people
joining the
group will
share time
between EIC
and other
UCD efforts.

Andrew





Prospects for more People (Faculty)

Prospects for a new faculty member:

- UCD Physics is ***still*** in the process of writing a new five-year hiring plan.
 - Six months ago, the thinking was that maybe the Dean would allow us two hires per year.
 - ➔ Nuclear was ranked sixth in priority, which would have suggested a new hire in 2026
 - Painful reality confronted us in the summer of 2023, and got worse on the fall and winter
 - ➔ The Governor is further cutting the State's contribution, this hurts L&S
 - ➔ UCD has a structural deficit, with the deficit being worst in L&S
 - ➔ The University has dictated a annual budget cuts for the next six years
 - ➔ The Dean's office pushes back on Physics department's plan, especially startup costs.
 - The department planning committee got more conservative
 - ➔ Dropped a generic "new initiative from the priority list ➔ Nuclear move up to 4th.
 - ➔ The dean pushed back further on our 1st priority CME (\$ 1.5M startup)
 - ➔ Nuclear moves up to 3rd.
- ➔ The Ask that we are now voting on includes a joint UCD/LNBL hire in 2026.

I expect a positive vote by next Wednesday



Prospects for more People (PD or Grads)

Prospects for a Postdoctoral Scholar:

- **No more PD opportunities at UCD.**
- Decided to convert the PD funding into more partial funding for GS, now funding two students who are resident at LBNL (Zach Sweger and Mathias Labonte).

New graduate students:

- Recruiting for new graduate students starts on Friday March 15th
- All new students joining the group will split time between EIC and another UCD effort.

Undergraduates:

- New our most experienced EIC students at LBNL, it is not currently possible to bring undergrads onto EIC projects. This will change when Saeahram returns from CERN and Ziyuan restarts research activities in the Spring quarter.



Physics Interests

How do our current interests mesh with the EIC?

Daniel



Manuel



- Phase Diagram on QCD Matter
- → Working with Spencer Klein on Backward Vector Meson Production, DVCS, . (Zach Sweger, Mathias Labonte, Ziyuan Zeng)
- Nuclear Data for Space Radiation Protection
- Astatine-211 production and applications
 - Detector development
 - → Efforts to assist Nikki Apadula's work (Mathias Labonte, Saeahram Yoo, Andrew Liggett, and Ziyuan Zeng)
- Heavy Flavor (Upsilon) Production
- → Saeahram Yoo has made progress. Working with LBNL group (Minjung, Yuanjing, Xin, and Spencer)
- Outreach (IMAX Movie)



Past Progress

MRPI Goals:

Encourage collaboration between personnel from campuses and labs to develop EIC detector proposals.

Historical Timeline:

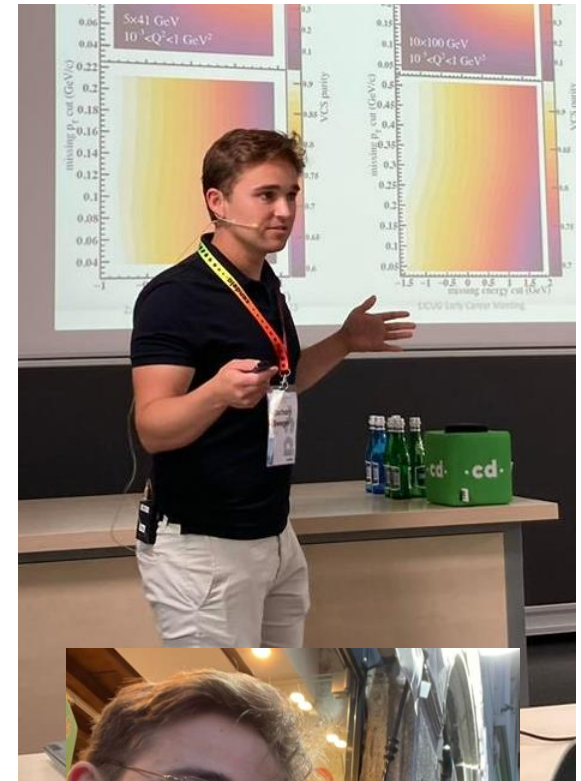
- Sam Heppelmann (UCD GS) moved to LBNL to work with Spencer on Vector Meson Production (2019-2021) (Now a staff scientist at LLNL)
- Zach Sweger (UCD GS) completed the Backward Vector Meson Production paper <https://journals.aps.org/prc/pdf/10.1103/PhysRevC.106.015204>. (LDRD 2021)
- Zach moved to LBNL in summer 2022.
- Zach starts DVCS project with Spencer in summer 2022. Paper now ready to submit.
- UCD hosts EIC Consortium meeting July 2022.
- Mathias Labonte, Saeahram Yoo, and Ziyuan Zeng commit to going to LBNL to work with Nikki on thermal measurements of carbon fiber structures in Fall 2022.
- Mathias moved to Berkeley in summer of 2023

***One of our goals has been to have a UCD grad student resident at LBNL (now two):
→ Sam Heppelmann (2020-2021), Zach Sweger (2022-2025), Mathias Labonte (2023-)***



Recent Progress - Zach

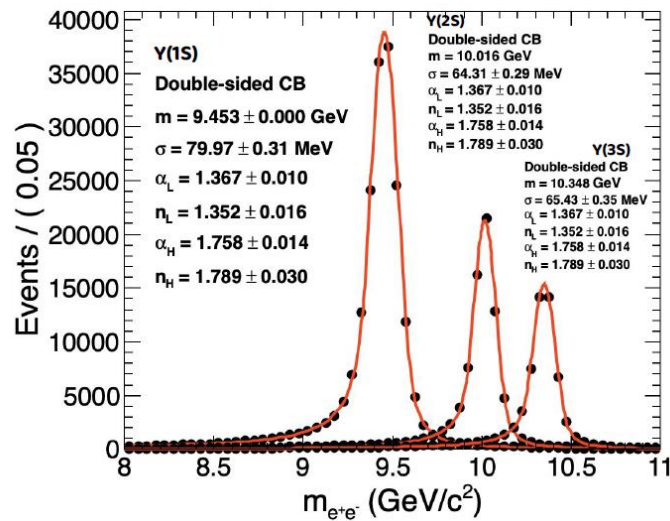
- Zach's paper was published (editor's suggestion) by PRC: Z. Sweger, S.R. Klein, Y. Ji, M. Kim, S. Yoo, Z. Zeng, D. Cebra, X. Dong, Modeling Backward-Angle (u -channel) Virtual Compton Scattering at an Electron-Ion Collider, (<https://journals.aps.org/prc/abstract/10.1103/PhysRevC.108.055205> 2023).
- Zach attended the EPIC Collaboration meeting at Argonne in January to participate in workfests.
- Zach was invited to speak at the [CFNS First Workshop on Baryon Dynamics](#) at Stony Brook in January, on interpretations of u -channel physics at the EIC. His talk is can be found here: <https://indico.cfnsbu.physics.sunysb.edu/event/113/contributions/763/attachments/154/224/uChannelInterpretations-2.pdf>
- Zach also worked on some studies on ZDC requirements for backward physics channels to inform the ZDC design.
- Zach is currently working with the Exclusive/Diffractive/Tagging group on far-forward benchmarks for B0 and ZDC development.





Recent Progress - Saeahram

- Saeahram gave a talk at the ePIC Exclusive/Diffractive/Tagging meeting on the work she's been doing with Minjung.
- The main result is shown here.
- She has since been focusing on upsilon polarization.
- Saeahram is now in CERN focusing on CMS. She returns on March 27th, and will re-engage in EIC work.



- She is also penciled in to help Mingjung with the quarkonia mass resolution plots for the TDR



Recent Progress - Mathias

Mathias is continuing the ongoing cooling studies with Nikki, where we are trying to identify an ideal stave material and configuration to supply air cooling to the silicon tracker. Mathias is our most experienced student with this group. He has helped bring Saeahram, Ziyuan, and Andrew up speed.

Mathias is starting a simulation project with Spencer. Using BeAGLE (an eA event generator) to look at how well we can parse coherent vs. Incoherent events. Starting this by looking at events of the variety $eA \rightarrow \text{Gamma}$ (The nucleus excites, then de-excites, and shoots a gamma into the ZDC). How well will the ZDC be able to measure these gammas?





Plans - Overview

Physics Goals: Heavy quarkonia production in DIS and in photon-nucleus collisions

Building on the expertise of Calderon, who has studied epsilon production at RHIC and at the LHC in $p+p$, $p+A$, and $A+A$ collisions, and the theoretical work of our colleague, Ramona Vogt, we would like to continue this research into the EIC era.

Photonuclear collisions involving the exclusive production of light vector mesons (ρ , ω , Φ) and of heavy quarkonia (J/ψ and Y particles) provide an excellent tool to probe gluon distributions at low x . Tagging the outgoing electron and is necessary to fully constrain the kinematics. Tracking is essential for the measurement of the leptons from the decays of the vector mesons and heavy quarkonia – this stimulates our interest in tracking simulations and performance.



Summary and Outlook

Summary:

- UCD has had a GS resident at LBNL (SH → ZS → ML → ...). Now two students.
- Zach completed and published work started by SH and supervised by SK.
- Zach has completed the DVCS project, paper published (supervised by SK).
- Saeahram will assist in producing TDR plots.
- Mathias, Saeahram, Andrew, and Ziyuan have joined the hardware effort at LBNL (led by NA).

Outlook:

- Faculty hire likely in the 2026 timeframe.
- Converted Postdoctoral scholar position to more GSR funding.
- Started UCD efforts in heavy flavor production and polarization.