REYES: making STEM accessible

OLD DOMINION UNIVERSITY

Jefferson Lab

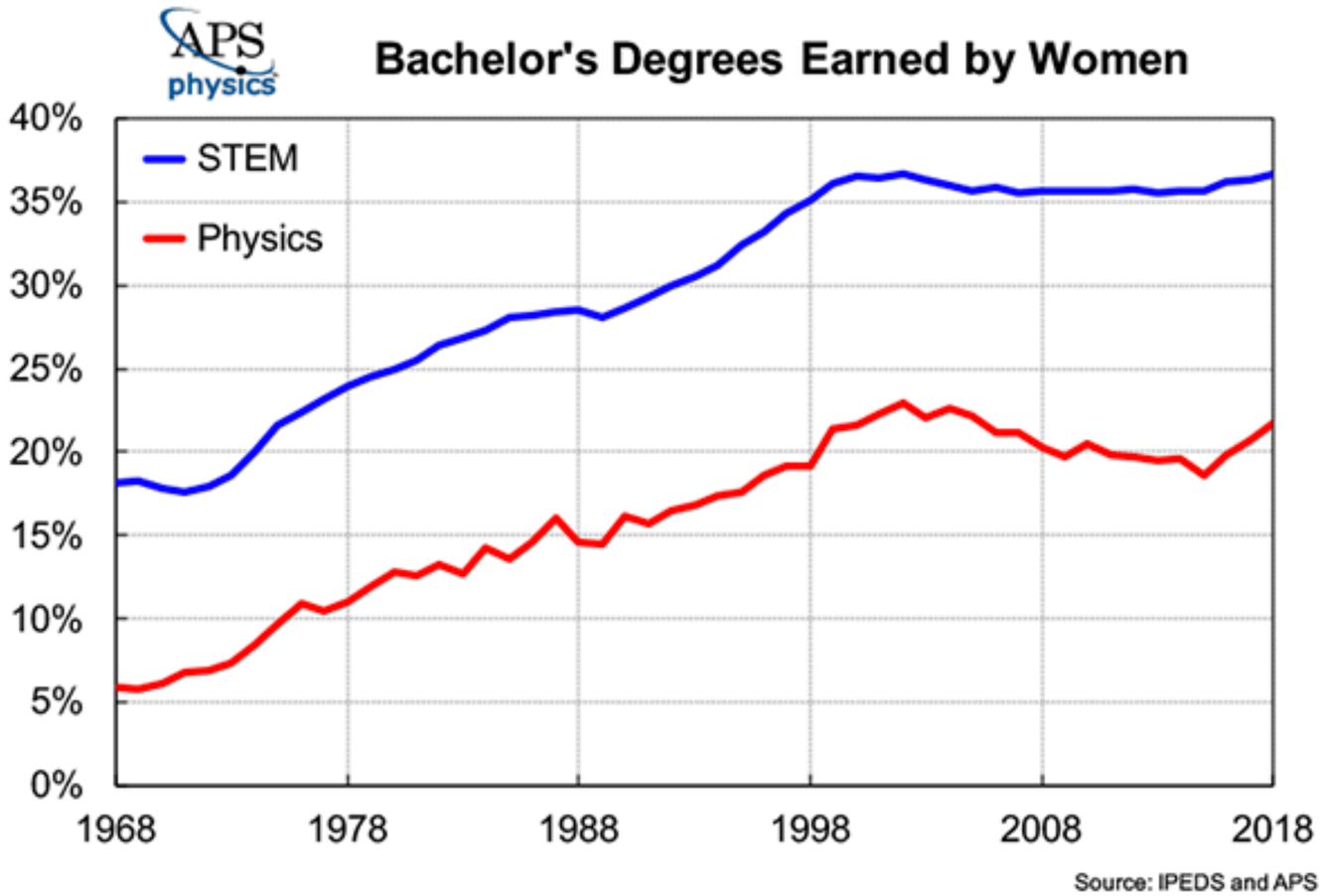
RAÚL BRICEÑO

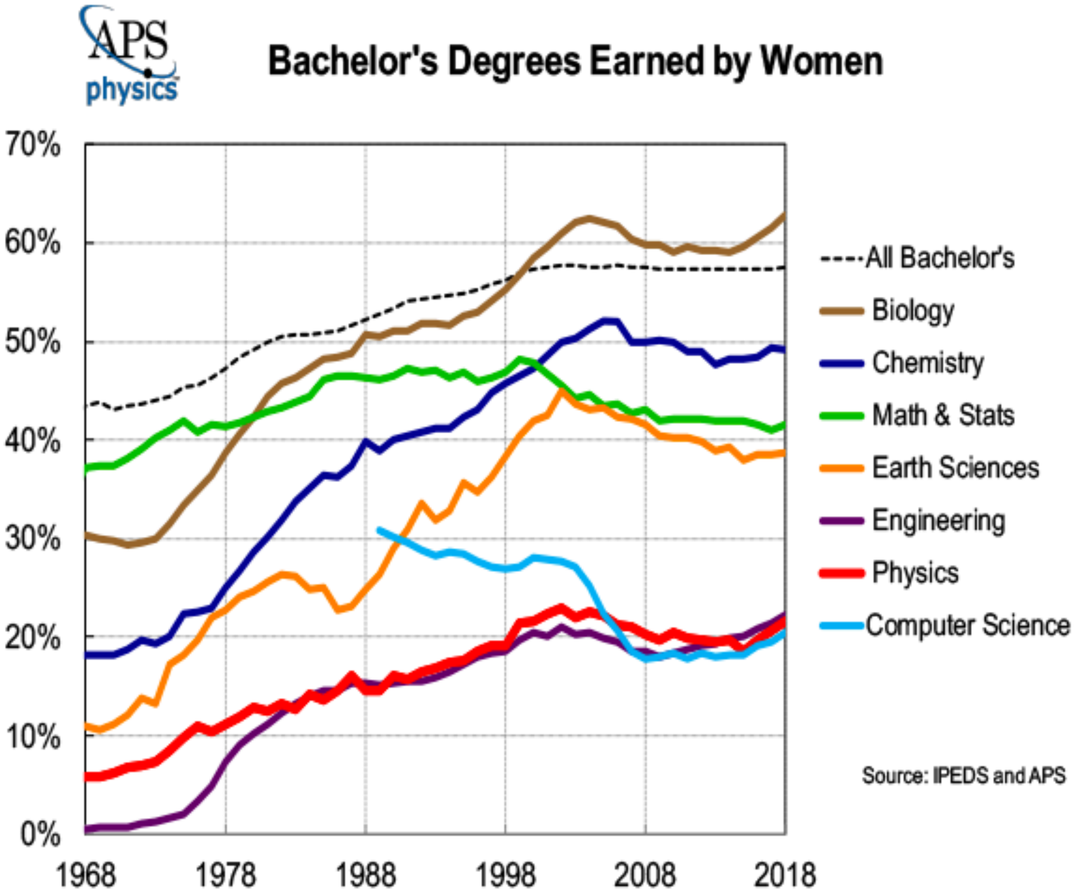
rbriceno@odu.edu

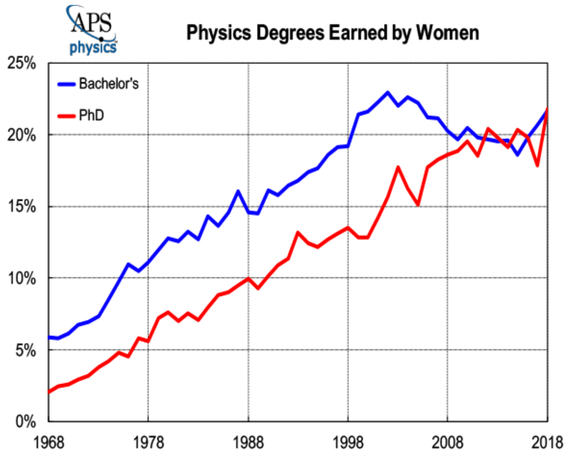
http://bit.ly/rbricenoPhD

@RaulBriceno12

BROKEN STEM PIPELINES

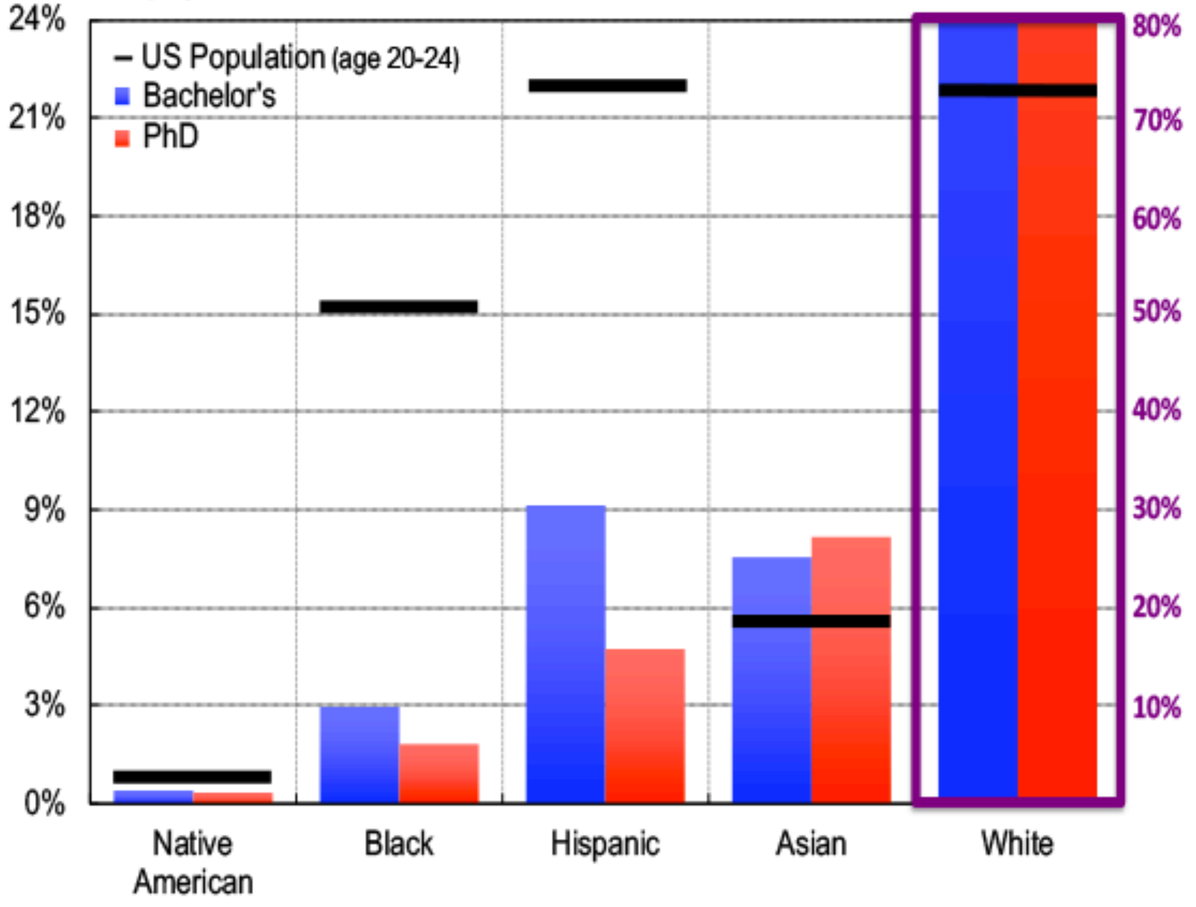




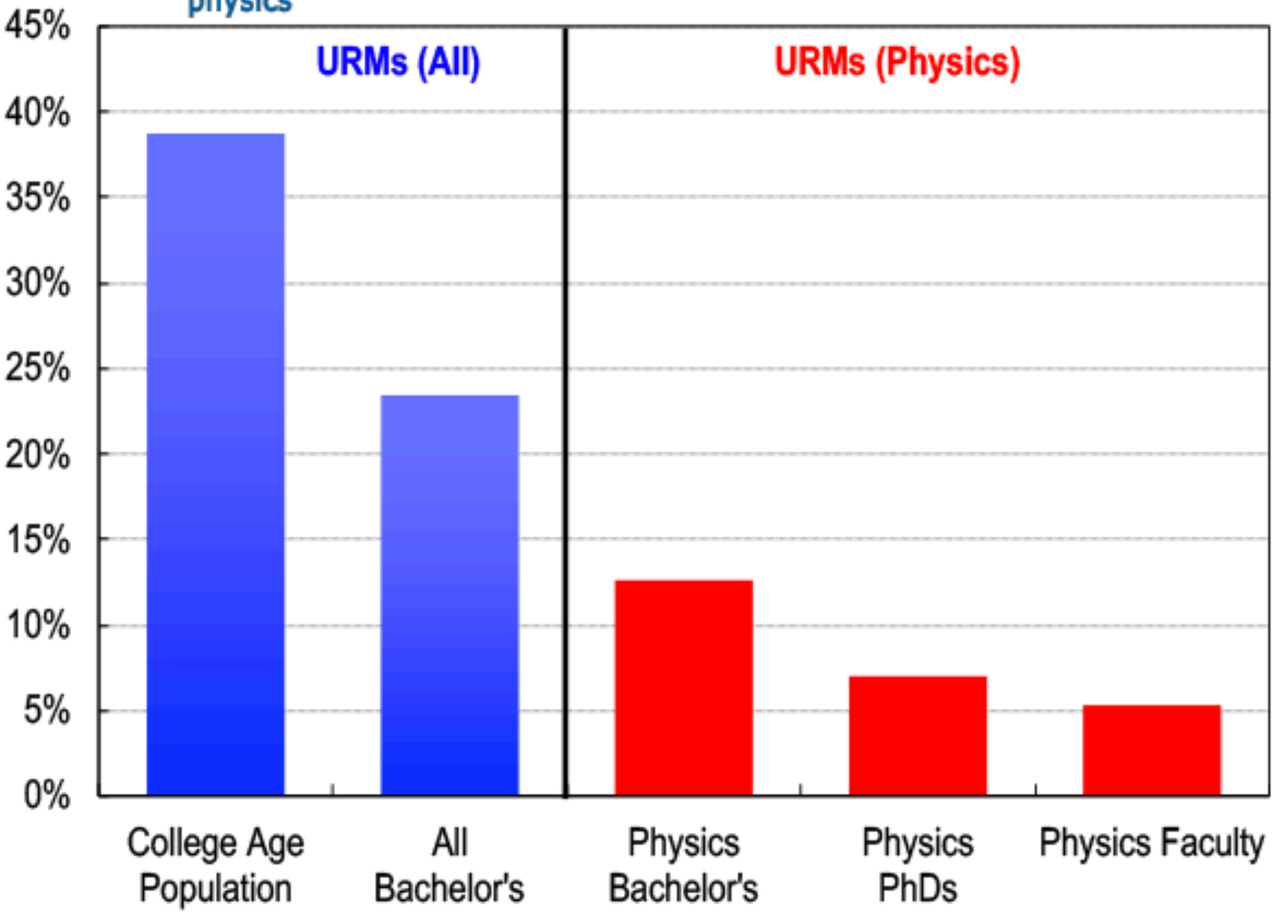


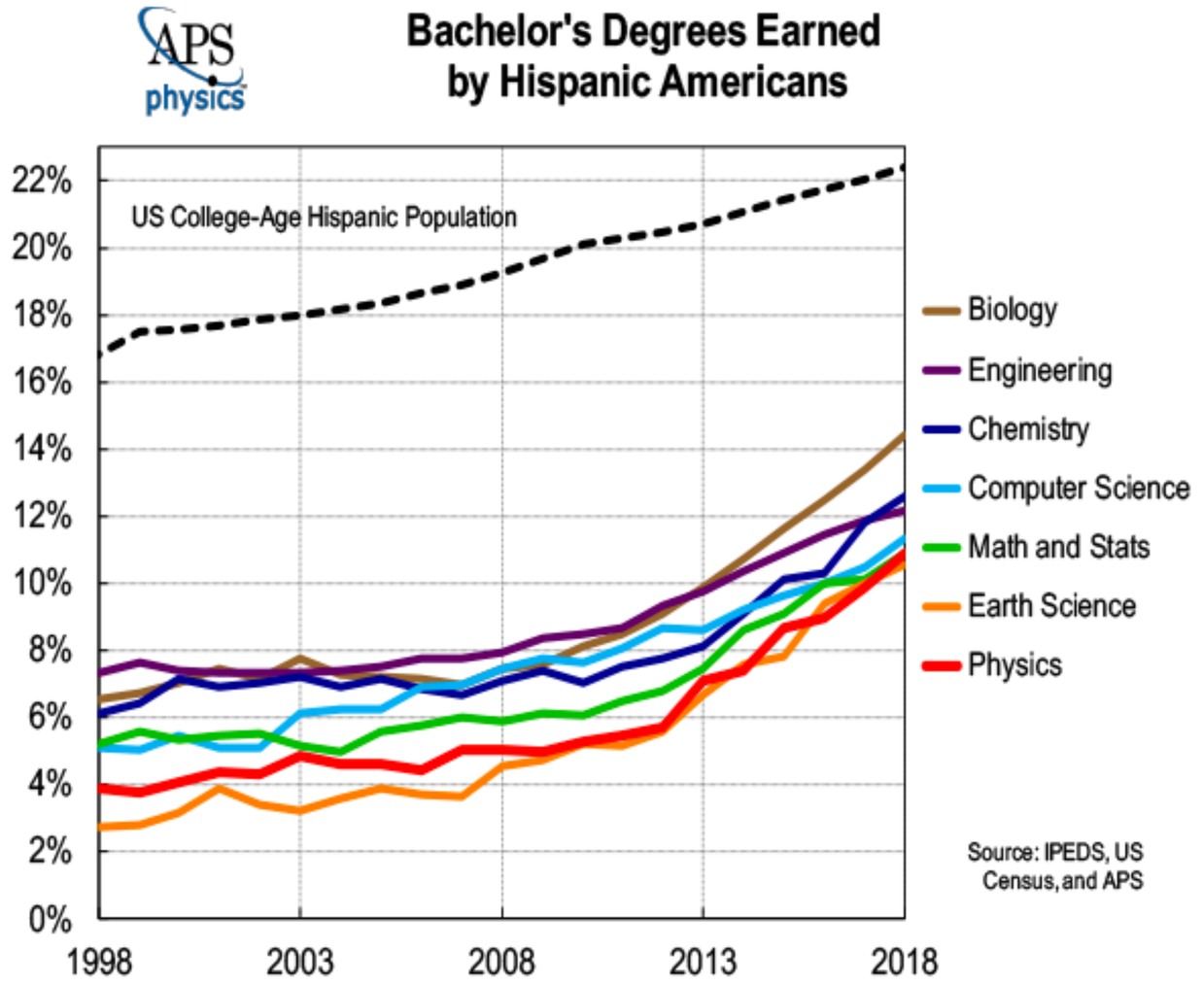
APS source: https://www.aps.org/programs/education/statistics

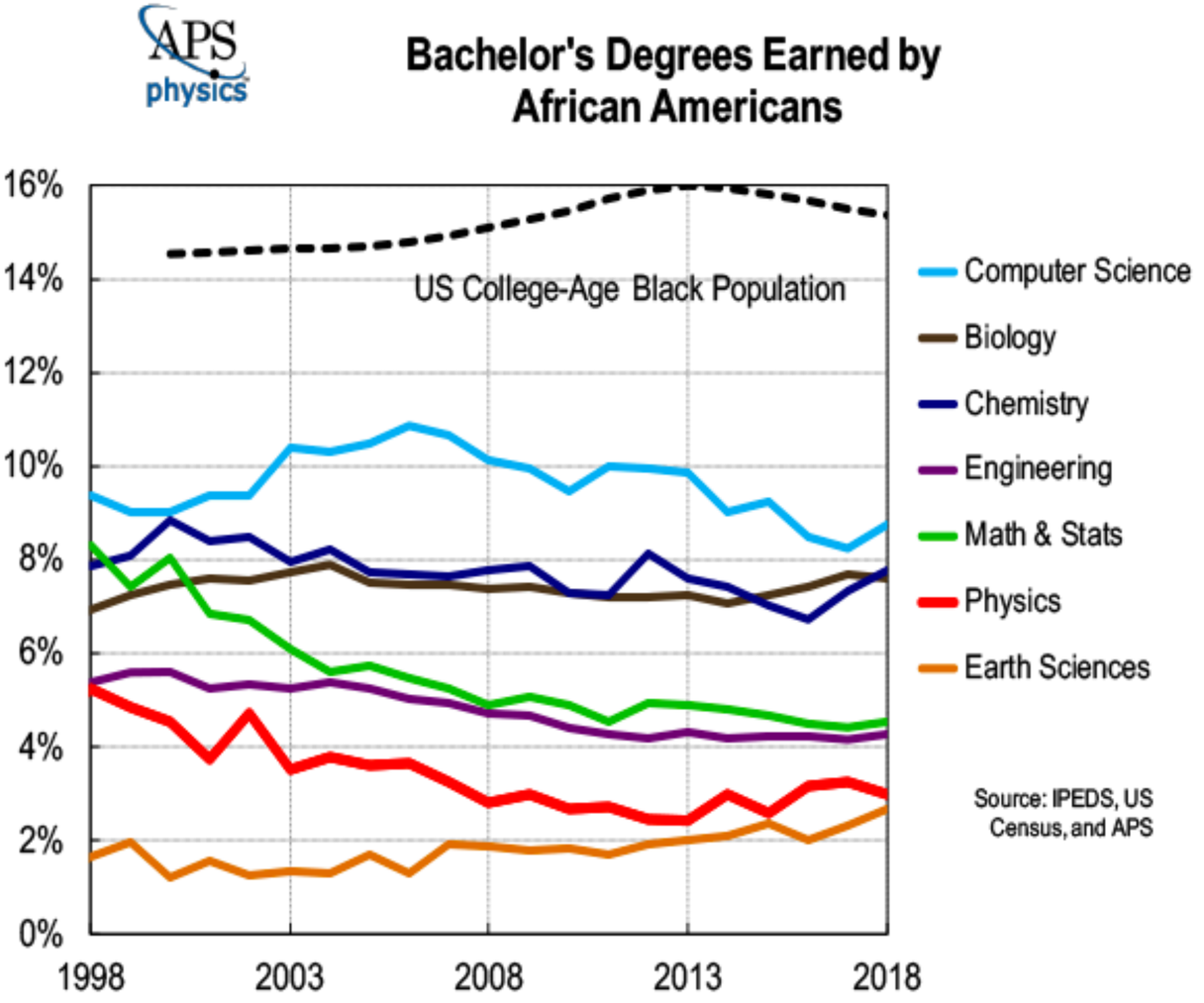
Physics Degrees (5-yr avg 2014-2018)



Retention of Underrepresented Minorities (URM)







APS source: https://www.aps.org/programs/education/statistics

“Not only is the lack of inclusion unfair, but it fails to maximally exploit the talents of a great humanity.”

Diversity in physics: Are you part of the problem? (2017)

*“…making an explicit and continual effort to **encourage**, **mentor**, and **support** all young physicists, to create a welcoming climate in your department, and to **promote** the hiring of diverse faculty members…”*

Ann Nelson
1958-2019

Encourage*, *mentor*, *support*, *promote* $\Longmapsto$ *outreach!

- ☑ Low number at the start,
- ☑ lower numbers at later stages,
- ☑ To partly remedy the problem…fix the pipelines!
  - ☑ recruit early,
  - ☑ Physics is taught at 10-11th grade,
  - ☑ *“at 11th grade students know what they want to study”*.
- ☑ We can do targeted or broad outreach:
  - ☑ Both lead to a more inclusive environment.

WHO WE ARE

Committed to making science more accessible, diverse and equitable.

@ODUREYES

@REYESODU

MEET OUR TEAM

Giovanna Genard

Raúl Briceño

Orlando Ayala

Maite Wilson

Alan Meca

Miguel Ramlatchan

Joanna Garner

Stephen Barry

Rachel White

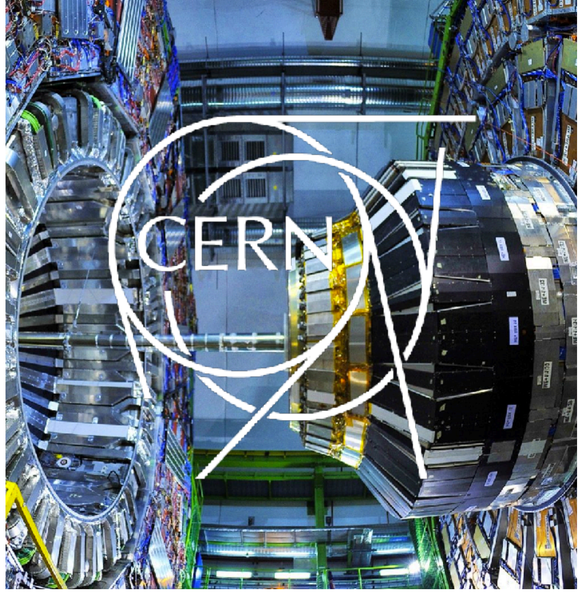
Sherry Dibari

Sara Maynard

Peter Mollica

OUR STORY

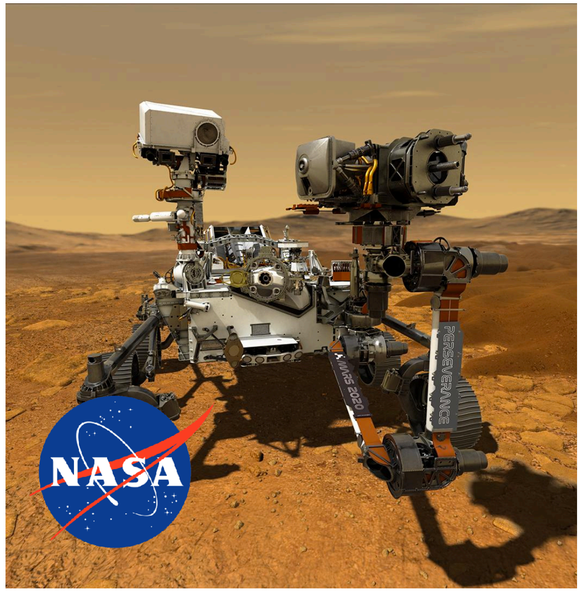

BERKELEY LAB


CERN


UNAM
Universidad Nacional
Autónoma de México


Jefferson Lab


AEM
AGENCIA ESPACIAL
MEXICANA

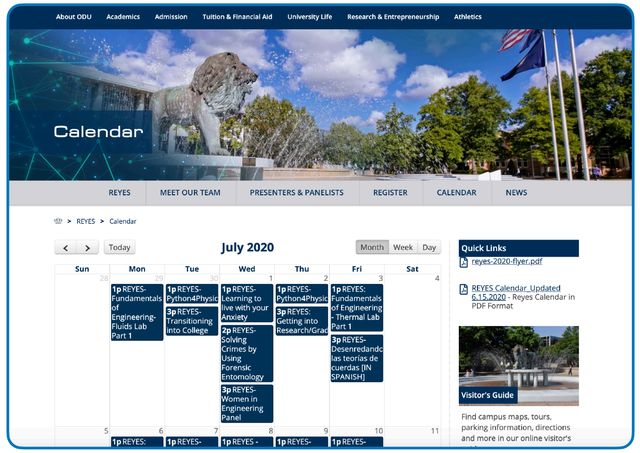

NASA
PERSEVERANCE

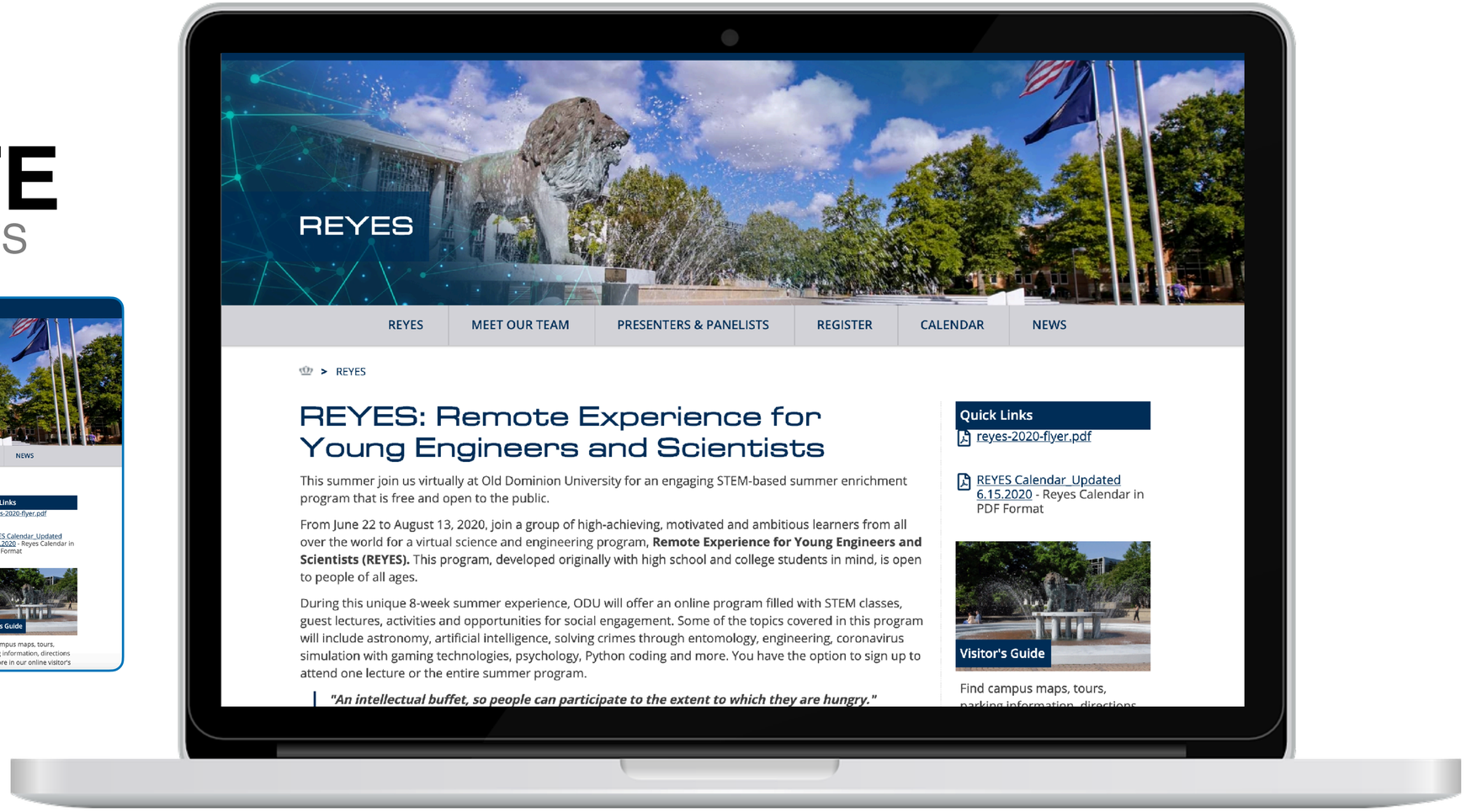

OLD DOMINION UNIVERSITY
OLD DOMINION
UNIVERSITY™

TOP EXPERTS

WEBSITE

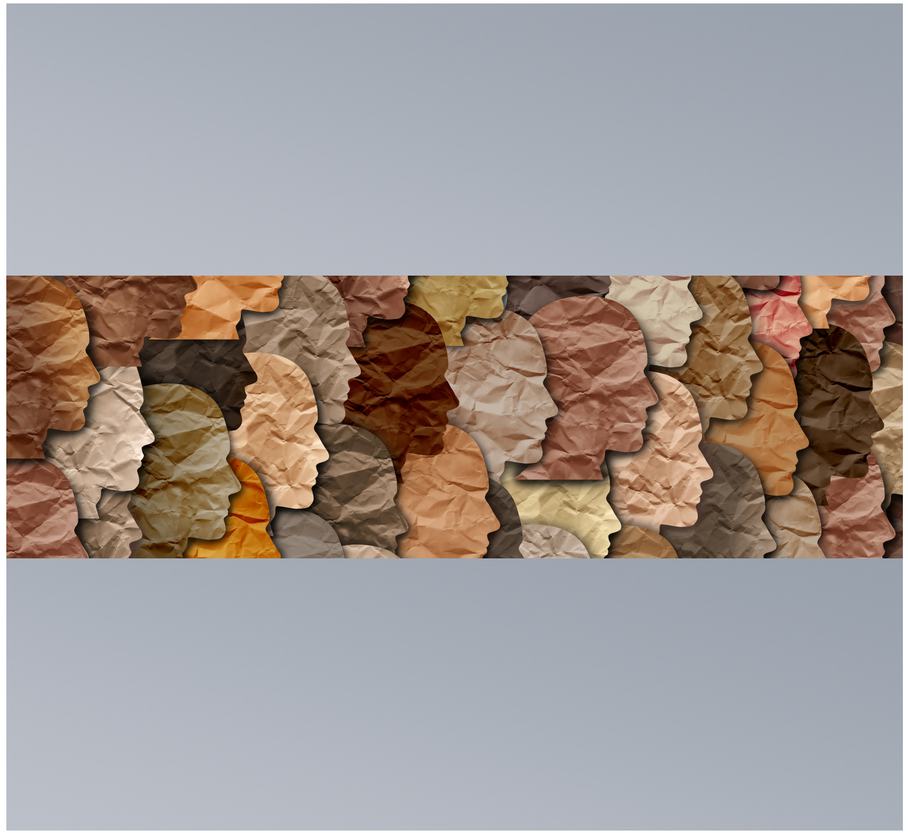
ODU.EDU/REYES

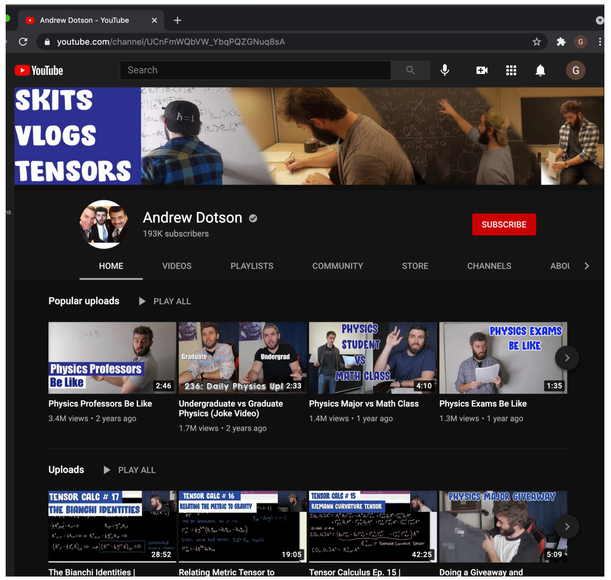




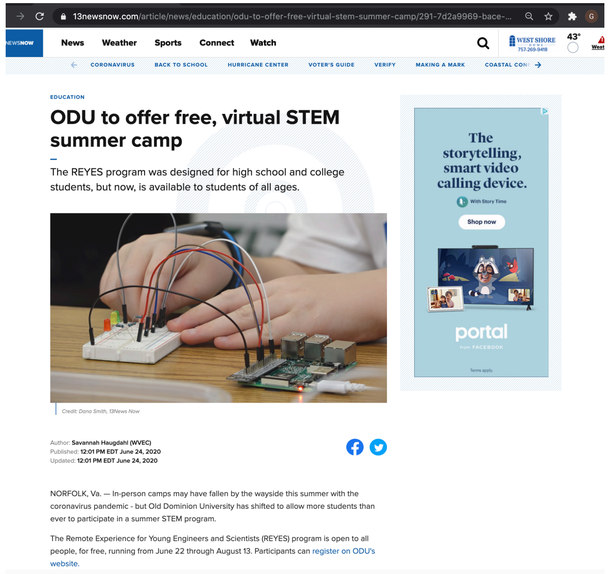
PURPOSEFUL + BROAD REACH

HIGH SCHOOL COUNSELORS
HIGH SCHOOL STUDENTS
CURRENT STUDENTS
FUTURE STUDENTS
SPACE GRANT CONSORTIUMS
PROFESSIONAL NETWORKS
LATIN AMERICAN EMBASSIES IN U.S.



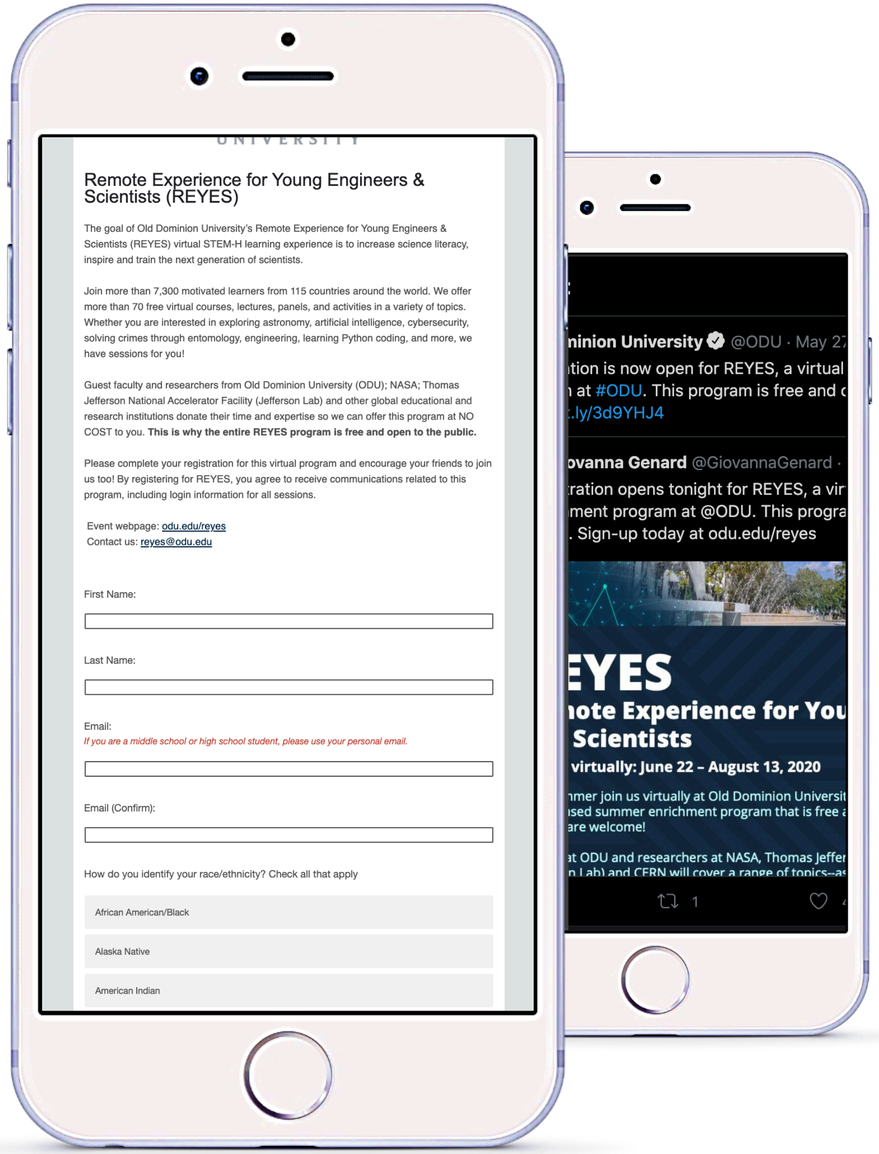

Andrew Dotson - YouTube
youtube.com/channel/UCnFmWQbVW_YbqPQZGNuq8sA
YouTube
Search
SKITS
VLOGS
TENSORS
Andrew Dotson
193K subscribers
SUBSCRIBE
HOME
VIDEOS
PLAYLISTS
COMMUNITY
STORE
CHANNELS
Popular uploads
PLAY ALL
Physics Professors Be Like
Physics Professors Be Like
3.4M views • 2 years ago
Undergraduate vs Graduate Physics (Joke Video)
1.7M views • 2 years ago
PHYSICS STUDENT VS MATH CLASS
Physics Major vs Math Class
1.4M views • 1 year ago
PHYSICS EXAMS BE LIKE
Physics Exams Be Like
1.3M views • 1 year ago
Uploads
PLAY ALL
TENSOR CALC # 17
THE BIANCHI IDENTITIES
The Bianchi Identities |
Relating Metric Tensor to
Tensor Calculus Ep. 15 |
Doing a Giveaway and


Argentina
Argentina
Embassy of the
Argentine Republic
United States of America

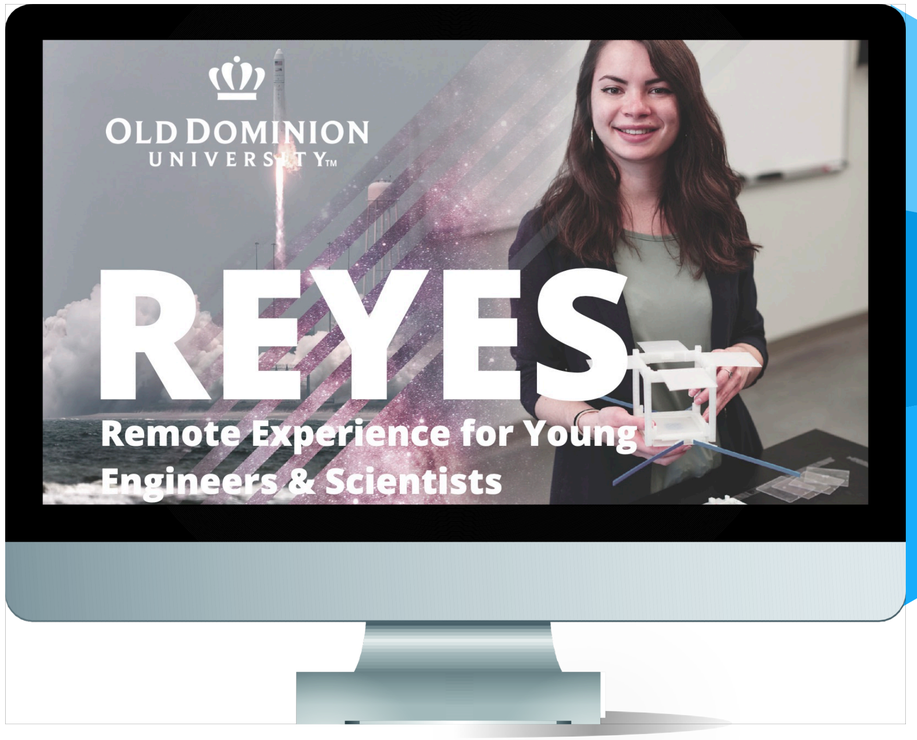

13newsnow.com/article/news/education/odu-to-offer-free-virtual-stem-summer-camp/291-7d2a9969-bace-...
News
Weather
Sports
Connect
Watch
CORONAVIRUS
BACK TO SCHOOL
HURRICANE CENTER
VOTER'S GUIDE
VERIFY
MAKING A MARK
EDUCATION
ODU to offer free, virtual STEM summer camp
The REYES program was designed for high school and college students, but now, is available to students of all ages.
Credit: Dana Smith, 13News Now
Author: Savannah Haugdahl (WVEC)
Published: 12:01 PM EDT June 24, 2020
Updated: 12:01 PM EDT June 24, 2020
NORFOLK, Va. — In-person camps may have fallen by the wayside this summer with the coronavirus pandemic - but Old Dominion University has shifted to allow more students than ever to participate in a summer STEM program.
The Remote Experience for Young Engineers and Scientists (REYES) program is open to all people, for free, running from June 22 through August 13. Participants can register on ODU's website.
The storytelling, smart video calling device.
Shop now
portal


Energy Education Fund @E... · Jul 7, 2020
Check out @ODU's new virtual program, REYES - Remote Experience for Young Engineers & Scientists. Register for FREE for their programs running through August 13.
odu.edu/reyes
More Tweets
Energy Education Fund @Energ... · Mar 31
Check out the @ElAgov Energy Kids website for information and resources to teach #energy concepts at home. ow.ly/nzBL50DOdVU

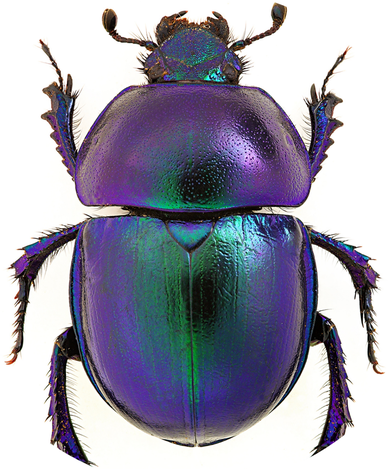
FREE REGISTRATION



REYES
VIRTUAL STEM PROGRAM



- 80+ STEM-H virtual sessions and classes + Q&A; broadcast live by ODUOnline
- Free and open to the public
- Access anytime on YouTube



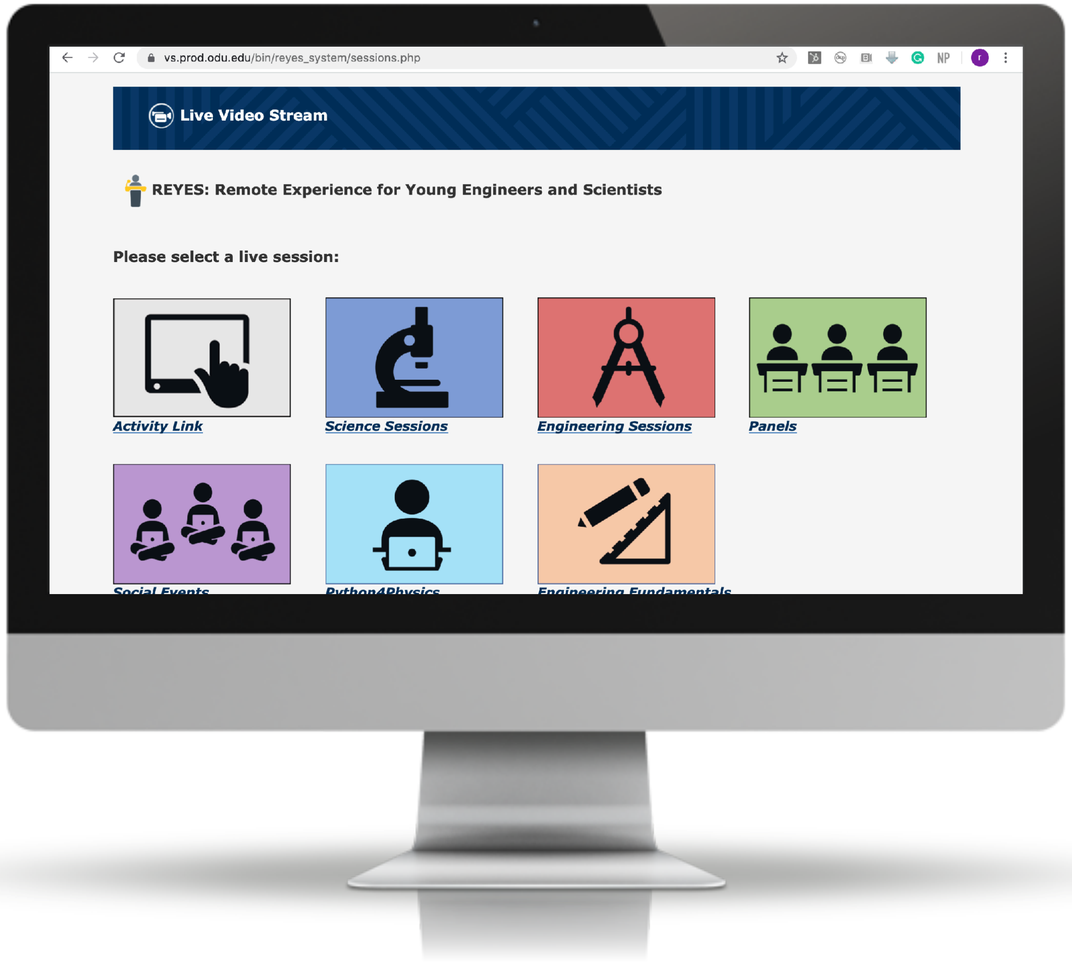
TOPICS

PROGRAM STRUCTURE

The REYES calendar contains all sessions and provides access to the link for each virtual session.

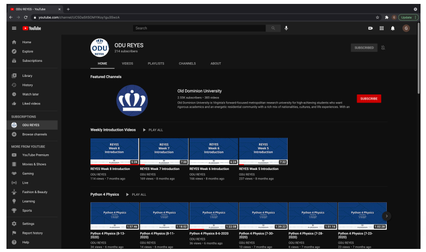
PROGRAM STRUCTURE

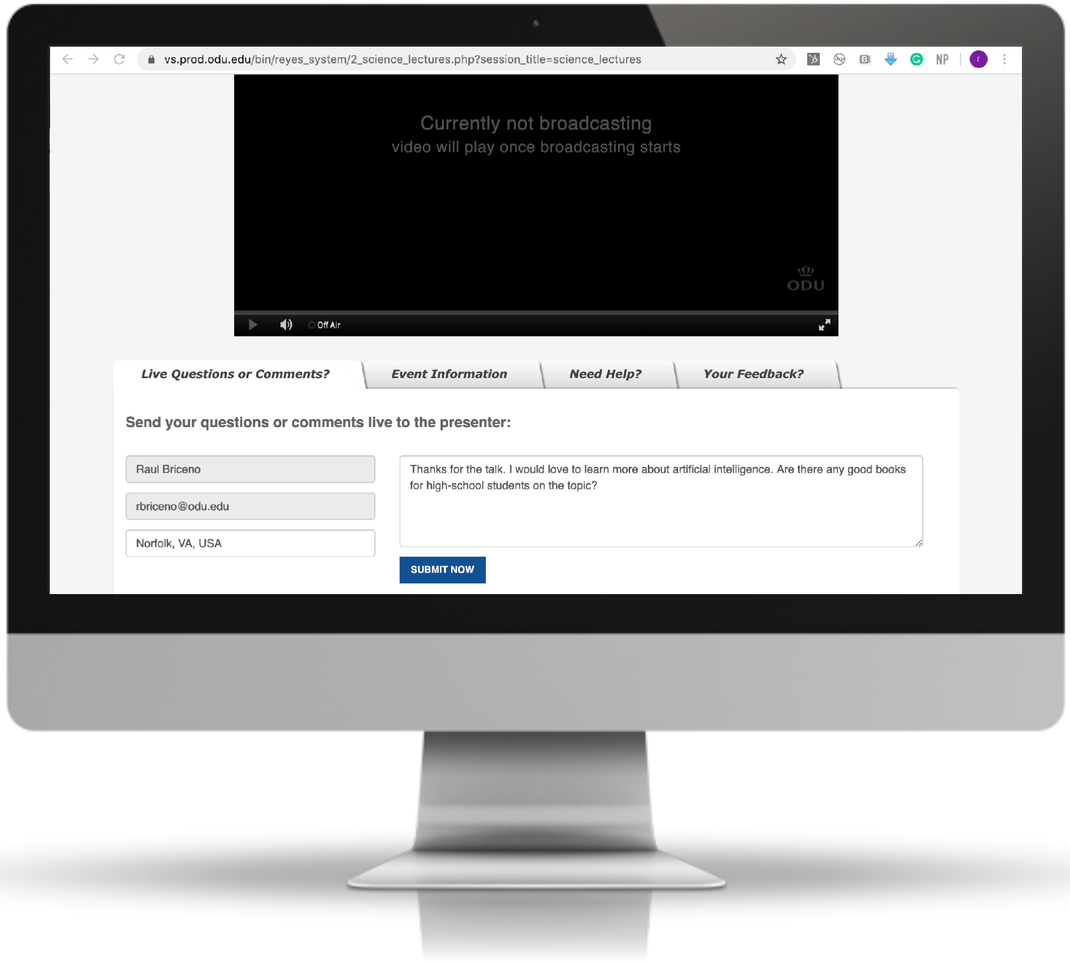
Virtual sessions are broadcast live by ODUOnline. Participants can enter this site at any time to see what sessions are live.



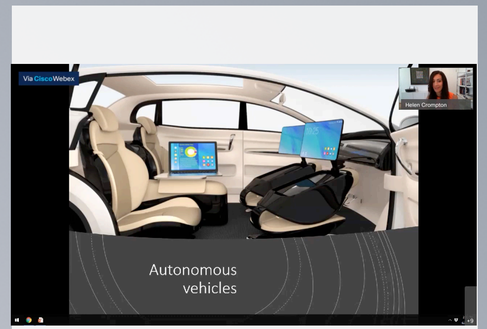
PROGRAM STRUCTURE

Every session includes a moderated Q&A session with experts. Sessions are recorded and made freely available on YouTube, where the content is organized by topic channels.

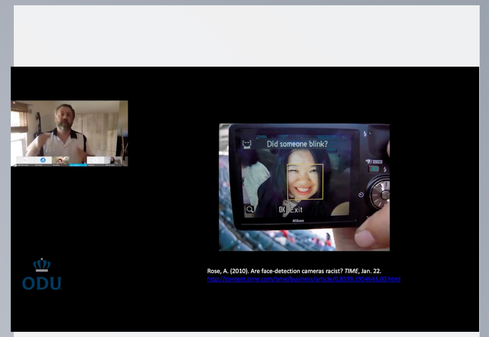




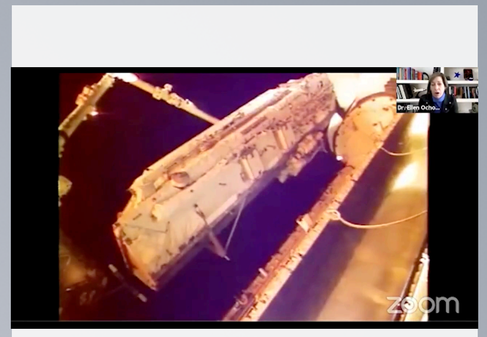
Raúl Briceño



Helen Crompton



Dylan Wittkower



Ellen Ochoa

SESSION HIGHLIGHTS

Python4Physics 8-Week Course

Exploring Artificial Intelligence

Racial Discrimination in Imaging Tech

Astronaut Ellen Ochoa: Champion of STEM & Diversity

00:00

-15:14

zoom

MEASURES OF SUCCESS

7,400
REGISTRANTS
115 COUNTRIES

Live Sessions
12,400

YouTube
4,692

Video Archives
5,190

WHAT THEY ARE SAYING

ODU Awareness

Pre-attendance, **58%** were unfamiliar with Old Dominion University (ODU).

Post-attendance, opinion of ODU improved **60%.**

STEM Inspiration

Thanks to REYES, **70%+** felt more confident and enthusiastic in pursuing a career in STEM and conducting research.

SOME SUCCESS STORIES

Felipe Ortega-Gama

Alexandru Sturzu

Connor McCarty - starting ODU this fall

JLAB-THY-18-2878
CERN-TH-2018-263

Form factors of two-hadron states from a covariant finite-volume formalism

Alessandro Baroni,[1,*] Raúl A. Briceño,[2,3,†] Maxwell T. Hansen,[4,‡] and Felipe G. Ortega-Gama[2,5,§]

JLAB-THY-20-3210
CERN-TH-2020-112

ndary conditions in quantum computations of scattering observables

Raúl A. Bri

[3]Department of Physics, Ol
[4]Theoretical Physics D
[5]Department of Physics, Colle
[2]D
[4]Departm

In this work we develop a Lüscher-
finite-volume matrix elements to 2

leads to a new finite-volu
detail. As an example we
for which the single-pion
remove all power-law fini
with arbitrary Lorentz str
ind

Key

ever, as w
to a finite
gate the c
Using the
effects for
source of s
day Euclic
finite volu
Lorentz in
both num
volume dis

Keywords:

In recent years
discoveries of u
nature of the u
configurations

[1] [hep-lat] 26

[hep-lat] 1 Jul 2020

9 Oct 2020

JLAB-THY-20-3272

Solving relativistic three-body integral equations in the presence of bound states

Andrew W. Jackura,[1,2,*] Raúl A. Briceño,[1,2,†] Sebastian M.
[3,4,‡] Md Habib E Islam,[2,§] and Connor McCarty[5,¶]

[1]*ccelerator Facility, 12000 Jefferson Avenue, Newport News, Virginia 23606, USA*
[2]*Physics, Old Dominion University, Norfolk, Virginia 23529, USA*
[3]*Physics Department, Indiana University, Bloomington, Indiana 47405, USA*
[4]*Center for Exploration of Energy and Matter, Indiana University, Bloomington, Indiana 47403, USA*
[5]*Matthew Fontaine Maury High School, Norfolk, Virginia 23517, USA*

(Dated: October 21, 2020)

We present a systematically improvable method for numerically solving relativistic three-body integral equations for the partial-wave projected amplitudes. The method consists of a discretization procedure in momentum space, which approximates the continuum problem with a matrix equation. It is solved for different matrix sizes, and in the end, an extrapolation is employed to restore the continuum limit. Our technique is tested by solving a three-body problem of scalar particles with an S wave two-body bound state. We discuss two methods of incorporating the pole contribution in the integral equations, both of them leading to agreement with previous results obtained using finite-volume spectra of the same theory. We provide an analytic and numerical estimate of the systematic errors. Although we focus on kinematics below the three-particle threshold, we provide numerical evidence that the methods presented allow for determination of amplitude above this threshold as well.

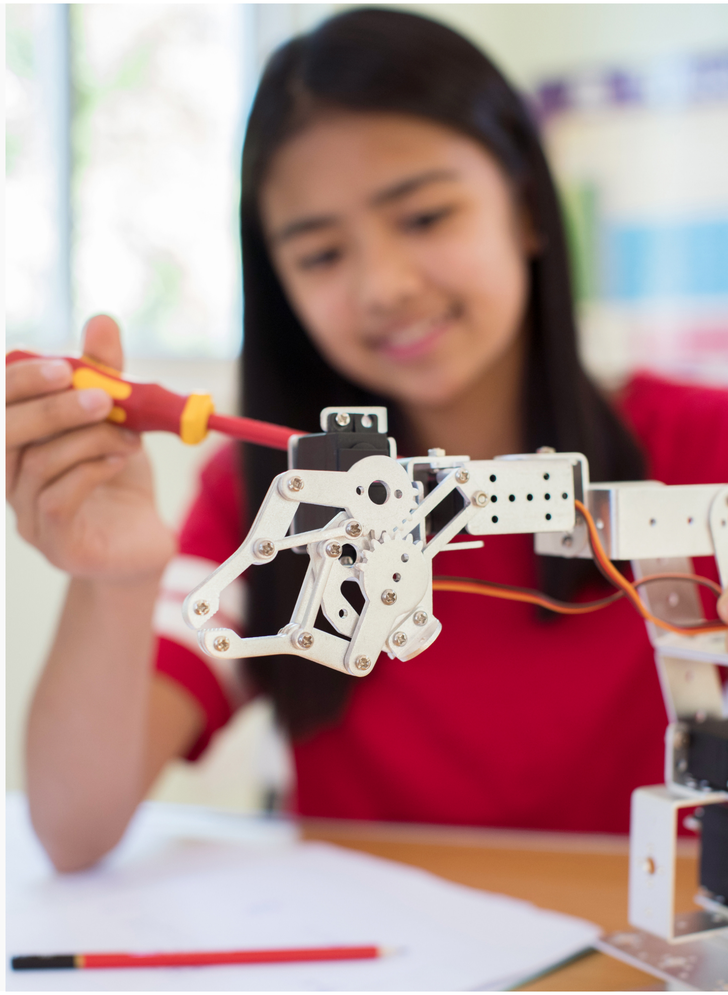
REYES 2.0 + 3.0

Expanding our reach and purposeful impact. Making the program sustainable in the future.

REYES

Why should we care about diversity in STEM-H?

“Not only is the lack of inclusion unfair, but it fails to maximally exploit the talents of a great humanity.” - Ann Nelson

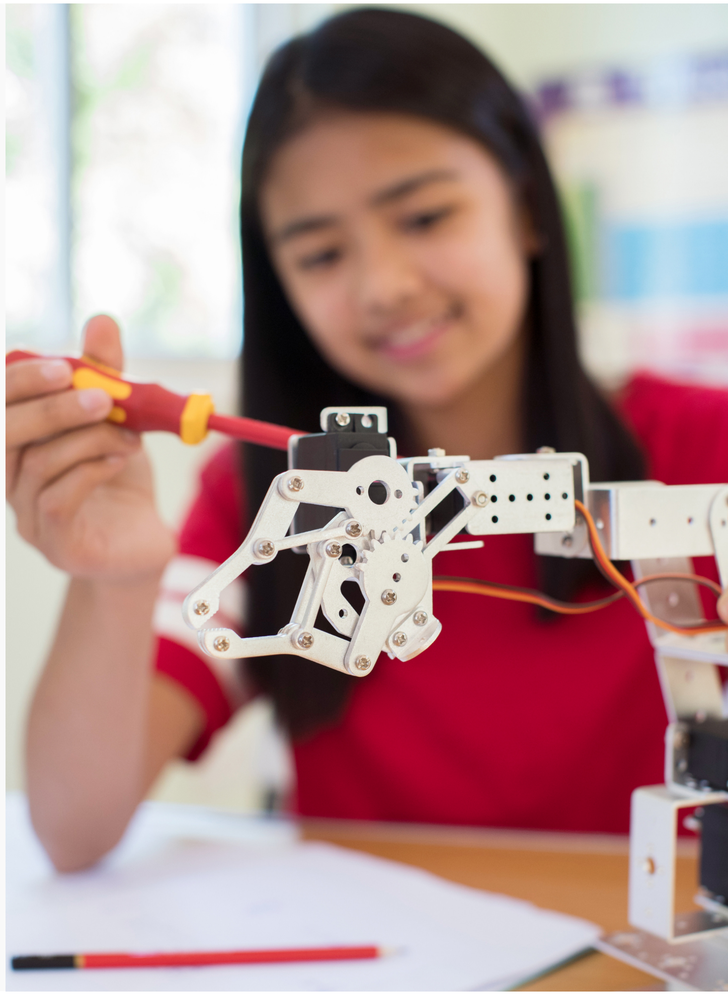


REYES

Fixing the broken pipelines!

We offer free virtual learning experiences that increase science literacy, inspire and train future generation of STEM-H students.

We are making science more accessible, diverse and equitable.



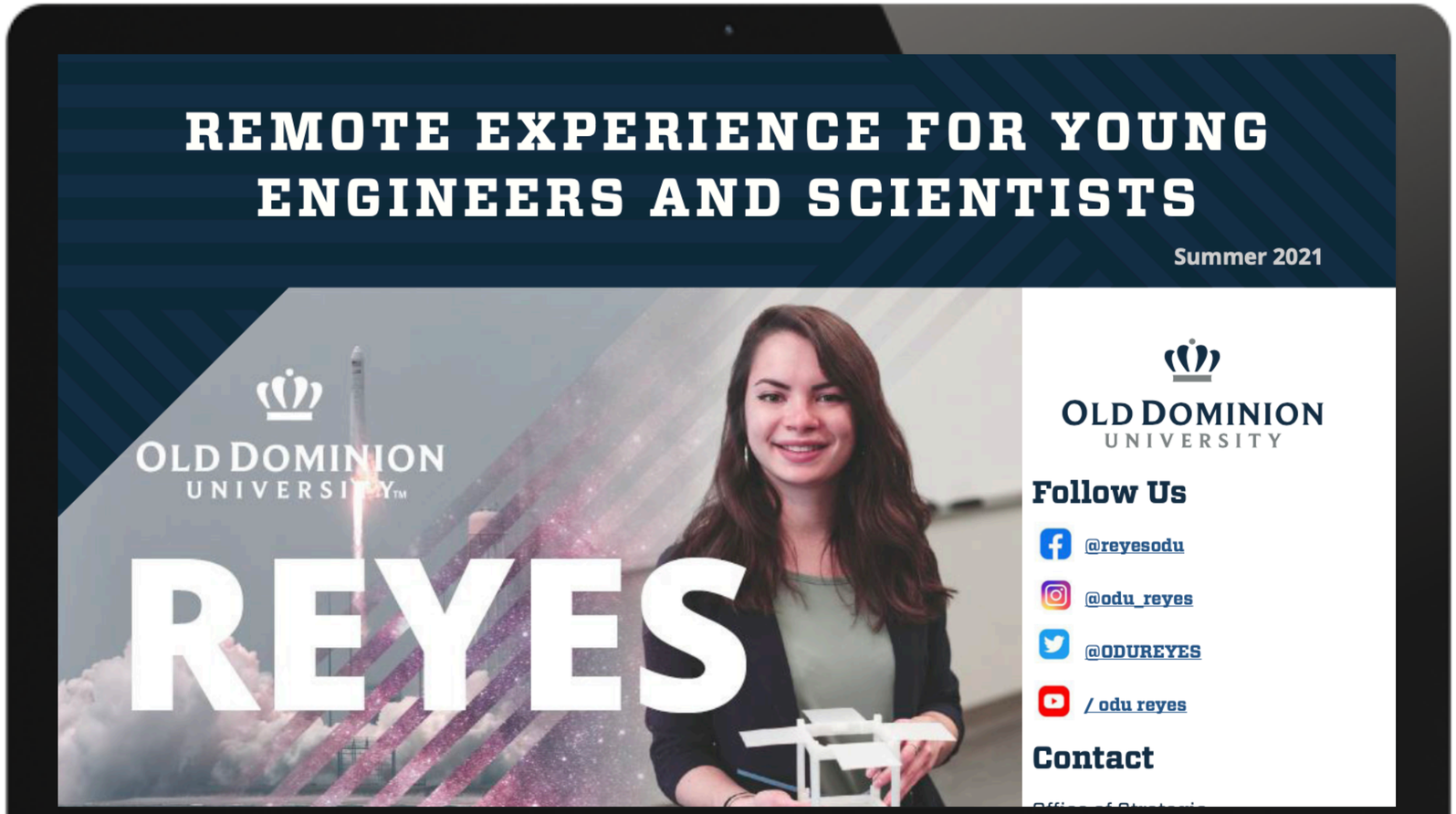
REYES

JUNE 28-JULY 23, 2020: ODU.EDU/REYES

Help spread the word!

Become a mentor: https://forms.gle/iDP51MNC45dBpycMA

Give a general-audience talk: https://forms.gle/AjLCdnKqc7V9kk347



OLD DOMINION
UNIVERSITY

REYES

REMOTE EXPERIENCE FOR YOUNG ENGINEERS AND SCIENTISTS

GIOVANNA GENARD
ASSISTANT VP FOR STRATEGIC COMMUNICATION & CMO
ggenard@odu.edu
@GiovannaGenard

RAÚL BRICEÑ0
PHYSICS & JEFFERSON LAB
rbriceno@odu.edu
@RaulBriceno12

MEET OUR TEAM

Giovanna Genard

Raúl Briceño

Orlando Ayala

Maite Wilson

Alan Meca

Miguel Ramlatchan

Joanna Garner

Stephen Barry

Rachel White

Sherry Dibari

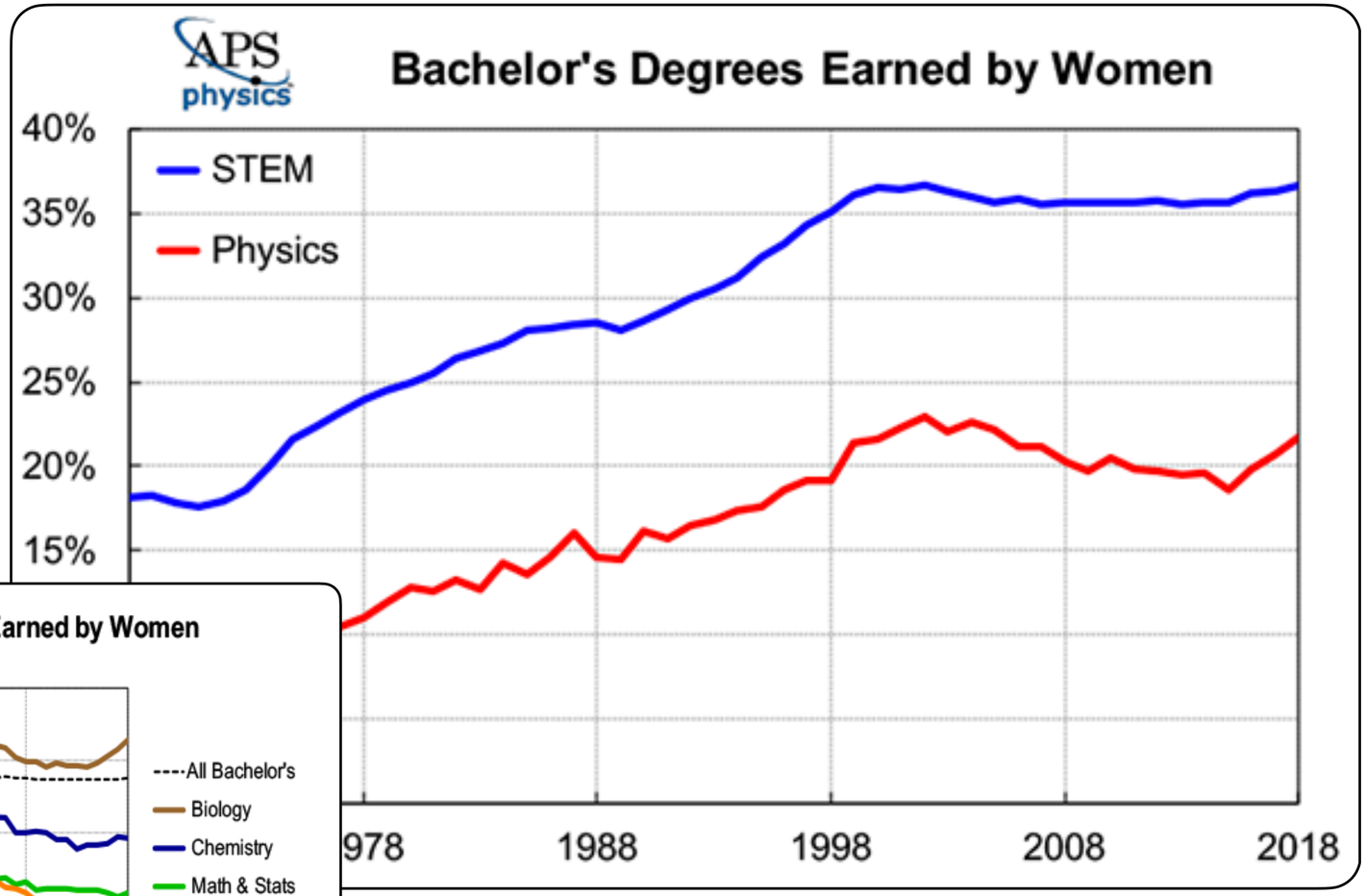
Sara Maynard

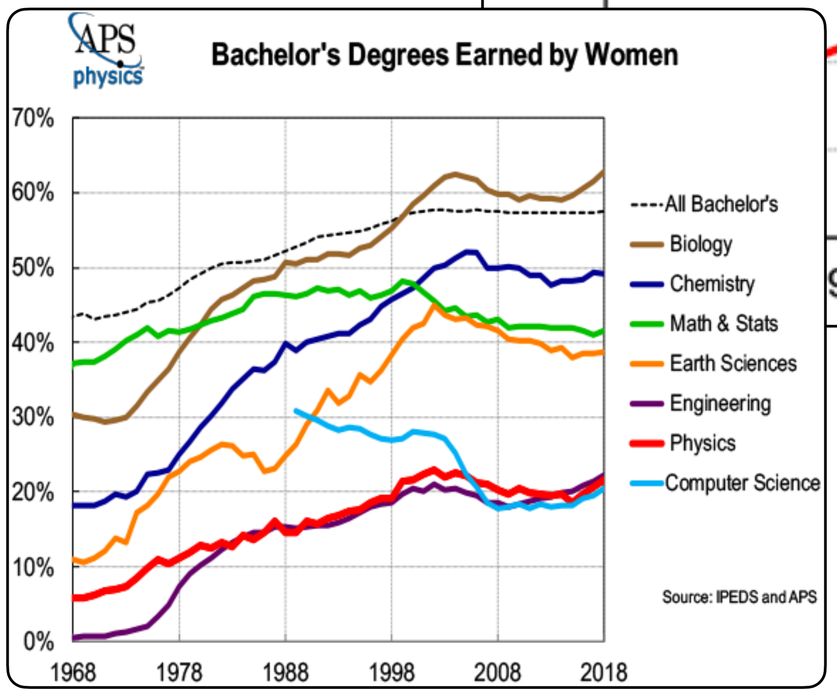
Peter Mollica

Mission/Goals

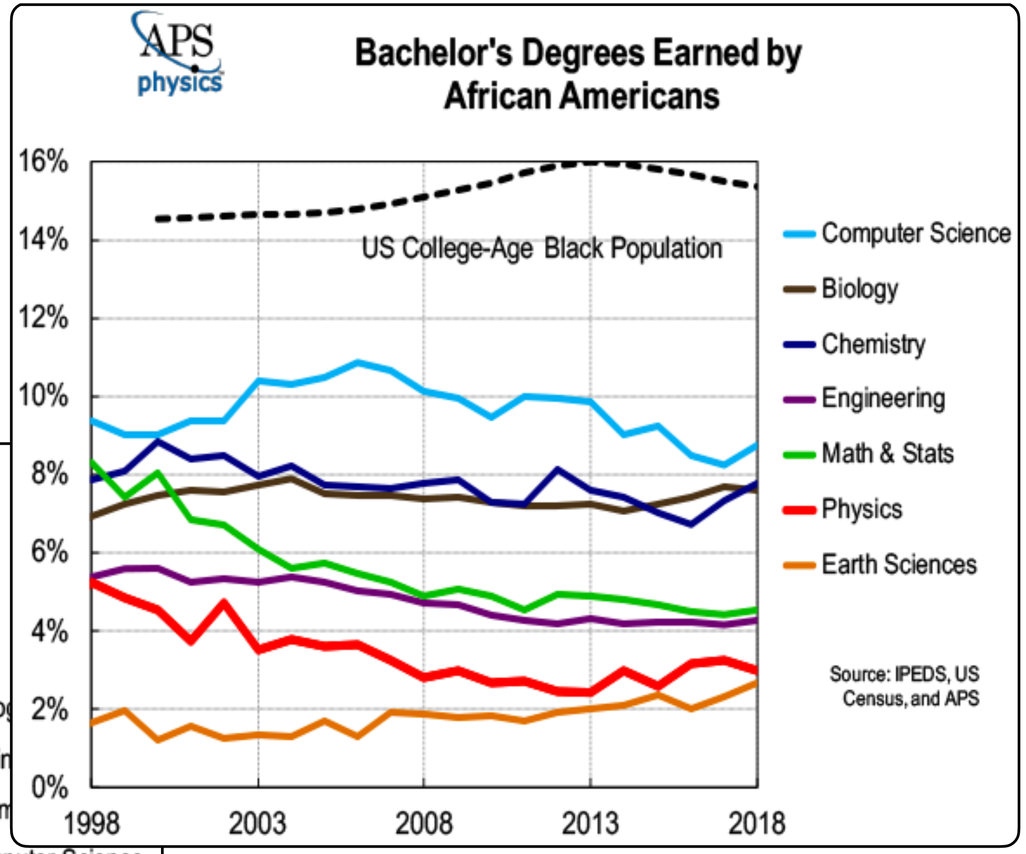
- ☑ Inspire students in STEM-H;
- ☑ Showcase the Hampton Roads strengths in STEM-H;
- ☑ Increase participation of underrepresented groups in STEM-H;
- ☑ Provide a free educational service to the community;
- ☑ Serve as a source of much-needed healthy and entertaining educational content;
- ☑ Train the next generation of STEM-H experts.

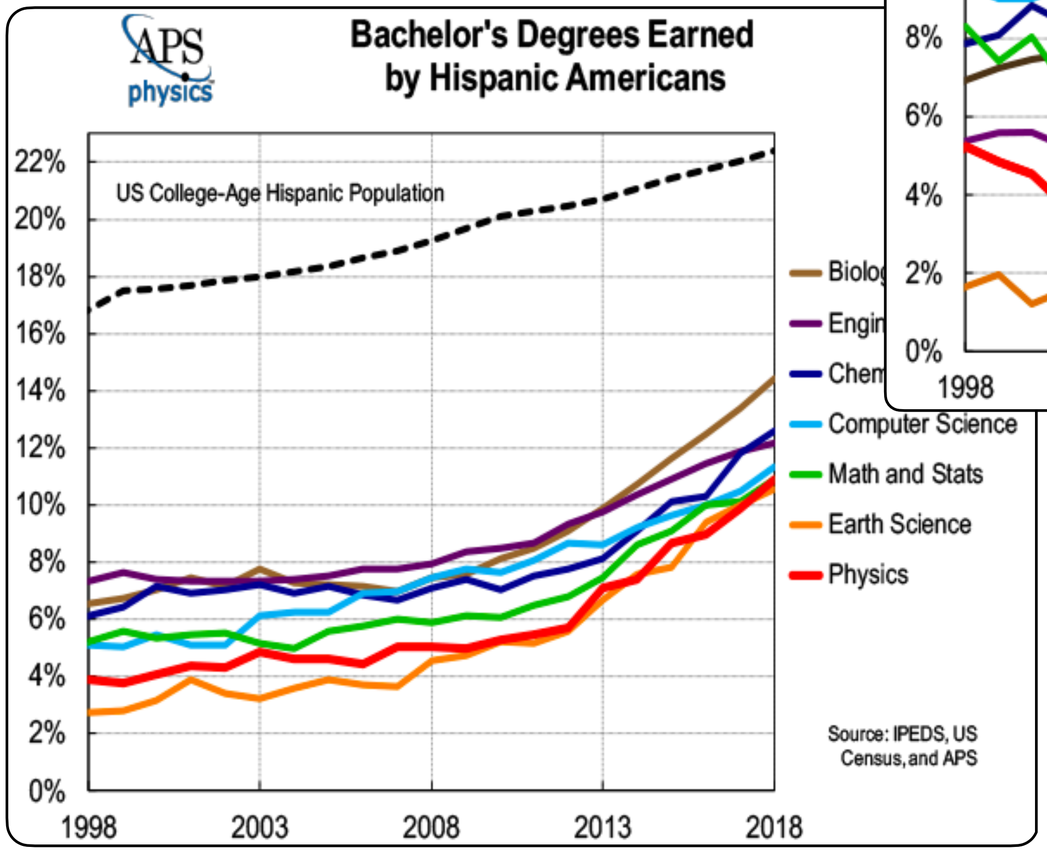
Representation crisis // USA stats



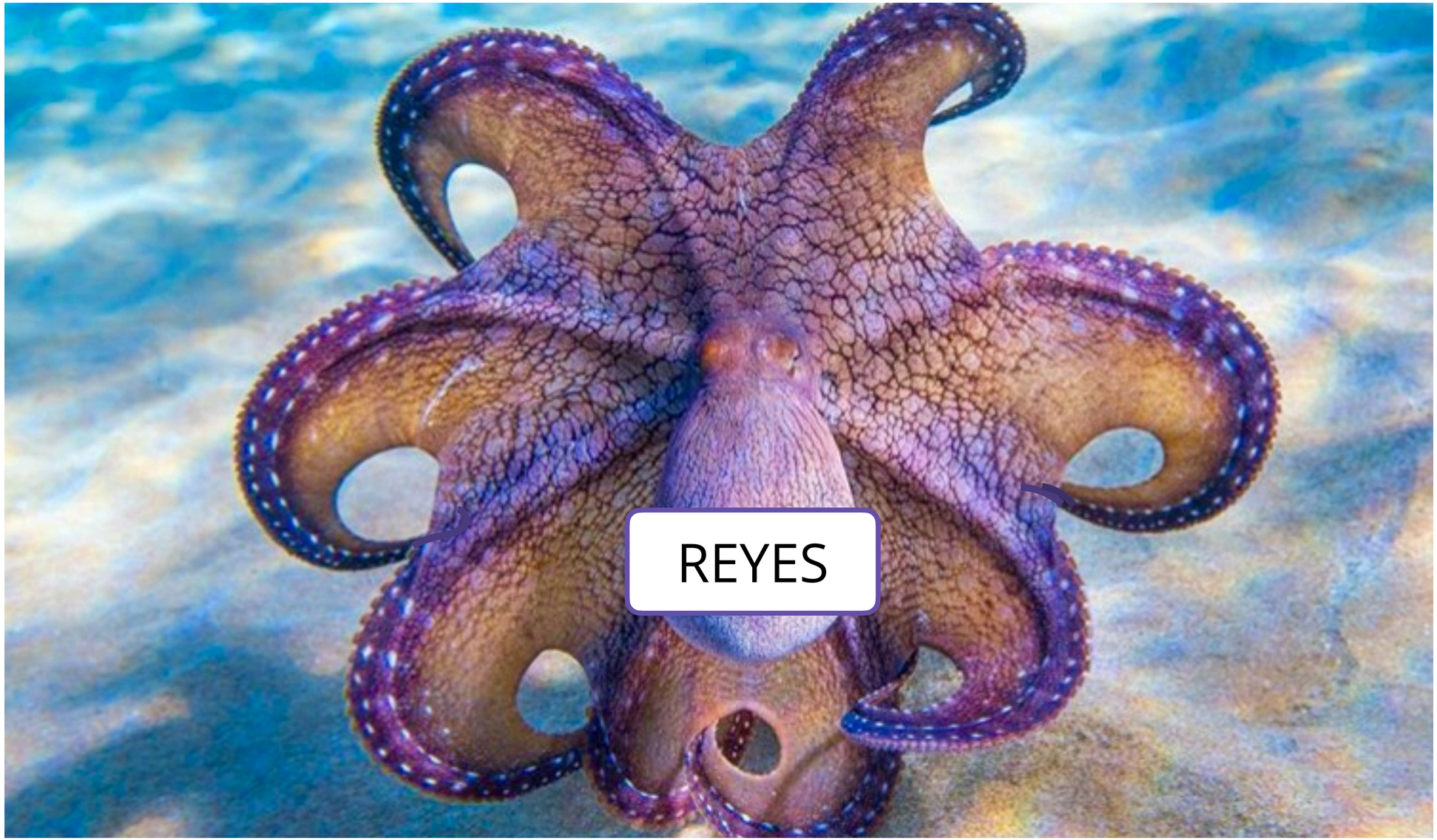


Representation crisis // USA stats



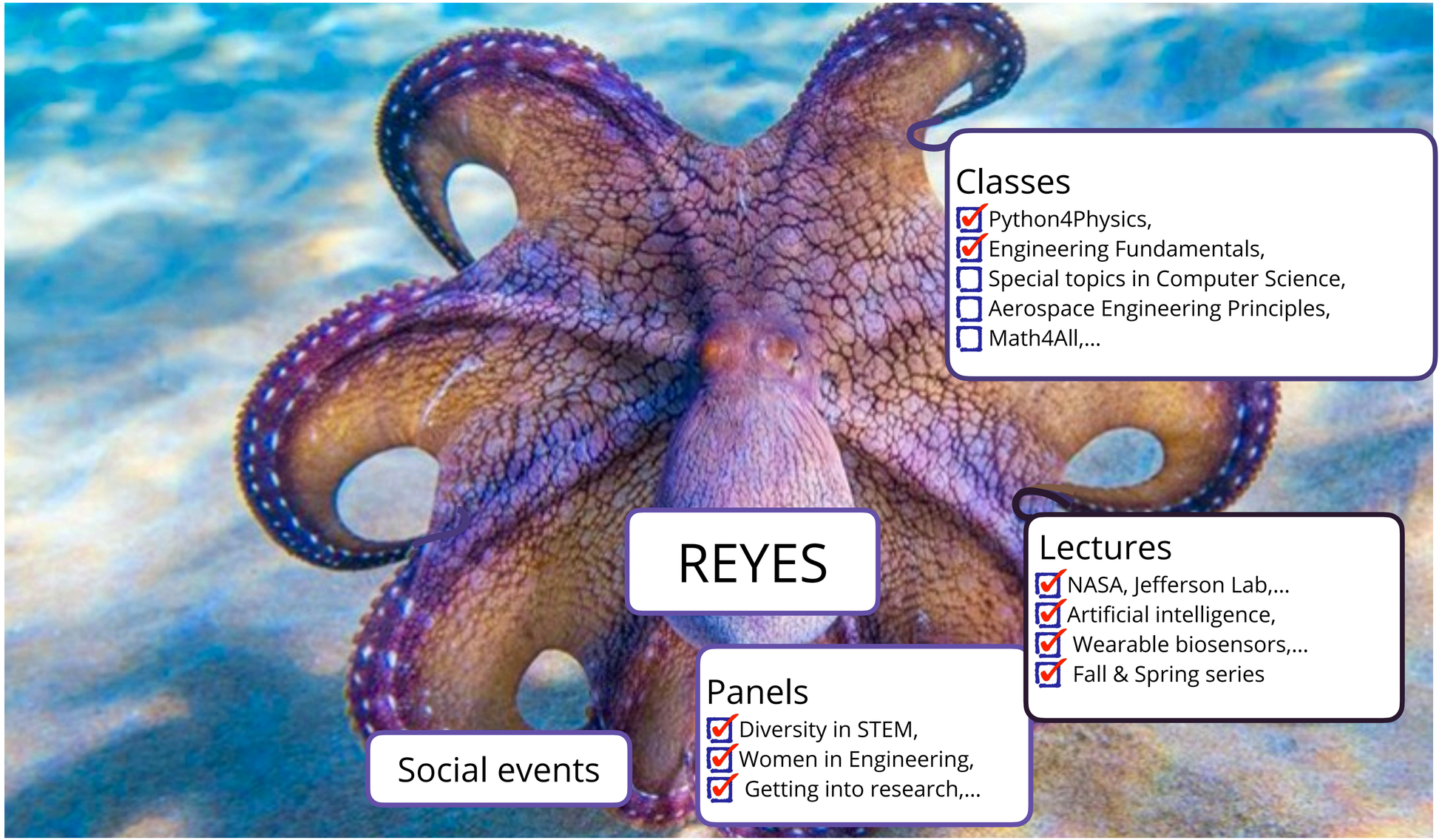


REYES overview

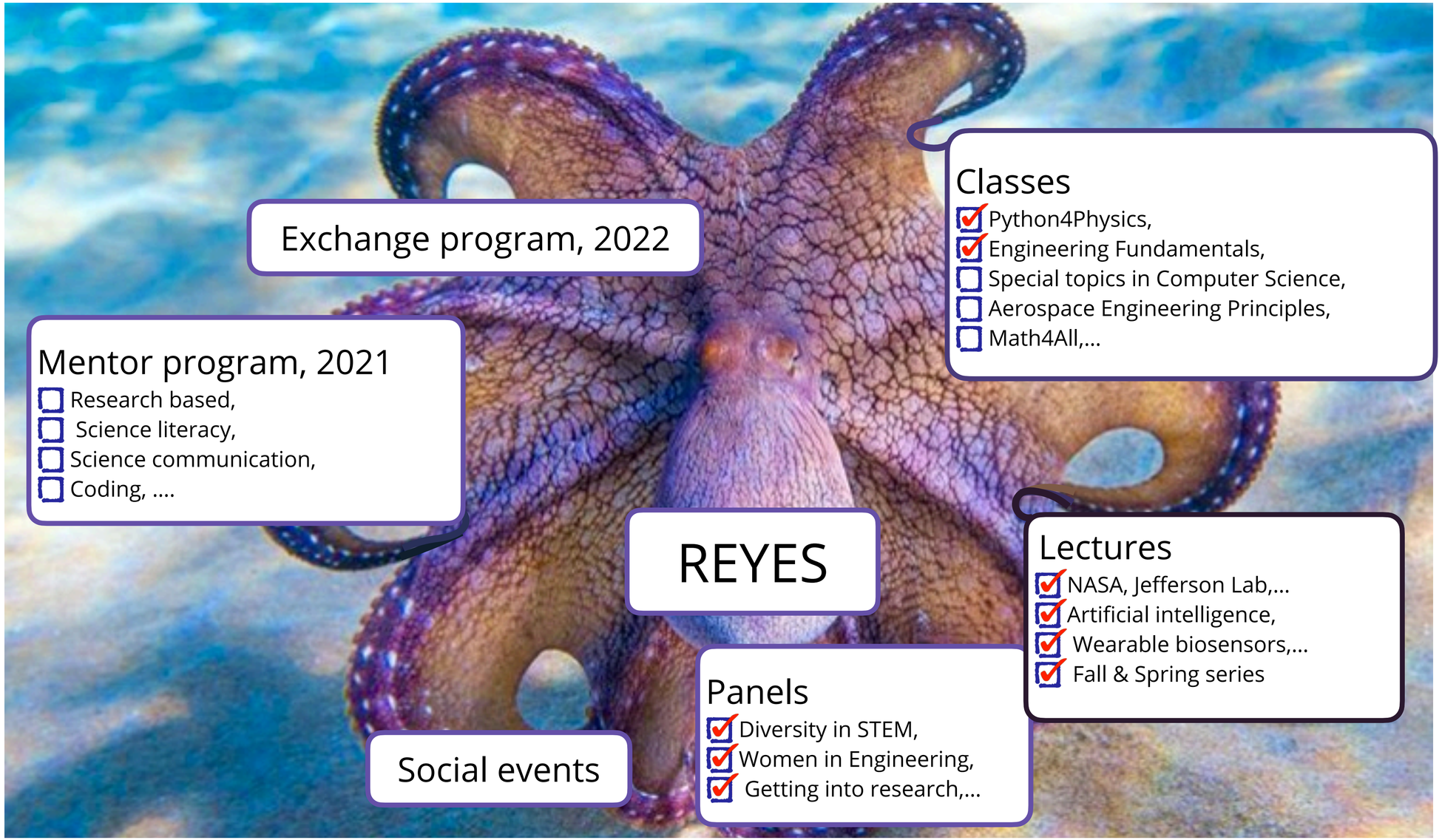


Pandemic ⟹ Cancelations ⟹ Virtual program ⟹ global ⟹ arbitrarily large

REYES overview // over 80 free virtual events



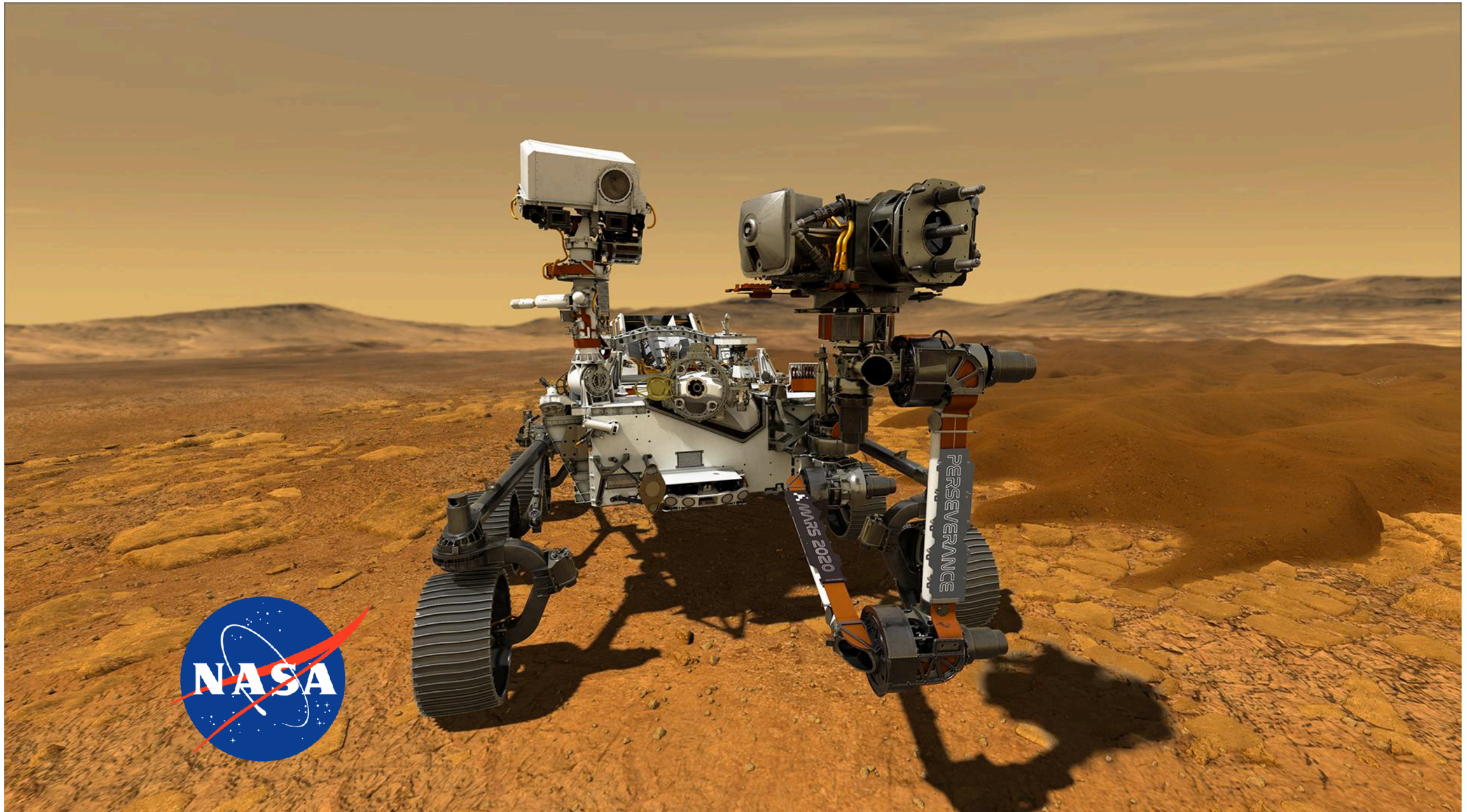
REYES overview // over 80 free virtual events



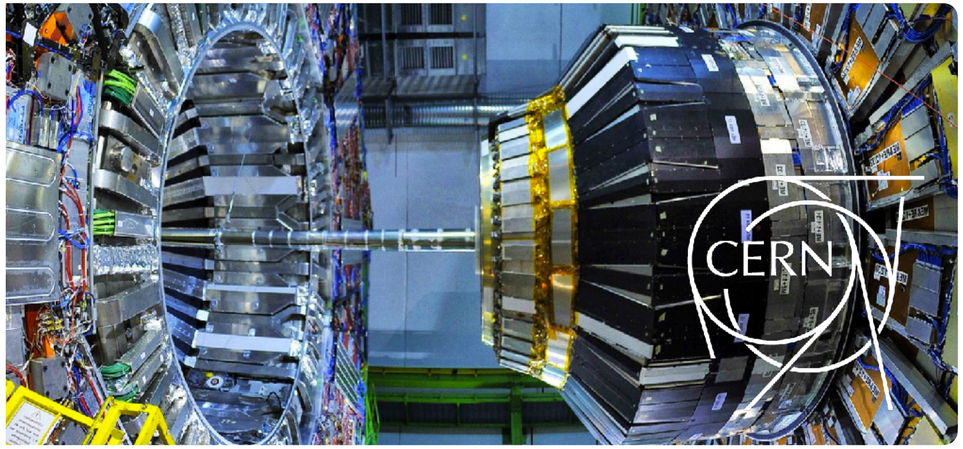
Contributions

Contributions

Contributions



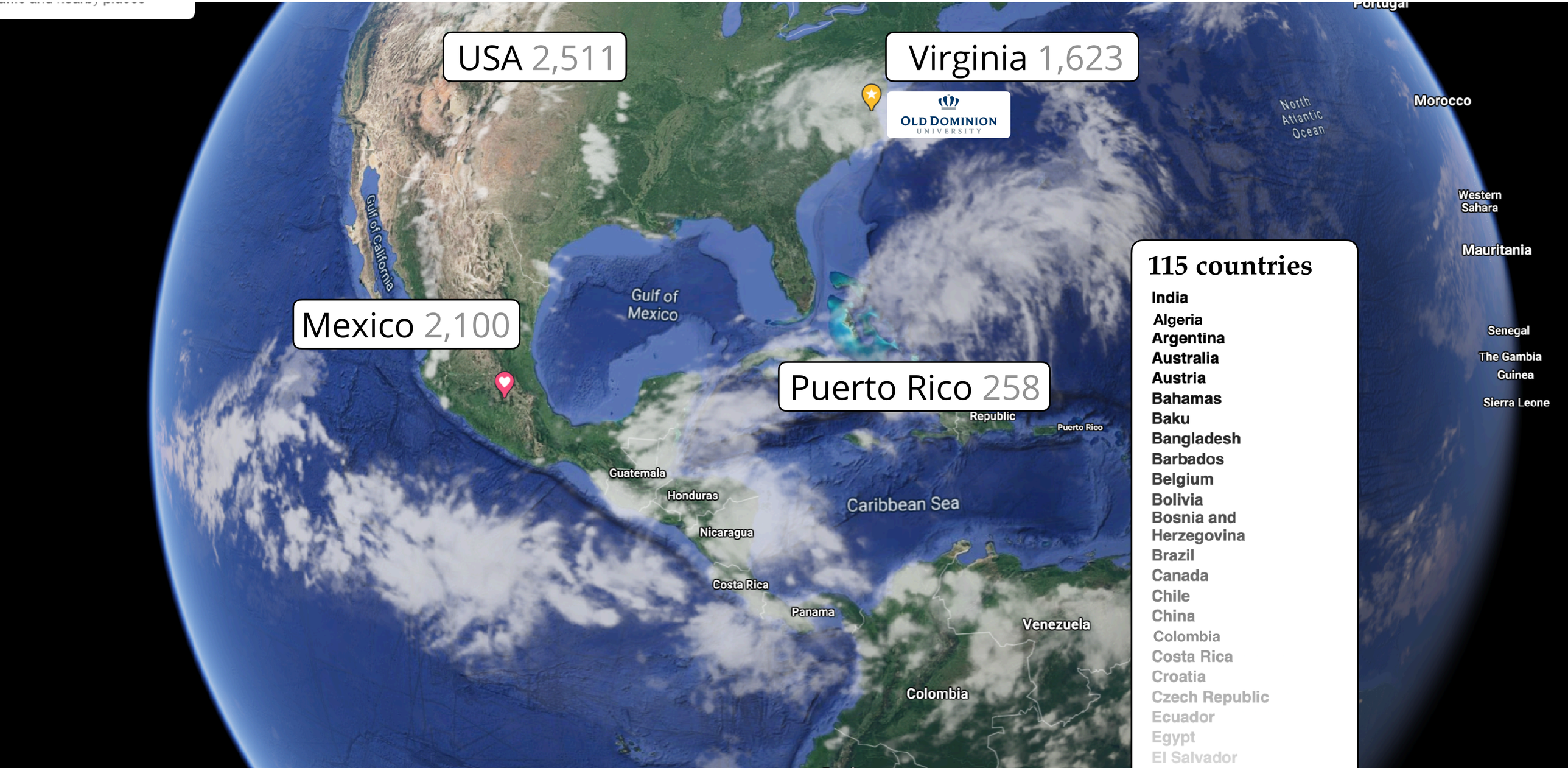
Contributions



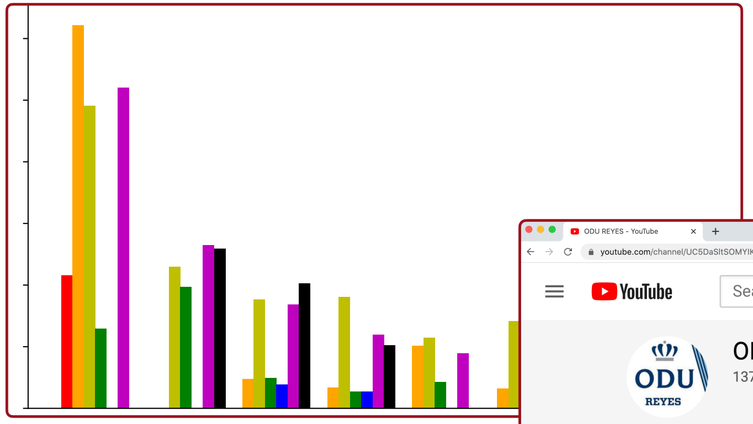
ario

WILLIAM & MARY
CHARTERED 1693

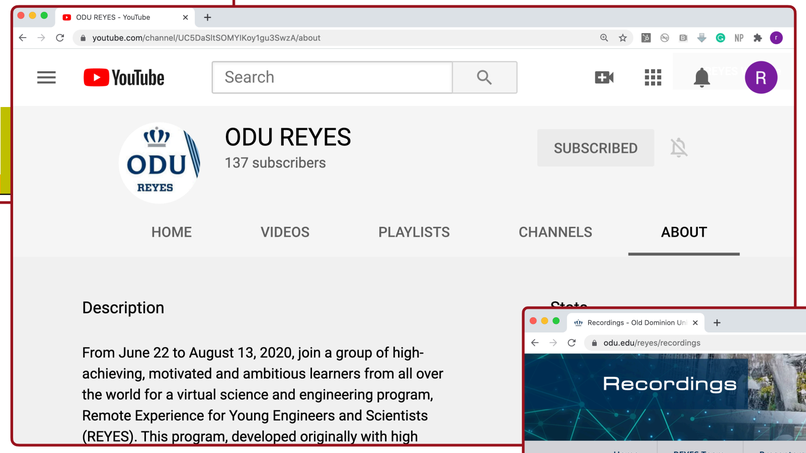
Global Participation // 7,335 (4,8424 international)



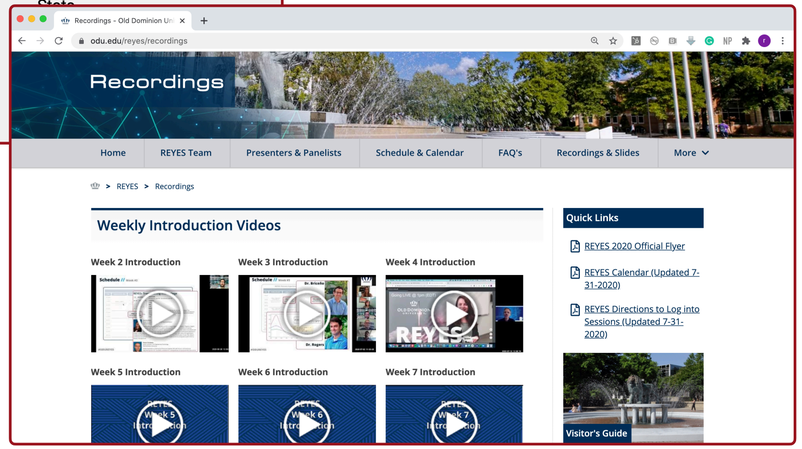
Viewership // 21k total views



LIVE // 12,151



YouTube // 3,569



Archive // 4,090 + 1,105

Python4Physics = 2,132

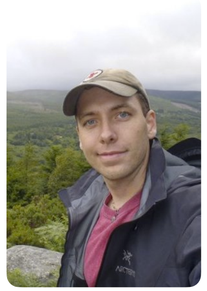
Ellen Ochoa, Ph.D // 2k views

NASA Astronaut
Director Johnson Space Center

Keynote Speakers // Fall 2020 + Spring 2021

Sept
~700

Saul Ramos-Sanchez



Oct
+200

Jaime Zahorian

Nov 19
~400

Stuart Henderson

Nov
~2k

Ellen Ochoa

Jan
~600

Carolyn Rutledge

Tina Gustin

RSVP Link

Zoom link: https://odu.zoom.us/j/99583621328

March 20
"Is the universe a simulation?"

Zohreh Davoudi
U. of Maryland Professor
RIKEN Fellow

Assessment // Enthusiasm & Recognition

Opinion of ODU:

- Prior to attendance, **58% of participants were unfamiliar with ODU**
- **Opinion of ODU improved for 60%**
- **54% are more likely to attend ODU thanks to REYES!**

Inspiration:

- **Over 70% felt more confident/enthusiastic in pursing both a career in STEM and conducting research after thanks to REYES.**

It works!

Connor McCarty,
starting at ODU in the fall

JLAB-THY-20-3272

Solving relativistic three-body integral equations in the presence of bound states

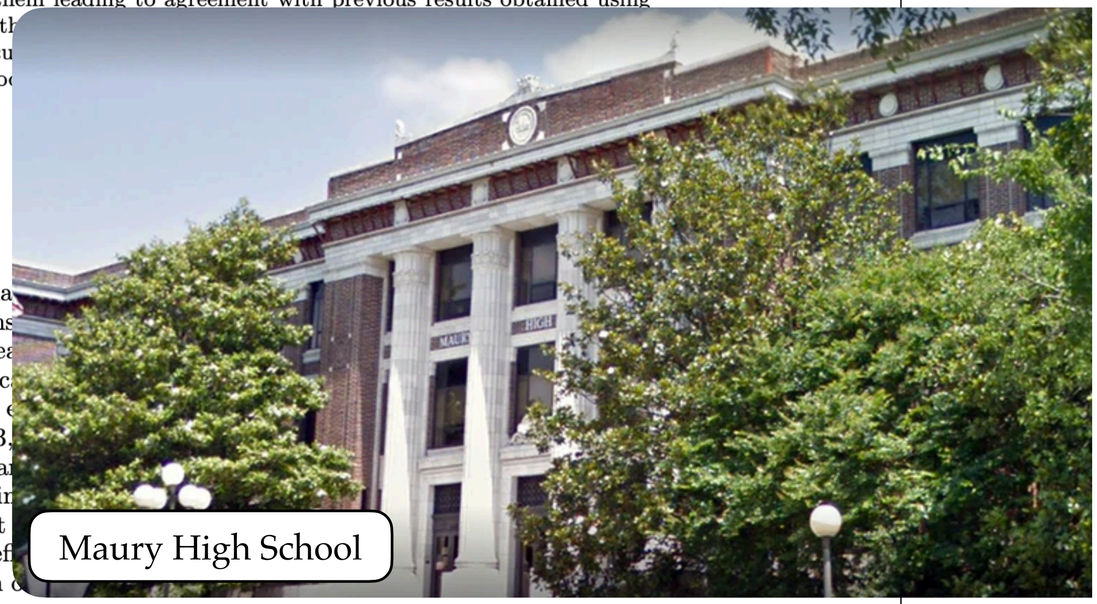
Andrew W. Jackura,[1,2,*] Raúl A. Briceño,[1,2,†] Sebastian M. Dawid,[3,4,‡] Md Habib E Islam,[2,§] and Connor McCarty[5,¶]

[1] *Thomas Jefferson National Accelerator Facility, 12000 Jefferson Avenue, Newport News, Virginia 23606, USA*
[2] *Department of Physics, Old Dominion University, Norfolk, Virginia 23529, USA*
[3] *Physics Department, Indiana University, Bloomington, Indiana 47405, USA*
[4] *Center for Exploration of Energy and Matter, Indiana University, Bloomington, Indiana 47403, USA*
[5] *Matthew Fontaine Maury High School, Norfolk, Virginia 23517, USA*

(Dated: October 21, 2020)

We present a systematically improvable method for numerically solving relativistic three-body integral equations for the partial-wave projected amplitudes. The method consists of a discretization procedure in momentum space, which approximates the continuum problem with a matrix equation. It is solved for different matrix sizes, and in the end, an extrapolation is employed to restore the continuum limit. Our technique is tested by solving a three-body problem of scalar particles with an S wave two-body bound state. We discuss two methods of incorporating the pole contribution in the integral equations, both of them leading to agreement with previous results obtained using finite-volume spectra of the same th
systematic errors. Although we focu
numerical evidence that the metho
threshold as well.

Several outstanding problems in modern-da
tion of the dynamics of multi-hadron systems
interaction, are observed experimentally in rea
example is the recently observed tetraquark c
the complexity of these reactions, it is rarely e
(QCD), or merely kinematic enhancements [3,
tests of the fundamental symmetries of the Sta
measurement of the enhanced CP violations in
can result from the presence of a rich resonant
three-nucleon forces are indispensable in the ef
some key examples]. However, the exact form o
see Ref. [9]



REYES 2.0 // 2021-2022

- Build on success of REYES 1.0,
- Expand educational content,
- Mentor program,
- **Collaborate with Virginia schools to enhance the learning experience,**
- Grant funding:
  - Assistantships,
  - Received one grant, applied to another.
- Launch crowdfunding fundraising campaign,
- Continue to offer fall + spring REYES Lecture Series.

REYES 2.0 // 2021-2022

Immediate challenges ahead:

- Zoomed out,
- Lack of novelty,
- Competition?
- ...?

Agenda

Agenda:

- **Introduction of the REYES program** - 15min ✅
- **Clarifying questions / feedback** - 15min
- **Brainstorm session** - 20min
  - What can we do to increase engagement with students?
  - What are the STEM-H topics of most interest to students and teachers?
  - What do students and teachers need?
  - How can we collaborate/partner with your schools/orgs?
  - What is the best way for us to distribute the content among educators?


OLD DOMINION
UNIVERSITY™
REYES
SUMMER SESSION: JUNE 28 - JULY 23
odu.edu/reyes
@reyesodu
@ODUREYES
@odu_reyes
/ odu reyes

Back up slides

Mentor program

Research oriented program

- Create pool of mentors with projects
- Mentees: HS students & young College
- Goals: increasing of access and participation of underrepresented groups.
- Weekly one-on-one meetings
- Weekly group meetings
- Training on programming, writing, and presenting technical content.

Viewership // Summer 2020