




**So You Were Chosen for
NITARP**

Questions we had:

- 1) What kinds of research can a person like me do?
 - 2) What will our year together look like?
 - 3) What about the students?
 - 4) What about our trips?
 - 5) What about our workload?
 - 6) What are some benefits of NITARP? (Why am I doing this??)
 - 7) Umm, advice???
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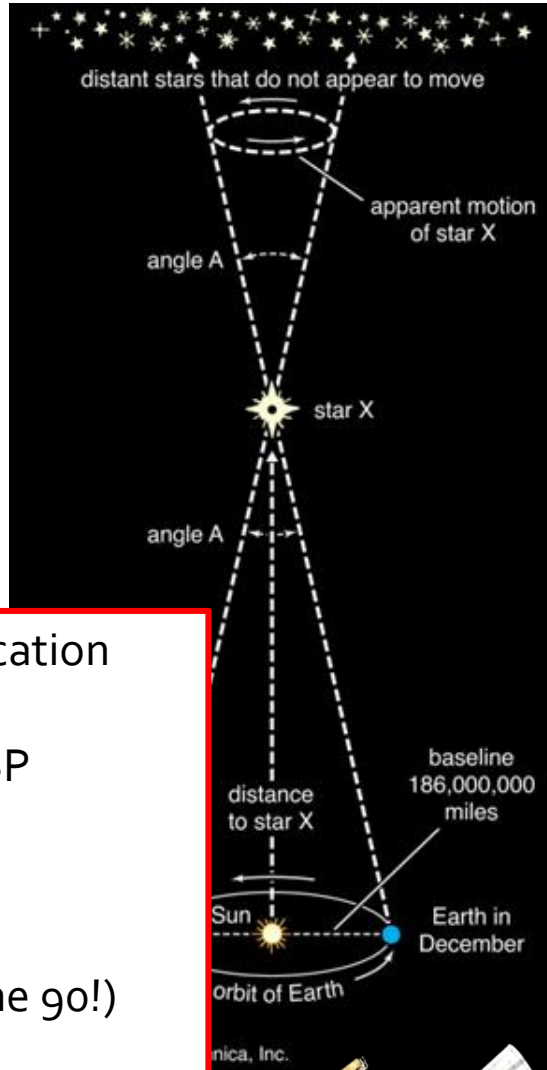
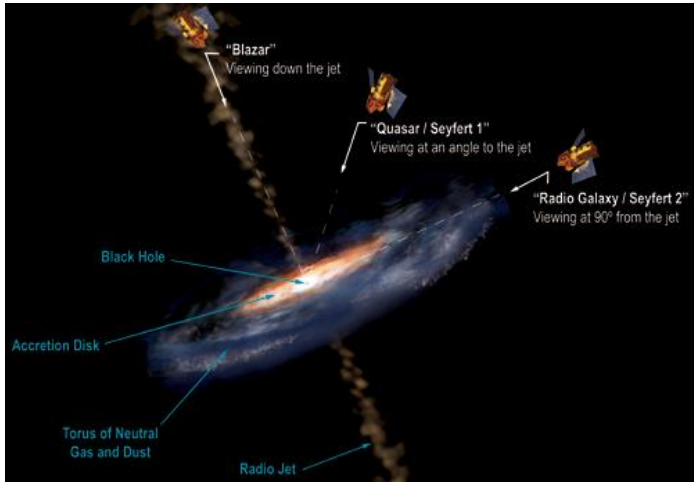
1. What Kinds of Research Can a Person Like Me Do?

Ben's Projects

- (Young Stellar Objects 'YSOs', with Luisa during Covid) - Two years of virtual work, posters and AAS meetings... Evidence for young stellar objects in the Nebular Stream of the Spider Nebula (IC417).
- Cyclops AGN w/Varoujan, 2024 - Prior work by Souchay et al identified 41 "misbehaving" active galactic nuclei with measured Gaia proper motions. Our work sought to expand the list of known AGN with this issue and determine the source(s) for their anomalous measured motion.

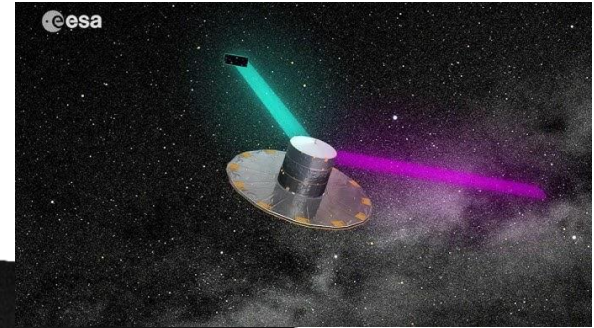
Jeff's Projects

- fIRes w/Varoujan, 2022 – Finding evidence of rocky planets around red dwarf stars using the technique of infrared excess
- Star Chasers w/Luisa. 2024 – Finding YSOs in two star-forming regions within Cassiopeia



Souchay et al ~500,000 starting pool

Cyclops AGN Gaia ~4,500,000 starting pool
(90% confidence AGN)



Misbehaving AGN vetted for sky location

No bias seen

Pool vetted with WISE W2 vs Gaia BP

Doesn't look like dust extinction

Color-Color plots of many types

They all look typical

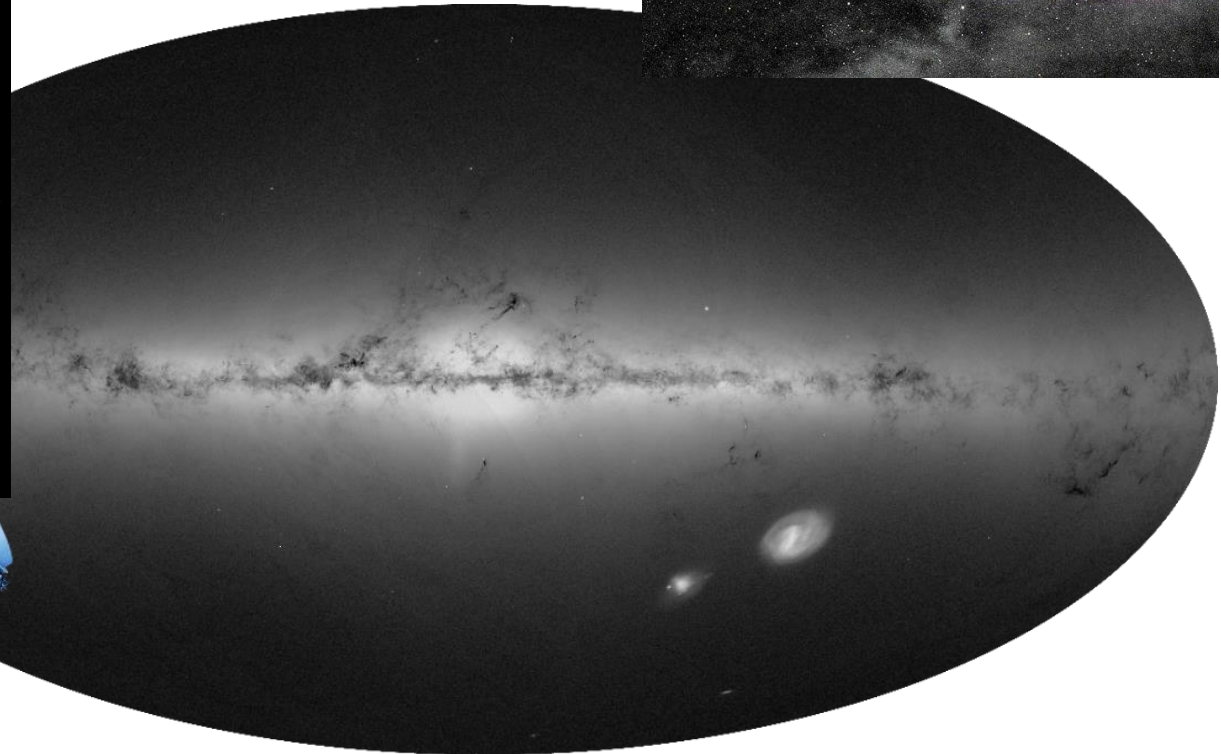
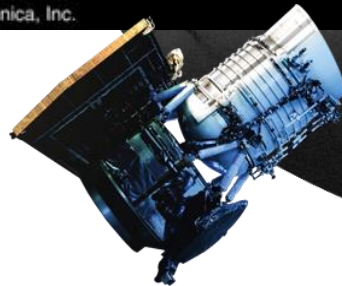
Stellar Contaminants (remember the go!)

A few stellar objects but VERY few

Double AGN??

Found some in our sample, but not enough

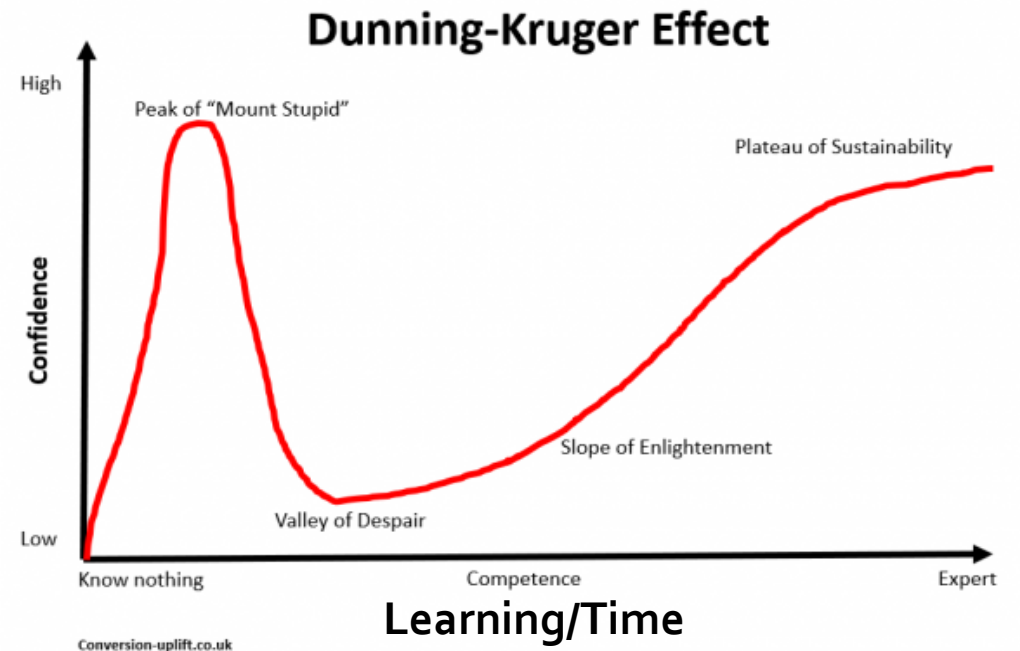
We remain with nearly 800 candidate AGN
with a measured proper motion.



2. What Will Our Year Together Look Like?

I. Learning (January – Summer, and really always)

- Weekly Zoom/Webex/“telecon” meetings
- Learn (actively celebrate wonder and curiosity, actively challenge confusion)
- Become confused, frustrated, etc.
- Learn some more
- Learn some more
- Write the group proposal ~March
- Onboard students as you choose them





AAS 243 125 YEARS
243RD MEETING OF THE AMERICAN ASTRONOMICAL SOCIETY NEW ORLEANS, LOUISIANA 7-11 JANUARY 2024
Join with the AAS High Energy Astrophysics and Historical Astronomy Divisions

NITARP Orientation Workshop
8:00 AM - 5:00 PM

AAS AMERICAN ASTRONOMICAL SOCIETY



2. What Will Our Year Together Look Like?

III. Data Analysis (Summer – December)

Create... "the poster(s)"

- Data Analysis & Selection at home and on Webex
- Poster Prep (x2)

Survey of the Spitzer Enhanced Imaging Products (SEIP) Catalog for Potential Debris Disks Around Main Sequence M Class Stars

Abstract

With the shift to NGSS, the focus is now on phenomenon-based learning and asking questions. After starting NITARP, I began to encourage my students to ask questions which lead to more discussion, deeper thought, and applying new knowledge.

- Will there be any effect in the far away future if there's no eclipses and the moon is slowly moving away from the Earth?
- What do geologists do when finding layers but it's not there like a uniformity or here or fossil?
- If humans look at break from burning so many fossil fuels could the climate go back to how it should be?
- Did the Cambrian explosion greatly affect greenhouse gases?

Color-Color Diagram

Examples of Targets for Further Research

Methods

Distribution of Final Times

Conclusions

The Next Steps

NGSS Science and Engineering Practices in Secondary Education through Real Astronomical Research

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Abstract

Teachers and their students of the 185x team utilized the Science and Engineering Practices of the Next Generation Science Standards (NGSS), which strive to move the real world methods of "doing science" into classrooms. One educational focus for this project was to incorporate the eight practices of science and engineering that are identified in the NGSS into student instruction, especially those of questioning, active student research, collaboration with peers, and communication of results. This research was made possible through the NASA/IPAC Teacher Archive Research Program (NITARP) and was funded by NASA Astrophysics Data Program.

Team Minnesota

Focus: Asking Questions and Defining Problems

With the shift to NGSS, the focus is now on phenomenon-based learning and asking questions. After starting NITARP, I began to encourage my students to ask questions which lead to more discussion, deeper thought, and applying new knowledge.

- Will there be any effect in the far away future if there's no eclipses and the moon is slowly moving away from the Earth?
- What do geologists do when finding layers but it's not there like a uniformity or here or fossil?
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Team Pennsylvania

Focus: Developing and Using Models

Model Used: NASA's Science of a Sphere Explorer

The Science on a Sphere Explorer is a visualization software with over 500 datasets that provides information collected from satellites, ground observations, and computer models. Models are used in science to aid in the development of questions and explanations, to make predictions, and to communicate ideas. After NITARP, I now challenge my students to ask questions and predict outcomes by a wide variety of datasets and models.

Team Illinois

Focus: Planning and Carrying out Investigations

Participating in NITARP has inspired me to review the science practices described in the NGSS and see them in a new light. Despite teaching the scientific method for the last 22 years, this was the first time that I had the opportunity to actually use it in original, professional-level research.

Team Tennessee

Focus: Analyzing and Interpreting Data

NITARP has fundamentally changed my teaching practice and solidified the idea that the way to learn science is by doing science, which prompted me to create a student scientific research group emulating the NITARP experience at an equal scale. These research opportunities specifically address the NGSS Science and Engineering practices, which require students to investigate the natural world as scientists.

Classroom Practices Inspired by NITARP

- Students self-select projects with the objective of answering scientific questions from Google.
- Students represent student research in science competitions.
- Students enroll with subject matter experts, but to the best of their ability to discover answers to their questions.

Student Perspective: How has NITARP influenced your future career choices?

"Science is not just a body of knowledge, it's a process."
- Dr. Varoujan Gorjan

Investigating Anomalies in Astrometry of AGNs in Gaia Data

David Forester¹, Varoujan Gorjan², Lenise Mason³, Michelle Rioridan⁴, Ben Sanson⁵, Dominic DeMatteo⁶, Rachel Susan⁷, Scott Pickett⁸, Daniel Caszucki⁹, Julia DeGuzman¹⁰

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Abstract

Gaia is an astrometric mission measuring the positions of millions of objects in the sky. An active galactic nucleus (AGN) is one example of such objects, and some AGNs appear as being parallel to proper motion. AGNs should show regular parallax or proper motion as they are in other galaxies, and are therefore far too distant for to detect their parallax or proper motion. The White Dwarf Asteroid Survey Explorer (WDSE) is a mission that has intentionally targeted the sky in order to identify and catalogue these quantities of AGNs, objects of which there are over 4 million AGNs, which allows us to reach larger sample sizes than what Gaia has been able to do.

Introduction

Proper motion is an apparent change in position of an astronomical object due to the object actually moving through space. Parallax is a well-understood effect in the proper motion measurement which is measured by an apparent shift in an object's position as it passes the further away an object is, the faster its transverse motion must be in order to have the proper motion detected by a set of earth-orbiting detectors. Other limitations arise due to measuring parallax, so how well we can accurately distinguish between two very close objects to the sky.

Methods

Our team has cross-matched AGNs from WISE with sources in Gaia Data Release 3 (DR3) that have proper motion. With this began a list of anomalous targets, we have performed analysis to see if there are other unique characteristics to environmental factors that they tend to align in an effort to gain insight as to why these anomalous targets are appearing. This includes cross-referencing them with optical sky surveys and other data sets.

Summary & Conclusions

We found the on-sky distribution of AGN candidates with proper motion was consistent with the parent AGN data set (Fig. 1), so that we can do statistical analysis in order to draw meaningful conclusions about why there are so many AGN candidates that are registering proper motion.

References

Smith et al. (2022) matched 152,409 sources from the Gaia DR3 catalog with Gaia Early Data Release 3 (EDR3) which led to 436,113 cross-matched celestial objects. In these conditions, 41 AGNs with larger proper motion (>10 mas yr⁻¹) were identified.

Our team cross-matched AGNs from the WISE 830 Catalog (Asari et al. 2018) with sources in Gaia DR3. This provided us with a list of AGNs. Of those we selected those with a proper motion in the DR3 data, and had a parallax below 0.001 (1000) of mas. A small number of AGNs were found for a high proportion of other objects. We also searched other objects based on other known characteristics in the combined WISE sources, distance, or apparent proper motion, other than the AGN sources. This led us with 2,077 objects, the majority registered were a thousand of them starting with the lowest 1000 values, the majority registered were 2 to 10000.

Acknowledgments

We gratefully acknowledge funding from NASA Astrophysics Data Program.

Teacher Research Experience and Its Deep Impact on Education

Lenise Mason¹, Ben Sanson², David Forester³, Michelle Rioridan⁴, Varoujan Gorjan⁵, Dominic DeMatteo⁶, Rachel Susan⁷, Daniel Caszucki⁸, Julia DeGuzman⁹

¹Coppage Middle School, Coppage, New York, ²Madison Metropolitan School District, Madison, Wisconsin, ³Missouri Valley High School, Des Moines, California, ⁴Polio Activities Leader of Cop Harbor Township & Harris County, Egg Harbor Township, NJ, ⁵Jet Propulsion Laboratory/Caltech, Pasadena, California

Abstract

The NASA/IPAC Teacher Archive Research Program (NITARP) is an authentic research experience for teacher teams in collaboration with a professional astronomer with the goal to contribute original results to the astronomical community. In the NITARP 2024 Cyclics AGN team we translated the personal research experience related to active galactic nuclei into outreach efforts in the communities in which we as teacher participants are embedded. This included a planetarium setting, a community non-profit youth organization focused on STEM experiences, traditional classroom settings at the middle and high school levels, and extracurricular STEM research clubs.

Teacher NITARP Experience Perspectives

Use of archival data, data visualization and image manipulation with tools like Protoplot in the NASA/IPAC Infrared Science Archive (IRSA) web interface, and engaging students in their own research efforts are examples of the ways in which the NITARP experience has an impact on all of its teacher participants. We will summarize the essential experience that changed our approach to teaching and learning with our students, as well as our plans for future changes to our course designs and outreach programs.

Student NITARP Experience Perspectives

"NITARP has given me a deeper understanding of astronomy and inspired me to continue research in this field... NITARP provided me with an amazing set of skills I use later in life."
- Rachel Susan

"NITARP has been an invaluable part of my journey toward becoming a research scientist... Long, meticulous nights scanning data points have strengthened my commitment for my work ahead."
- Dominica DeMatteo

"I have become more passionate about the field of astronomy and research as a whole."
- Daniel Caszucki

"My participation in NITARP opened my mind to the field of STEM that I did not have before... I have gained insights that scientific research is a complicated, lengthy process where even seemingly insignificant things must be considered."
- Julia DeGuzman

"Participating in real scientific research has shown me what actually goes into studies and just how much double-checking is actually done to provide correct information for a study."
- Scott Pickett

2. What Will Our Year Together Look Like?

IV. Sharing Our Results at the 247th AAS (January '26 in Phoenix)

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3. What About the Students?

Who and How Many to Pick?

- NITARP pays up to 2 (can bring up to 4). None is an option, too. Can involve as many as you want back home.
- Selection Process? Up to you! Participation? Essays? Interviews? Cage matches?
- Same kids at Cali and AAS (strongly recommended)
- Seniors discouraged
- Be comfortable: Like them!

Student Responsibilities

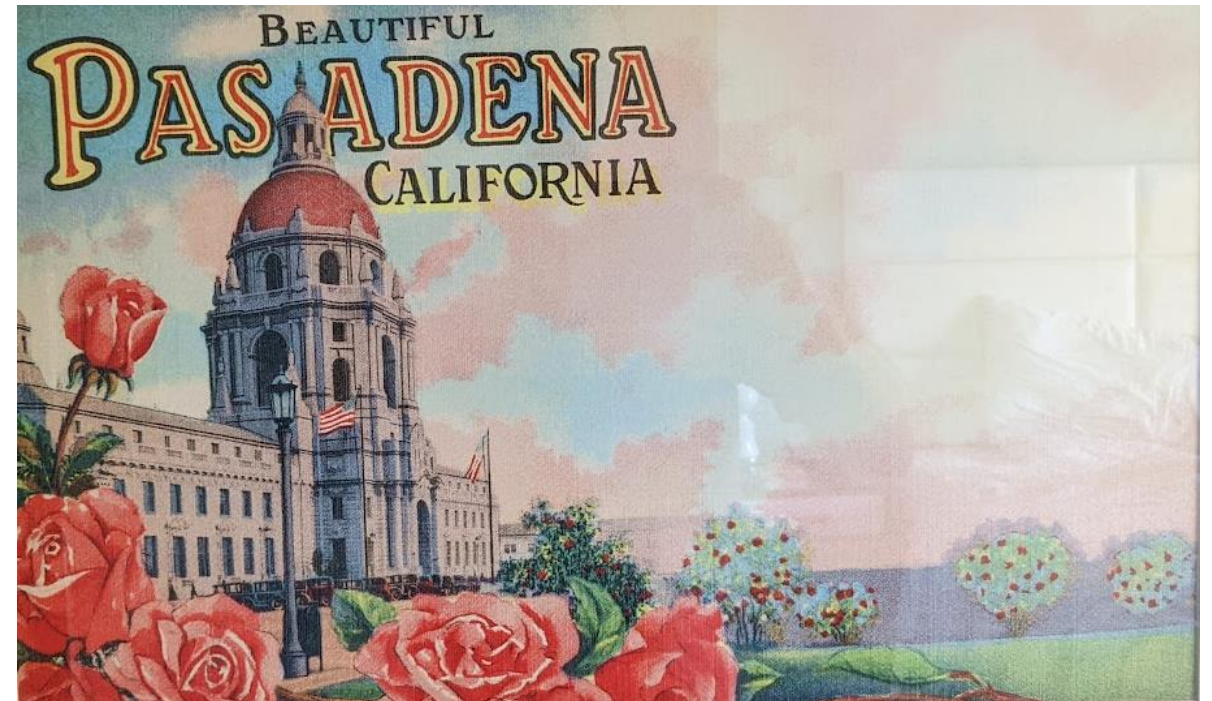
- Learn the science (from you and hopefully attend at least some telecons or watch the archived ones)
- Do the science: analyze the data & give input
- Present the science poster (with you) at the AAS

Advice to You as Their Teacher

- Enjoy the experience of learning with them
- Be prepared to lean on them: you'll help each other!

4. What About the Trips?

- **Trip 1: You're On It!**
- **Trip 2: Training in Cali (Five Days and Nights in Sunny Pasadena)**
Trip Extracurricular Possibilities:
 - Old Pasadena
 - Santa Monica Pier
 - Griffith Park & Observatory
 - Hollywood Boulevard
 - Dodgers Game
 - Mt. Wilson Observatory
- **Trip 3: Present in Phoenix**

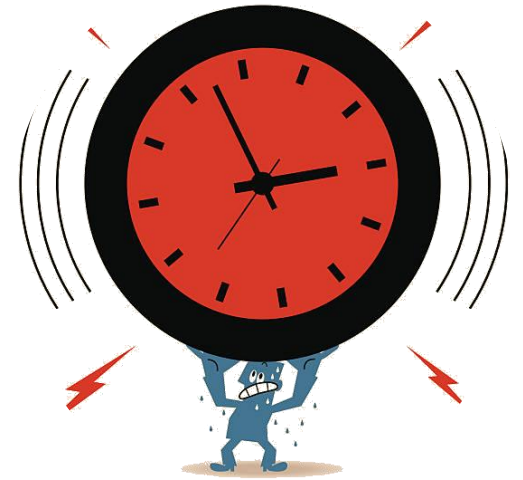




**BUT ABOUT THAT
WORK....**

5. What About the Workload?

- Weekly “Zoom” meetings ~hour
- Homework: Background reading and writing and analysis
- Some parts more work-intensive than others. These parts include the initial learning, proposal writing, data analysis, and poster prep
- What kind of work?
 - Reading & learning
 - Writing proposals
 - Organizing, Processing and Analyzing Data: using tools (IPAC IRSA viewer, Topcat, & Excel) to handle and calculate numerical data and visually check sources



6. What Are Some Benefits?

- Learn cool astro stuff
- Build your Grit and persistence
- Meet people
- Learn about astro opportunities
- Step out of your comfort zone and try something new
- Do authentic research
- Great experiences
- Become famous back home



7. Ummmm..... Advice???

- Ask questions... more than once... actively challenge confusion and lack of clarity
- Be open to the experience
- Be human
- COMMUNICATE, Communicate, communicate
- Dive into the NITARP poster sessions this week, especially ones with the kids: “Explain it to me like I’m five....”