Preparing for Undergraduate Research Day

Rebecca Alexander on behalf of
the URECA Center committee

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ZSR Auditorium | July 27, 2017

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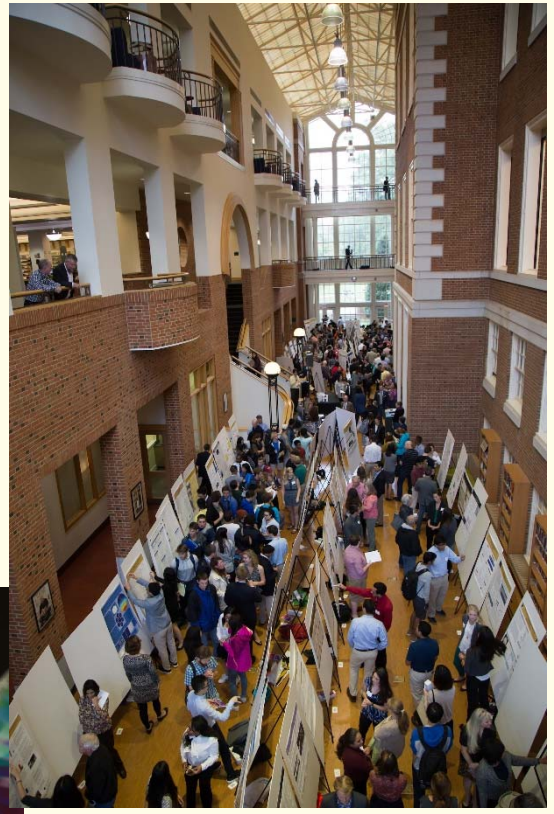
Undergraduate Research Day

This is one of the best days of the year!



3 – 5 p.m.

Family Weekend

Talks

Poster session

Oral presentations

- Only ~10-12, typically more humanities projects
  - In two different rooms
  - Running at the same time as poster session
  - 8-10 minute talks, including questions
- Works well if you have a story to tell
- Audience is smaller
- Okay to use slides or just talk
- Best when it's not reading a paper

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Poster presentations

Most students will do posters (~120 of these!)

Great way to present images, data, charts

Needs more pre-planning

Bigger audience

Presentation is easier

How to make a poster

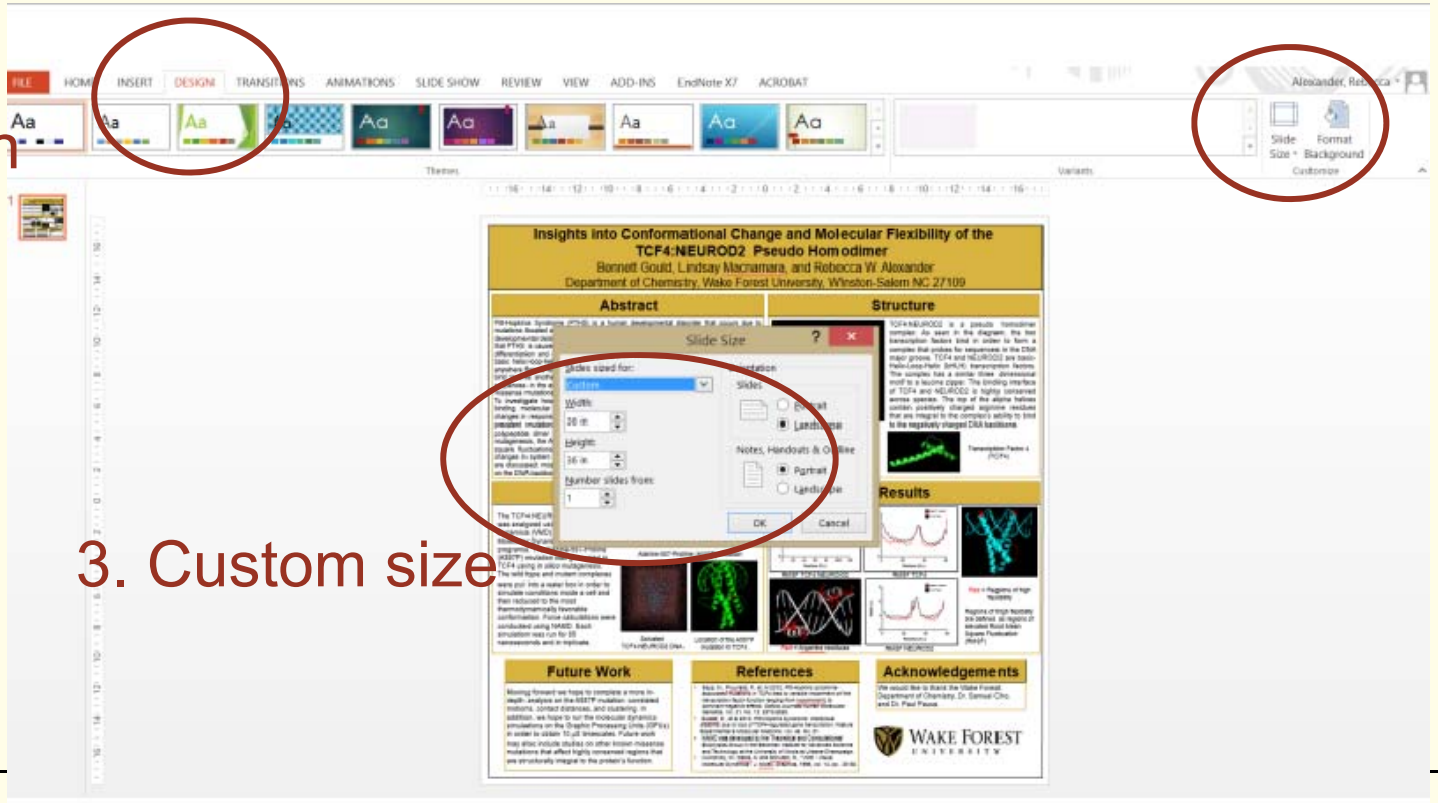
Just use PowerPoint!

Format for 36X36" – one big slide

Template available on ureca.wfu.edu

2. Slide size

1. Design



3. Custom size

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URECA will pay!

Convert your .pptx to .pdf to make sure nothing changes

Send to copies.wfu.edu

Subject line “to print for Research Day”

Include your name in the file “Alexander_poster.pdf”

We’ll pay for one 36X36 poster

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How to make a GOOD poster

Lots of suggestions at http://colinpurrington.com/tips/poster-design

Key points:

Pictures >>> Words

Use color without being too cute

Font large enough to read from 3 ft away

- Title = 60-72 pt
- Headings = 40+ pt
- Text = 36 pt
- Figure legends, citations = 24 pt

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Here's a GOOD poster

Identifying Pre-Columbian Housefloor Dimensions through Lithic Analysis at the Redtail Site (31Yd173)

Maya Krause – *Anthropology, Biology Minor*

Introduction

This archaeological research analyzes the spatial distribution of lithic materials in an attempt to identify the dimensions of a housefloor at the Late Woodland Period Native American settlement, dating to about AD 1325. The Redtail site (31Yd173) provides archaeologists with a distinctive example of a precontact single family settlement in the upper Yadkin River Valley (Figure 1). Ongoing excavations at Redtail have revealed a potential housefloor, trash disposal area, and several pit features. Previous results show that as ceramic sizes and concentrations in 1 meter areas decrease, organic sediment content rises, suggesting a maintained surface with repeated human activity. This pattern generally indicates the existence of a housefloor. The identification of housefloor dimensions reveals invaluable details concerning household size, domestic activities, and social interactions. This work explores important questions regarding the lived experience of individuals and their communities in the North Carolina Piedmont.

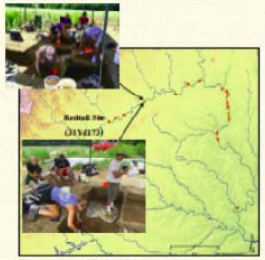

Figure 1. Map of Redtail Site location in upper Yadkin River Valley and a photos from excavation during summer 2016.

Site History

In most of the Piedmont Southeast the Late Woodland Period began around 800 A.D. and culminated by 1600 A.D. The Piedmont Village Tradition (PVT) refers to a culture that developed in the upper Yadkin River Valley. Most people had been living in scattered settlements, usually consisting of a single household, but by 1100 A.D. populations began to consolidate (Ward & Davis 1999: 98). However, these changes did not happen uniformly across the Piedmont. Some settlements, like Redtail, remained isolated, with relatively little interaction with neighboring hamlets. Houses at these settlements were generally constructed using wooden posts, rarely over 10cm in diameter (Ward & Davis 1991: 218). Two basic house styles have been distinguished: a small rectangular form averaging around 7 X 4m; and a larger style (Ward & Davis 1999: 218). However, the sandy and acidic sediment causes unique preservation issues for archaeologists attempting to identify housefloors dimensions. Therefore, it is important to consider other lines of evidence, such as sediment analysis, ceramic analysis, and lithic analysis. At the Redtail site (31Yd173) excavations have revealed a 12 X 18m cultural lens with over 400 postmolds.

The lithics at this site are dominated by local quartz, however other materials seem to be worked as well, including rhyolite, quartzite, jasper, and chalcedony.

Methods

Quartz flakes from unit 56, potential housefloor.

Rhyolite flake from unit 56, potential housefloor. Example of 1cm sizing.

My research took a random sample from three excavation blocks of continuous units (Blocks A, B, and C). This random sample represented a potential housefloor area, a potential pit feature or activity area, and other general use areas of the site (Figure 2). The units in the potential housefloor were established based on their increased organic content. Lithics were analyzed by material and for any features that indicated they had been worked, including ereillure scars, bulbs of percussion, and radiating fissures. If none of these features could be identified the lithic was classified as general debitage. For each lithic, a general sizing was taken (this sample ranged from 1-6cm). Lithics were also separated based on material and each assemblage per unit was weighed. Only materials from the ¼ inch screens were analyzed.

Quartz flake and core from unit 56, potential general use area.

Quartz flakes from units 40 & 42, potential midden area.

Discussion

This data set serves as one o the many components of a multi-faceted housefloor identification project at the Redtail Site (31Yd173). The lithic analysis presented here, is just one line of evidence. Other research highlights sediment analysis and ceramic analysis. The proposed hypothesis maintains that the 12x18m cultural lens represents a housefloor area that experienced repeated human activity. The lithic analysis revealed that average lithic weight can be used as an indicator of site maintenance, as the differences in weighes were significant between the housefloor and other areas of the site. The general count of lithic artifacts between areas of the site were not significant, however artifact counts may be a problematic measure of site maintenance. It would have been difficult in the prehistoric Piedmont to clear of surfaces entirely. Therefore, site maintenance would only remove large and heavy artifacts. As a results lithic weight is the best measure of site maintenance. This research is important to the study of the Piedmont Valley Tradition because it will provide another example of a housefloor and, in turn, the internal arrangement of a site.

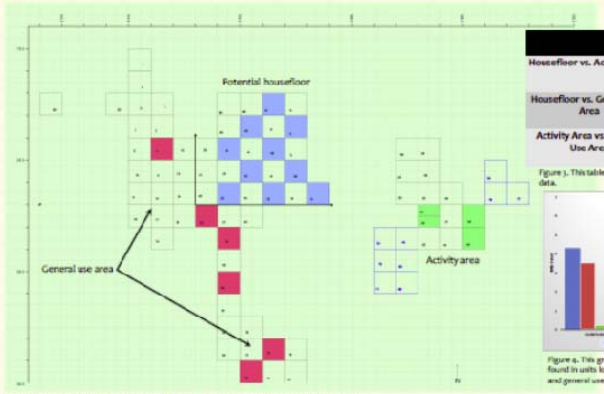

Figure 2. This site map highlights the units from the Redtail Site used in this sample.

Lithic Analysis	Lithic Weight (g):
Housefloor vs. Activity Area	M_{HF} = 13.10 M_{AA} = 167.33 t(11) = 1.796, p = 0.002
Housefloor vs. General Use Area	M_{HF} = 13.10 M_{GA} = 44.16 t(153) = 1.753, p = 0.038
Activity Area vs. General Use Area	M_{AA} = 167.33 M_{GA} = 44.16 t(8) = 1.860, p = 0.034

Figure 3. This table displays the t-test results from the lithic data.

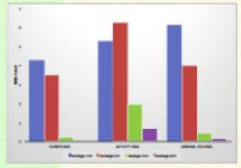

Figure 4. This graph shows the average sizes of lithic artifacts found in units located in the potential housefloor, activity area, and general use area.

Results & Interpretations

The results from this sample at the Redtail Site showed that, on average, the potential housefloor area contained smaller (in weight) lithic artifacts, averaging 13.1g per unit. The potential housefloor area also contained the fewest lithic artifacts, averaging 8 pieces per 1x1m unit. Alternatively, the potential pit feature area, or activity area, contained the largest (in weight) lithic artifacts, averaging 167.33g per unit. The potential pit feature area also contained the highest concentration of lithic artifacts, averaging 34.33 pieces per 1x1m unit. The other areas of the site fell between the two extremes, averaging 30.86 lithic artifacts per 1x1m unit and 44.16g. A two sample t-test assuming equal variances demonstrated significant differences in litnic weight between the housefloor and the activity area ($p=0.062$), the housefloor and the general area ($p=0.038$), and the activity area and the general area ($p=0.034$).

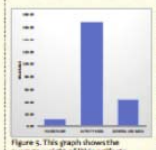

Figure 5. This graph shows the average weight of lithic artifacts found in units located in the potential housefloor, activity area, and general use area.

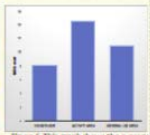

Figure 6. This graph shows the average count of lithic artifacts found in units located in the potential housefloor, activity area, and general use area.

Acknowledgements

This work was made possible by Dr. Eric E. Jones and the Anthropological Geographic Analysis Laboratories of Wake Forest University, Wake Forest University Anthropology Department, Wake Forest University UREGA, and my family and friends. Dedicated to John N. Krause III.

References

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And another

Aminotransferase activity of a novel AARS appended domain

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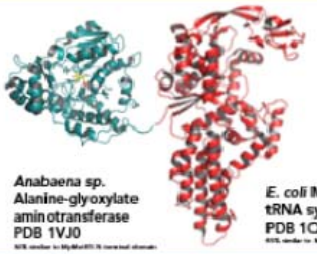
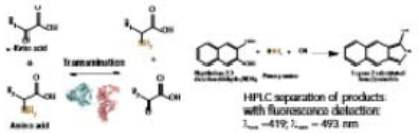
Program #751.3

Aminoacyl-tRNA synthetases (AARSs) are key enzymes in protein biosynthesis, responsible for attaching amino acids to the 3'-end of cognate tRNAs. The AARSs are modular proteins, with separate polypeptide domains responsible for tRNA binding and catalysis; additional domains on some AARSs contribute oligomerization, localization, and editing functions. The opportunistic pathogen *Mycoplasma penetrans* expresses an unusually long version of methionyl-tRNA synthetase (MetRS) that contains an extra N-terminal domain with sequence homology to class V aminotransferases. We anticipated that this domain carries out pyridoxal phosphate (PLP)-dependent aminotransferase activity, possibly to modify Met-tRNA^{Met} for enhanced pathogenicity.

We overexpressed and purified *M. penetrans* MetRS (MpMetRS) and used the amino-reactive aromatic dialdehyde naphthalene-2,3-dicarboxaldehyde followed by HPLC to analyze enzyme activity in vitro. Initial characterization confirms the proposed aminotransferase activity, with several amino acids and α-keto acids serving as amino group donors and acceptors, respectively. Substitution of amino acids in the transferase and synthetase catalytic sites indicate that these activities are independent. Ultimately we seek to identify the cellular substrates and implications of the MpMetRS aminotransferase activity.



Does the N-terminal appended domain of MpMetRS catalyze aminotransferase activity?

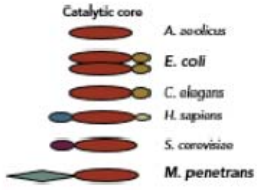


Mycoplasma penetrans

- Bacteria of class Mollecutes
- Opportunistic human pathogen
- Colonizes urogenital and respiratory tracts of immuno-compromised individuals
- Small (1.3 Mb) A:T-rich genome

Methionyl-tRNA synthetase

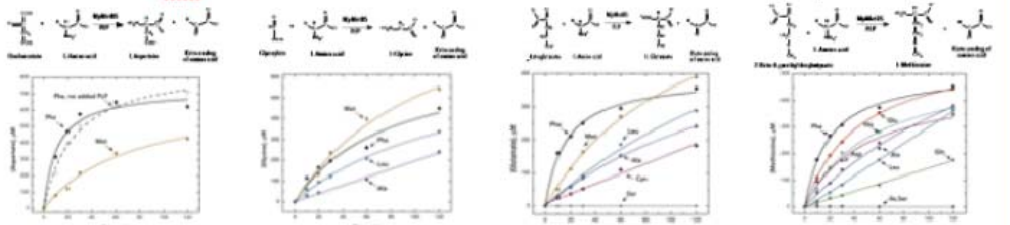
- Essential for protein biosynthesis
- Catalyzes methionine activation and transfer to tRNA^{Met} or tRNA^{fMet}
- Exhibits great structural diversity through evolution: a common core with varied appended domains



- What is the role of extra protein domain in MpMetRS?
- Why does a parasitic organism with a condensed genome have an extra-long MetRS?

Appended domain is homologous to Class V PLP-dependent aminotransferases

Which α-keto acids and amino acids are *in vitro* substrates? Is methionine a substrate or a product?

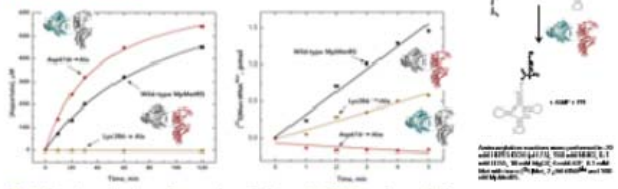


Exogenous PLP is not necessary, indicating that the enzyme is purified with bound PLP

A wide variety of substrates are used by the aminotransferase active site in vitro, with varying efficiencies. Not all amino acids are suitable amino group donors.

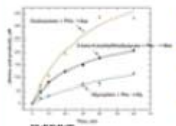
Are the catalytic activities of the domains independent or coupled?

- Aminotransferase domain: Lys-386 is key PLP binding residue
- Synthetase domain: Asp-616 is key ATP binding residue



Mutation to aminotransferase domain impacts tRNA aminoacylation

What are the preferred substrates?
What are the *in vivo* substrates?



Next steps: *in vivo* experiments
Hypothesis: the aminotransferase domain is generating methionine

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Here's a BAD poster

PIGS IN SPACE: EFFECT OF ZERO GRAVITY AND AD LIBITUM FEEDING ON WEIGHT GAIN IN CAVIA PORCELLUS

Colin B. Purrington
6673 College Avenue, Swarthmore, PA 19081 USA

ABSTRACT:

One ignored benefit of space travel is a potential elimination of obesity, a chronic problem for a growing majority in many parts of the world. In theory, when an individual is in a condition of zero gravity, weight is eliminated. Indeed, in space one could conceivably follow ad libitum feeding and never even gain an gram, and the only side effect would be the need to upgrade one's stretchy pants("exercise pants"). But because many diet schemes start as very good theories only to be found to be rather harmful, we tested our predictions with a long-term experiment in a colony of Guinea pigs (Cavia porcellus) maintained on the International Space Station. Individuals were housed separately and given unlimited amounts of high-calorie food pellets. Fresh fruits and vegetables were not available in space so were not offered. Every 30 days, each Guinea pig was weighed. After 5 years, we found that individuals, on average, weighed nothing. In addition to weighing nothing, no weight appeared to be gained over the duration of the protocol. If space continues to be gravity-free, and we believe that assumption is sound, we believe that sending the overweight — and those at risk for overweight — to space would be a lasting cure.

INTRODUCTION:

The current obesity epidemic started in the early 1960s with the invention and proliferation of elastane and related stretchy fibers, which released wearers from the rigid constraints of clothes and permitted monthly weight gain without the need to buy new outfits. Indeed, exercise today for hundreds of million people involve only the act of wearing stretchy pants in public, presumably because the constrictive pressure forces fat molecules to adopt a more compact tertiary structure (Xavier 1965).

Luckily, at the same time that fabrics became stretchy, the race to the moon between the United States and Russia yielded a useful fact: gravity in outer space is minimal to nonexistent. When gravity is zero, objects cease to have weight. Indeed, early astronauts and cosmonauts had to secure themselves to their ships with seat belts and sticky boots. The potential application to weight loss was noted immediately, but at the time travel to space was prohibitively expensive and thus the issue was not seriously pursued. Now, however, multiple companies are developing cheap extra-orbital travel options for normal consumers, and potential travelers are also creating news ways to pay for products and services that they cannot actually afford. Together, these factors open the possibility that moving to space could cure overweight syndrome quickly and permanently for a large number of humans.

We studied this potential by following weight gain in Guinea pigs, known on Earth as fond of ad libitum feeding. Guinea pigs were long envisioned to be the "Guinea pigs" of space research, too, so they seemed like the obvious choice. Studies on humans are of course desirable, but we feel this current study will be critical in acquiring the attention of granting agencies.

MATERIALS AND METHODS:

One hundred male and one hundred female Guinea pigs (Cavia porcellus) were transported to the International Space Laboratory in 2010. Each pig was housed separately and deprived of exercise wheels and fresh fruits and vegetables for 48 months. Each month, pigs were individually weighed by duct-taping them to an electronic balance sensitive to 0.0001 grams. Back on Earth, an identical cohort was similarly maintained and weighed. Data was analyzed by statistics.

RESULTS:

Mean weight of pigs in space was 0.0000 +/- 0.0002 g. Some individuals weighed less than zero, some more, but these variations were due to reaction to the duct tape, we believe, which caused them to be alarmed push briefly against the force plate in the balance. Individuals on the Earth, the control cohort, gained about 240 g/month ($p = 0.0002$). Males and females gained a similar amount of weight on Earth (no main of effect of sex), and size at any point during the study was related to starting size (which was used as a covariate in the ANCOVA). Both Earth and space pigs developed substantial dewlaps (double chins) and were lethargic at the conclusion of the study.

CONCLUSIONS:

Our view that weight and weight gain would be zero in space was confirmed. Although we have not replicated this experiment on larger animals or primates, we are confident that our result would be mirrored in other model organisms. We are currently in the process of obtaining necessary human trial permissions, and should have our planned experiment initiated within 80 years, pending expedited review by local and Federal IRBs.

ACKNOWLEDGEMENTS:

I am grateful for generous support from the National Research Foundation, Black Hole Diet Plans, and the High Fructose Sugar Association. Transport flights were funded by SPACE-EXES, the consortium of wives divorced from insanely wealthy space-flight startups. I am also grateful for comments on early drafts by Mañana Athletic Club, Corpus Christi, USA. Finally, sincere thanks to the Cuy Foundation for generously donating animal care after the conclusion of the study.

LITERATURE CITED:

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Sekulić, S.R., D. D. Lukač, and N. M. Naumović. 2005. The Fetus Cannot Exercise Like An Astronaut: Gravity Loading Is Necessary For The Physiological Development During Second Half Of Pregnancy. Medical Hypotheses. 64:221-228

Xavier, M. 1965. Elastane Purchases Accelerate Weight Gain In Case-control Study. Journal of Obesity. 2:23-40.

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How to present a poster

Practice a 3-minute version of your project

Show enthusiasm

Get to the punch line – what did you learn?

Make sure you can answer questions if people are interested

Only put things on your poster you can explain

Other details

"Business casual" dress

- Pants and polo or button-up for men
- Skirt or pants for women
- Don't need to wear a suit
- Comfortable shoes! ☺

Don't chew gum

Hands out of pockets

Look people in the eye

Have fun!

How to talk about your summer experience

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When might you need to?

- Job interview
- Grad/Med/etc school interview
- Meeting with your academic advisor
- Cocktail party with your future in-laws

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What to think about

- How to use the experience to tell about yourself
  - How did you grow?
  - What skills did you develop?
  - What are you prepared to do now?
- The project itself might be peripheral

STAR Approach

For a "Behavioral Interview"

- Situation/Task
- Action
- Result

Use the STAR method to answer

What was the most difficult task you performed during your summer project?

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Next steps

Keep working on your project

Consider an honors thesis

Follow us on Twitter @WFU_URECA

Sign up for Handshake, LinkedIn

Come to

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Remember

Undergraduate Research Day - Friday of Family Weekend

Abstract will be due 2 weeks ahead