

**Physics NSF-REU Site
Director Workshop:
What Did We Learn and
What Questions
Remain?**

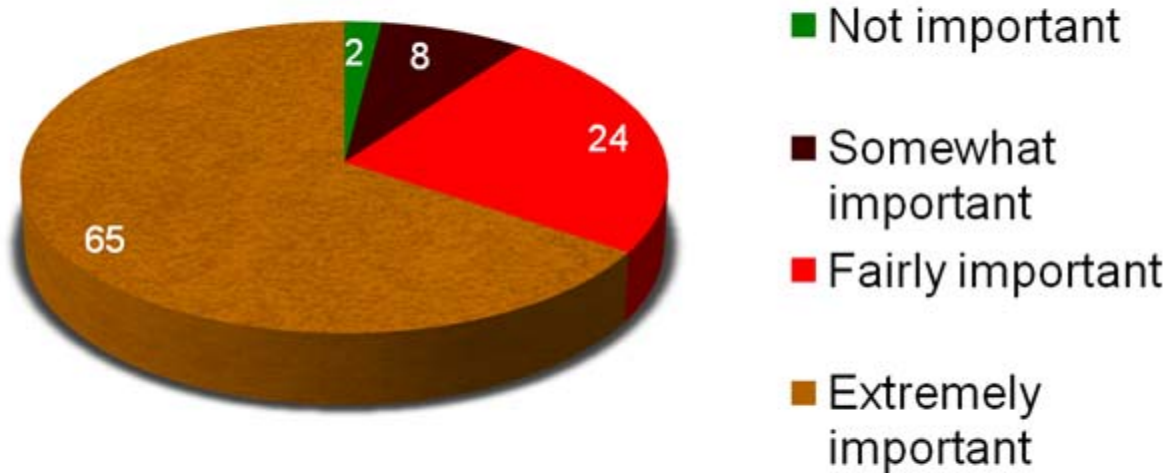
Dr. Mario Affatigato
Physics Department, Coe College
Physics REU Leadership Committee

Motivation

Why is the REU program important?

Preaching to the choir.

UROs Were Important to Career Decisions

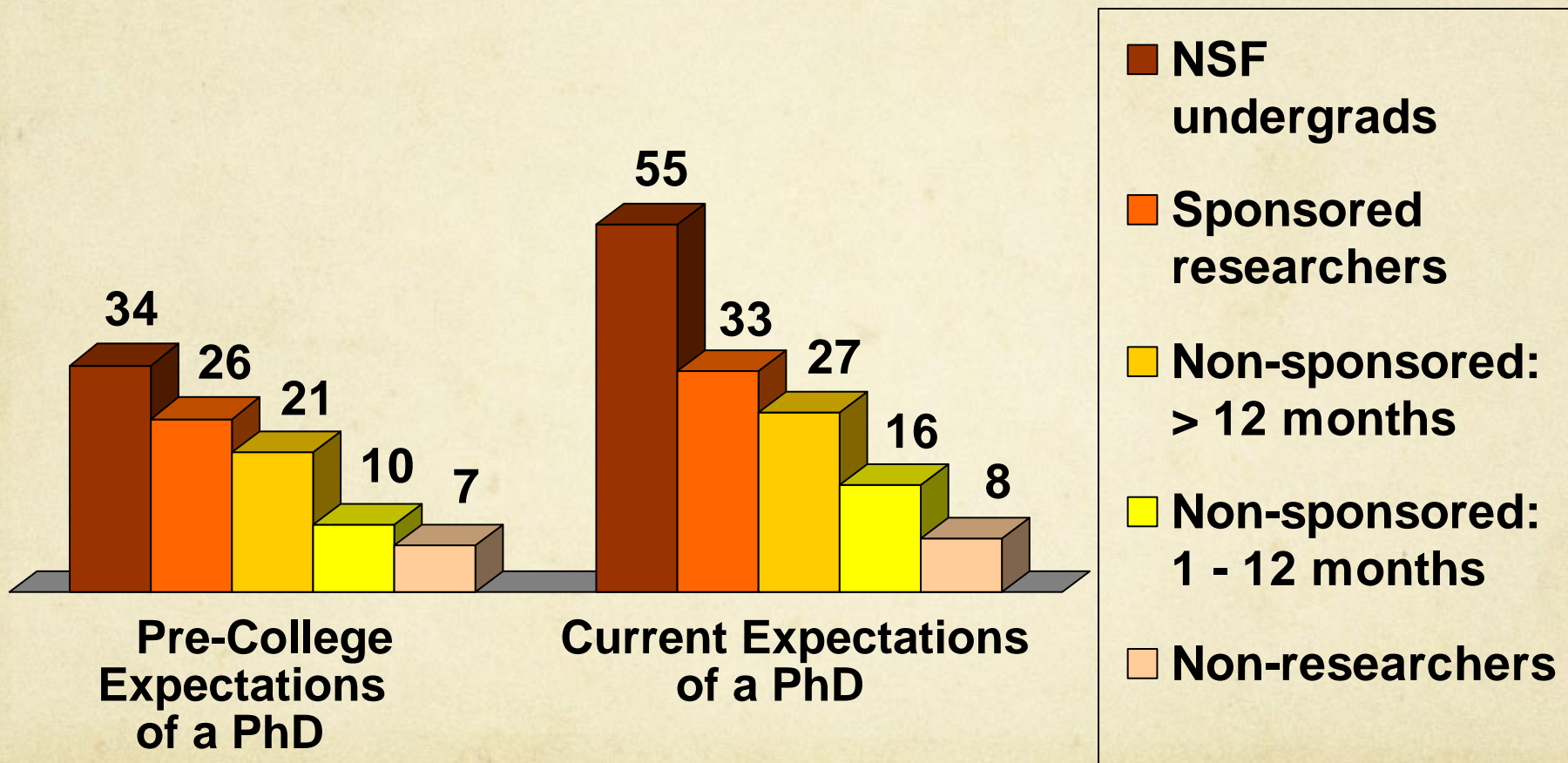


Source: NSF follow-up survey

Susan Russell, pan-REU workshop
Presentation, 9/21/2005.

UROs Attracted and Encouraged High Degree Expectations

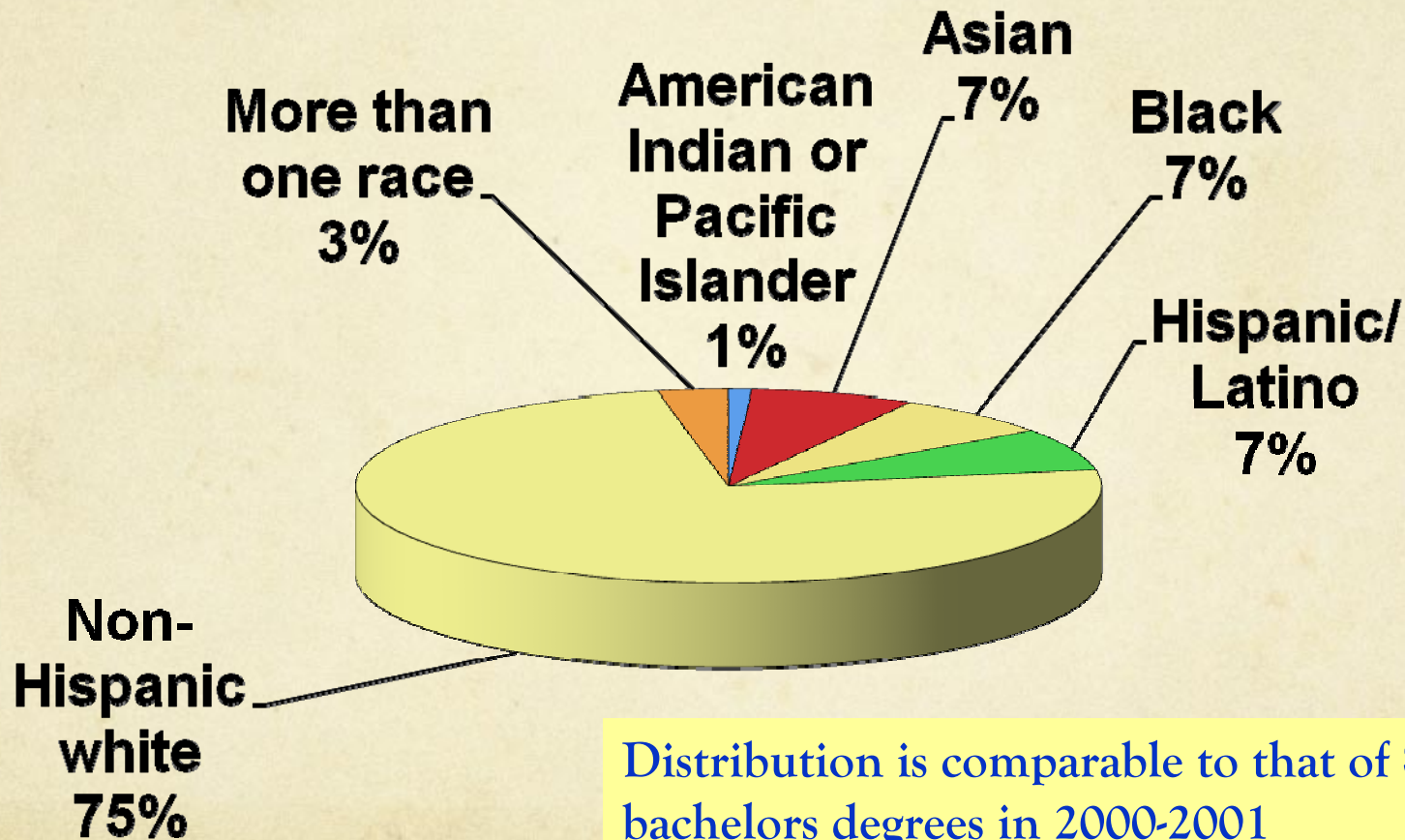
Percent of each NSF/STEM group who expected a PhD



Sources: NSF follow-up
and STEM surveys

Susan Russell, pan-REU workshop 9/21/2005.

Among STEM Students, Minorities Are (Fairly) Well-Represented in REU



Distribution is comparable to that of STEM bachelors degrees in 2000-2001

Source: NSF undergrad survey

Susan Russell, pan-REU workshop 9/21/2005.

Correlates of Increased Confidence

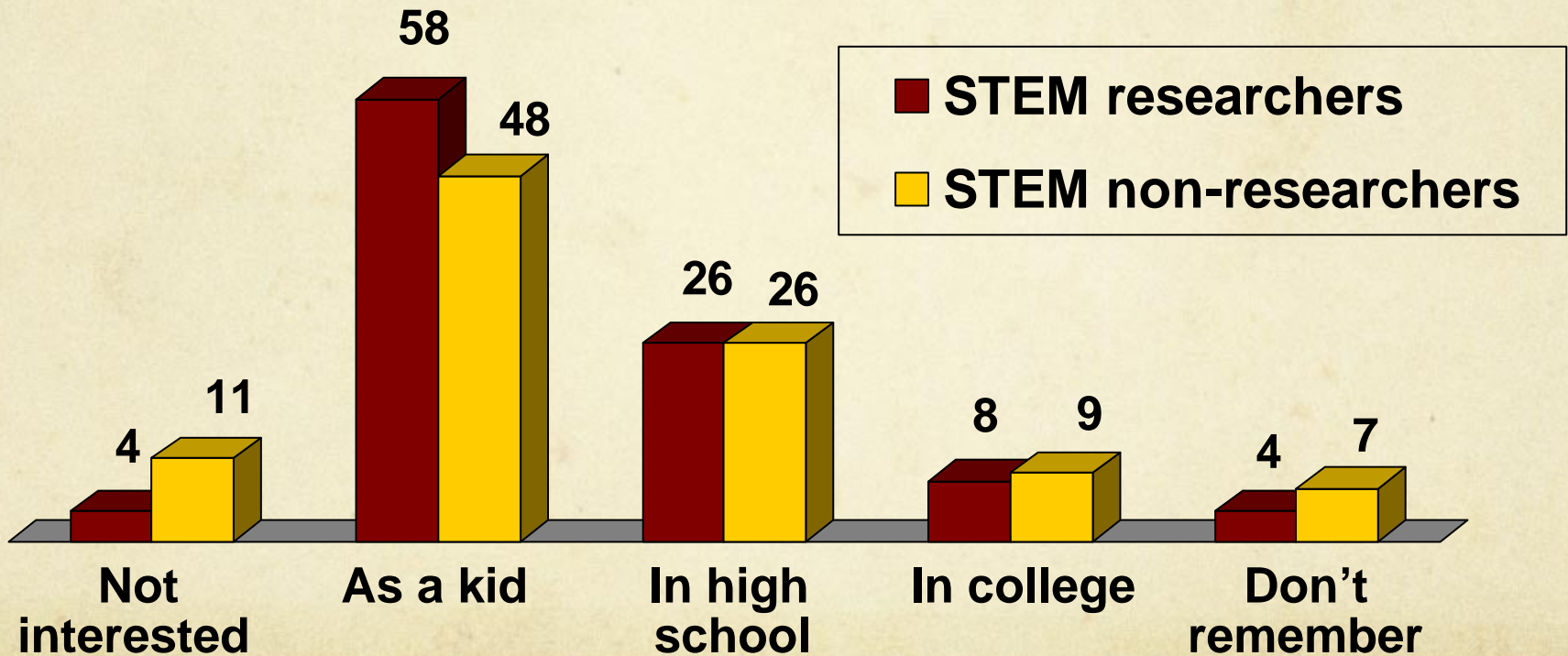
- ✿ Variety of research activities and intensity (hours/week) of the research experience
- ✿ Amount of time spent with faculty mentor
- ✿ How well prepared the student felt s/he was for the work s/he was asked to do
- ✿ Involvement in project design

Source: NSF undergraduate survey

Susan Russell, pan-REU workshop 9/21/2005.

Most STEM Majors—Especially Researchers—Became Interested in STEM as Kids

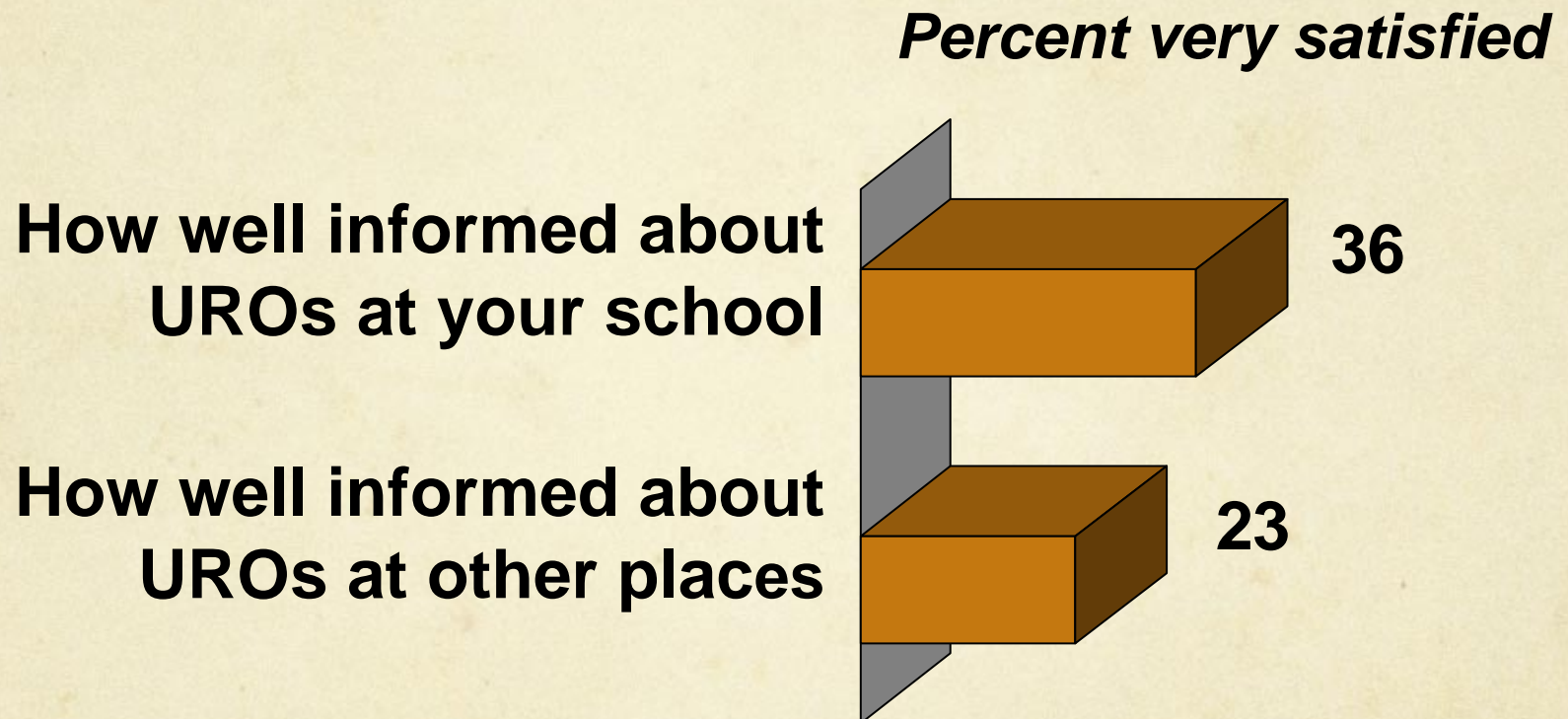
*Percent of each group who became interested in STEM
at each specified time*



Source: STEM survey

Susan Russell, pan-REU workshop 9/21/2005.

Students Are Not Very Well Informed About UROs, Especially Those at Other Institutions



Source: NSF follow-up survey

Susan Russell, pan-REU workshop 9/21/2005.

Students Are Not Very Satisfied With the Variety/Relevance of UROs

Percent very satisfied

The relevance of UROs at your school to your interests

40

The variety of UROs at your school

37

Source: NSF follow-up survey

Susan Russell, pan-REU workshop 9/21/2005.

The pan-REU workshop

The History

September 21, 2005

Randy Duran

Mary Boyd

Andrew Cohen

Mario Affatigato

Pat Dixon

Charles Becker

Robyn Hannigan

Karen Sutherland

John Vetelino

Topics

Symposium I: Impact of the REU Program at the National Level

9:00 a.m.–12:00 noon

Session I.1, Room 375A:

REU and National Need

Speakers: Ben Oni and Diane Clayton,
NASA Headquarters

Moderator: Mario Affatigato, Coe College

Symposium II: Impact of the REU Program on Students

1:00 p.m.–4:00 p.m.

Session II.1, Room 375A:

Adding to the Student Experience

Speaker: Earnestine Psalmonds, NSF

Moderators: Frances Van Scoy, West

Virginia University, and Karen Sutherland,
Augsburg College

Symposium III: Running and Assessing REU Sites: Strategies and Models

Plenary Session and Breakfast, Room 1235

8:00–8:30 a.m.

Breakfast

Symposium I: REU and the National Need

Increasing the Pool

Summary recommendations (A):

- 1. Provide students with more and better information regarding summer research experiences*
- 2. Broaden the base of students by systematically reaching out to students who do not have ready access to those activities.*
- 3. Provide opportunities for participation in research experiences early in students' academic careers.*
- 4. Create more interdisciplinary programs, and develop a formal structure to handle them.*
- 5. Focus on maximizing the quality of REU participants, letting quantity be a secondary consideration.*

Assessing and Aiding

Summary recommendations (B):

- 1. Track REU participants by sending a follow-up questionnaire twice yearly, perhaps using a dedicated website, for the three years following their summer research experience or until they have chosen their first career path.*
- 2. Encourage development of site-specific electronic newsletters that could be distributed to past REU students*
- 3. When compiling statistics to assess the success of REU programs, carefully develop an operational definition of what constitutes persistence in science.*
- 4. Fund post-REU activities of willing REU participants to a greater degree.*
- 5. Encourage the inclusion of activities within REU programs that can help the students with the graduate school application process.*
- 6. Foster and/or encourage partnerships with private industry, federal organizations, and professional societies.*

Increasing Visibility

Summary recommendations (C):

- 1. Develop a mechanism by which individual programs can provide information that can be used judiciously by NSF to enhance the national visibility of REUs.*
- 2. The NSF should find novel ways to enhance its role in increasing institutional commitment to REU programs.*
- 3. The NSF should encourage the producers of national academic rankings to include undergraduate research programs as a criterion in their rating.*
- 4. The NSF should publicize effective REU models involving partnerships between universities and foundations, corporations and other domestic and international institutions.*
- 5. Wherever possible, REU sites should apply to interested research institutes, professional societies, and industries for supplemental support.*



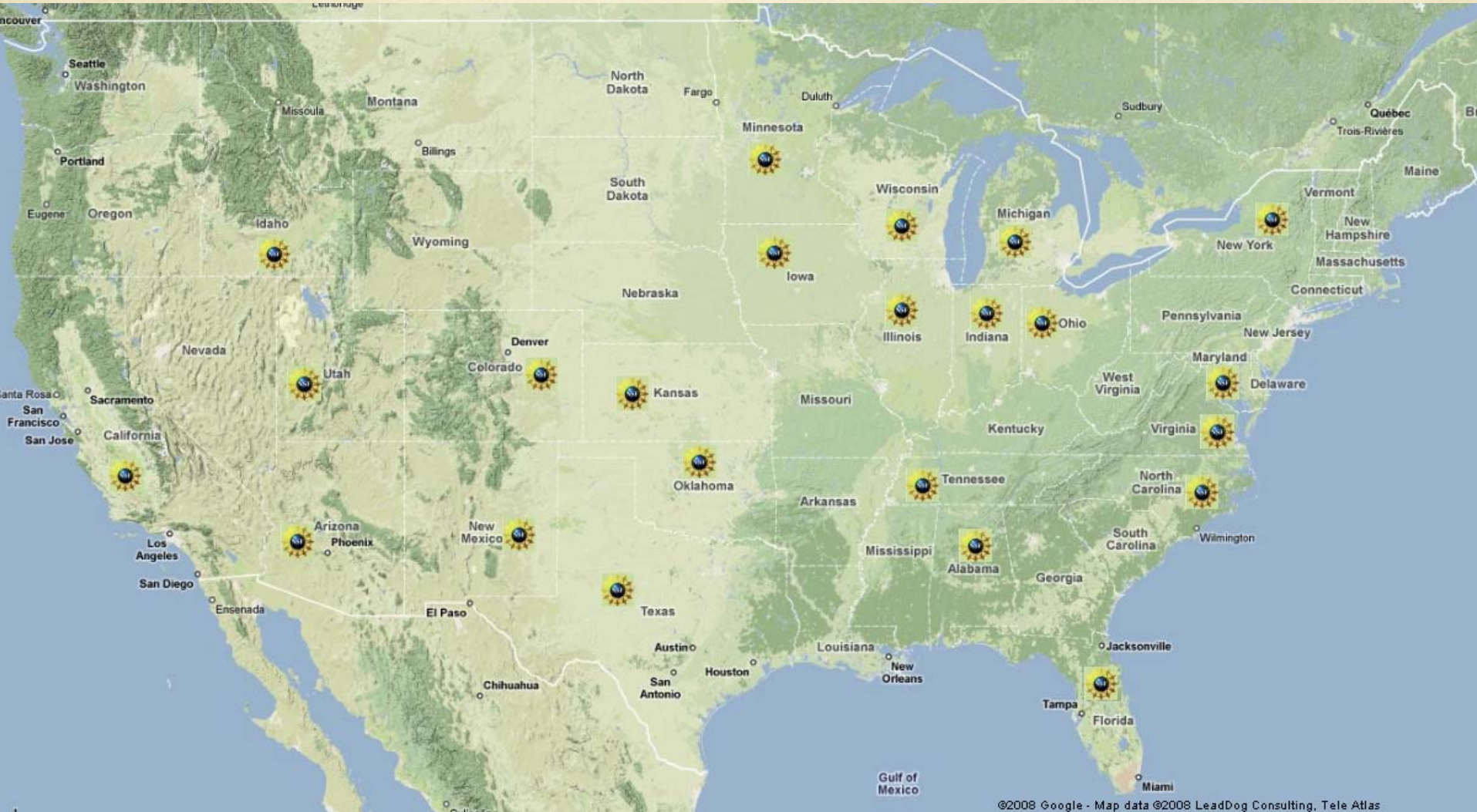
The Physics REU Site Directors Workshop



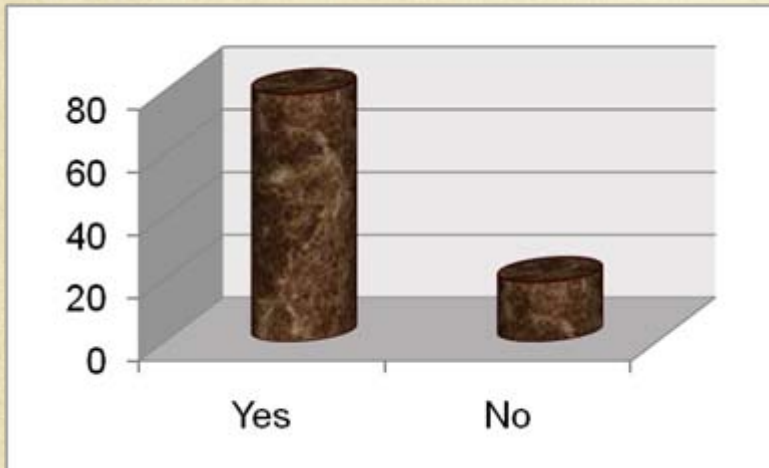
Pictures by Ken Cole

I. Background:

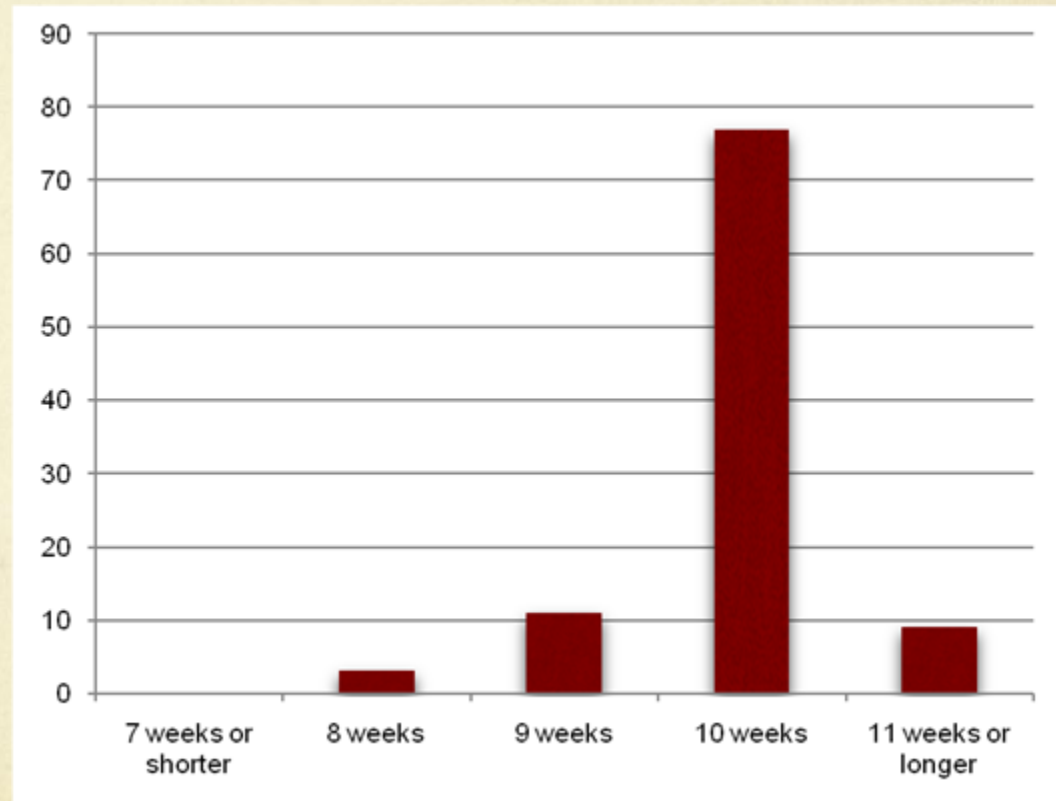
Geographical distribution of NSF Physics REU Sites



I. Background data gathering

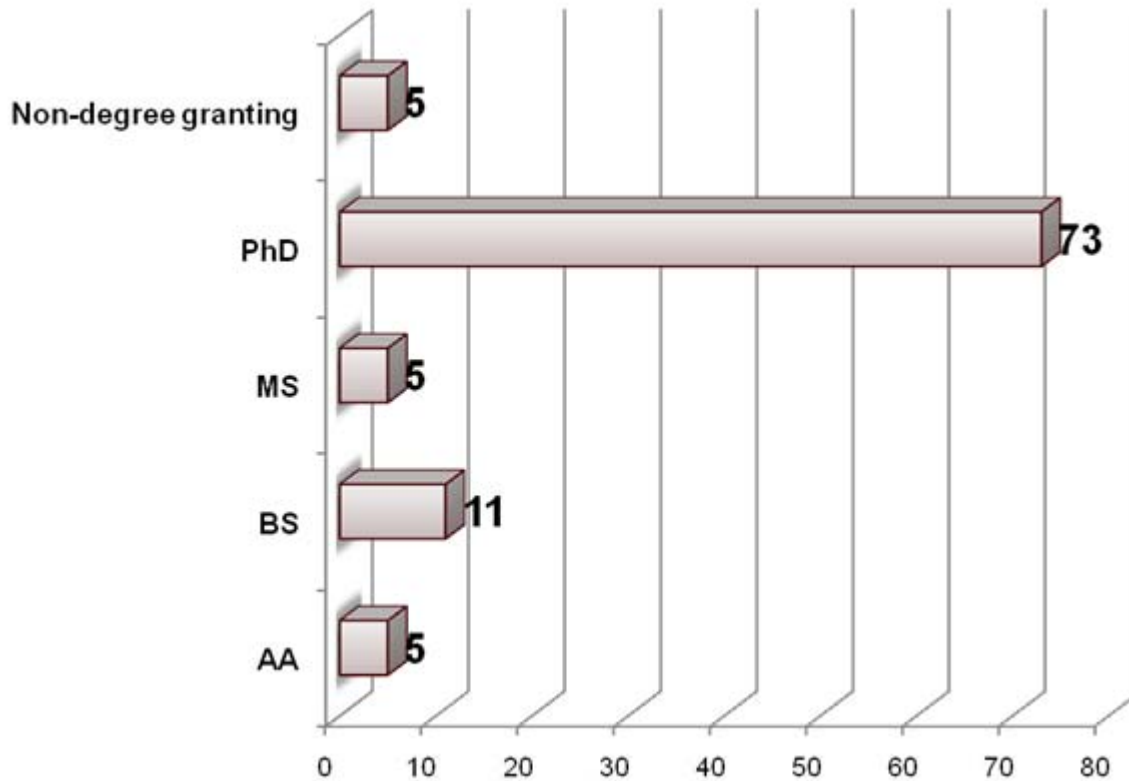


Did you participate in research as an undergraduate?
(Site directors)

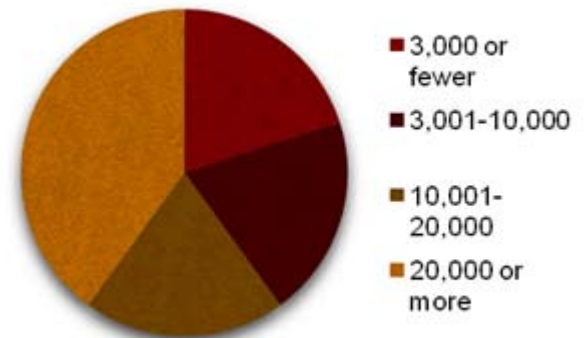


How long is your program?

I. Background data gathering

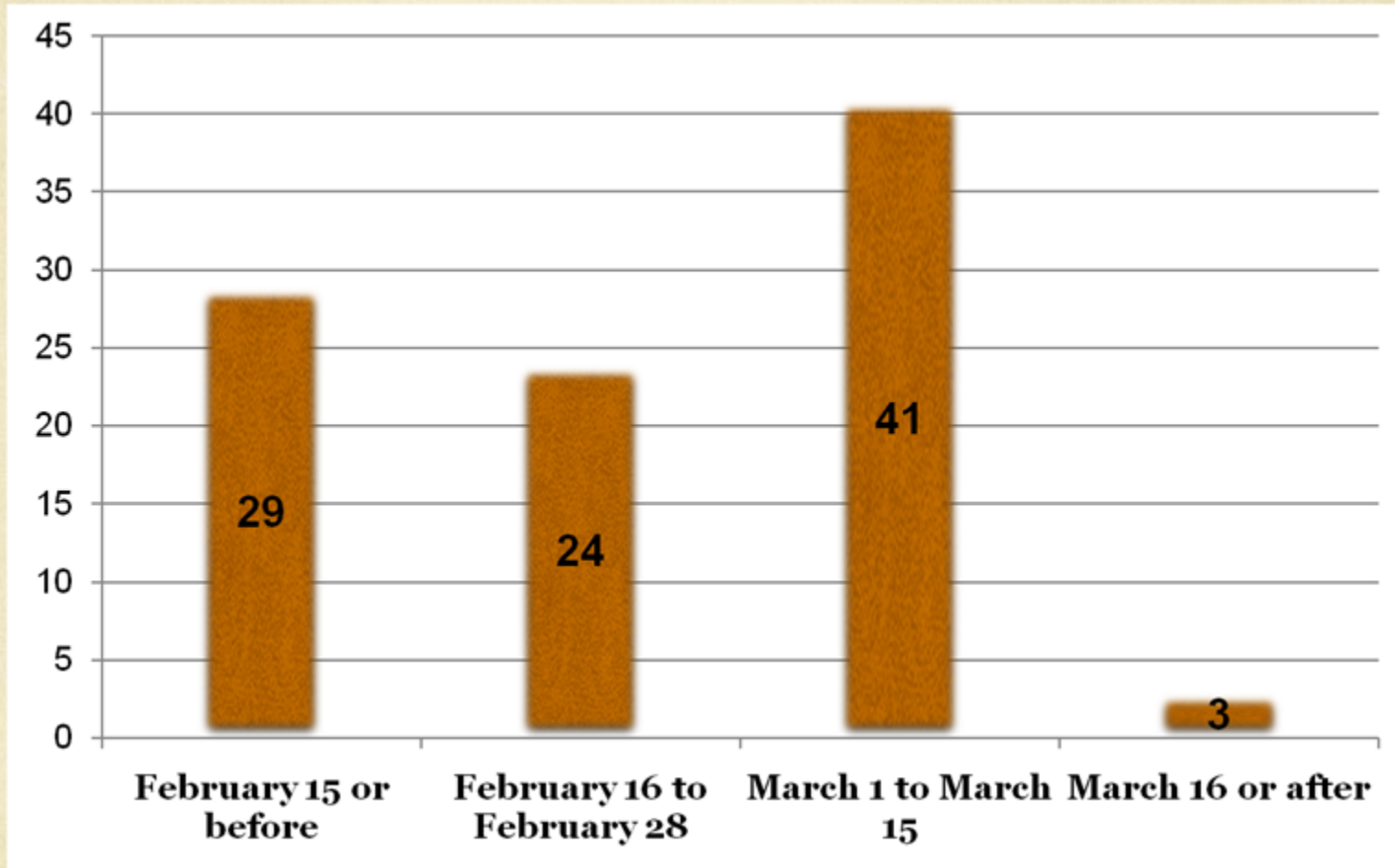


What is the highest degree awarded in the host department(s) of the site?



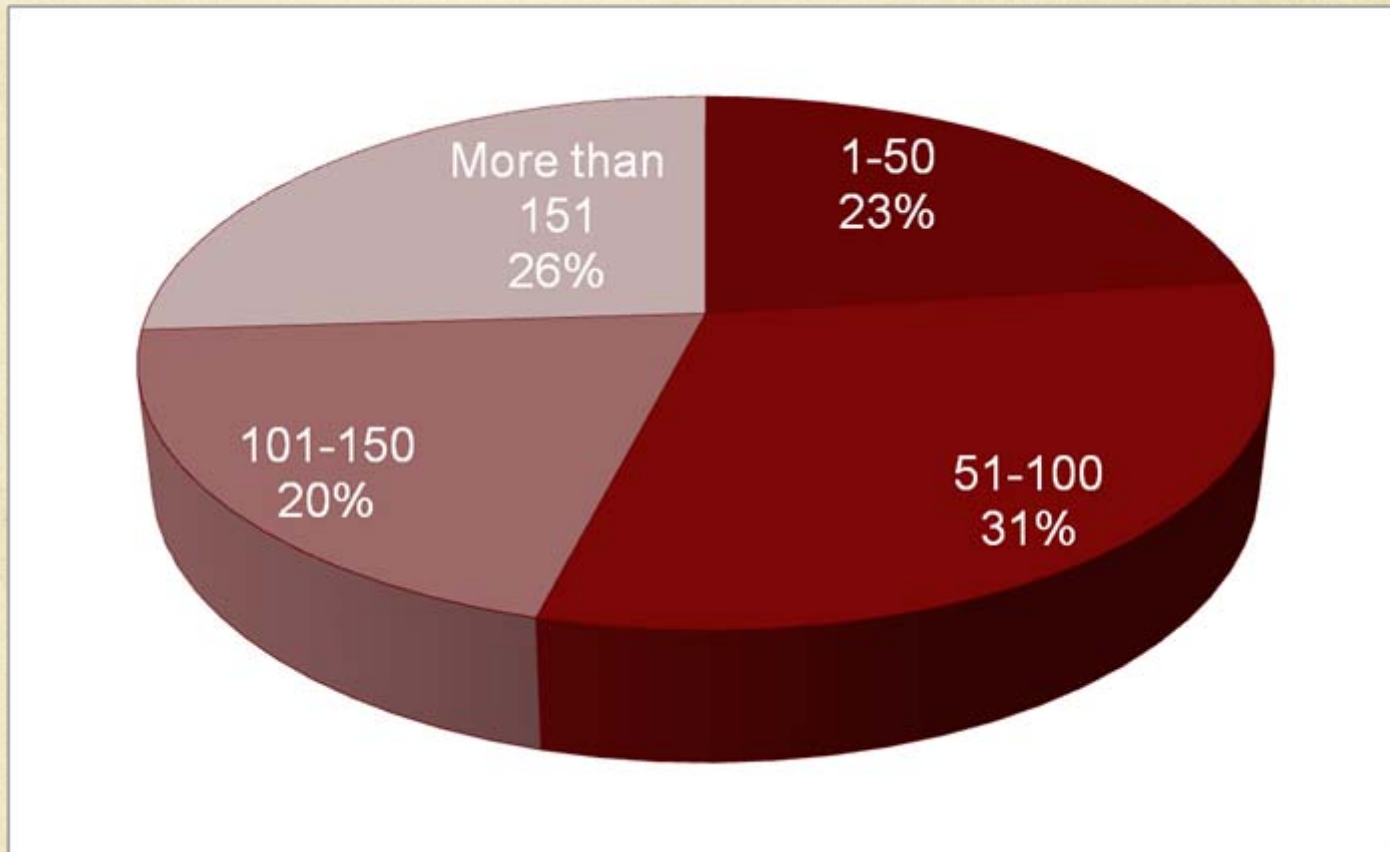
How large is your college or university?

I. Background data gathering



**If you have an application deadline,
what is your first deadline?**

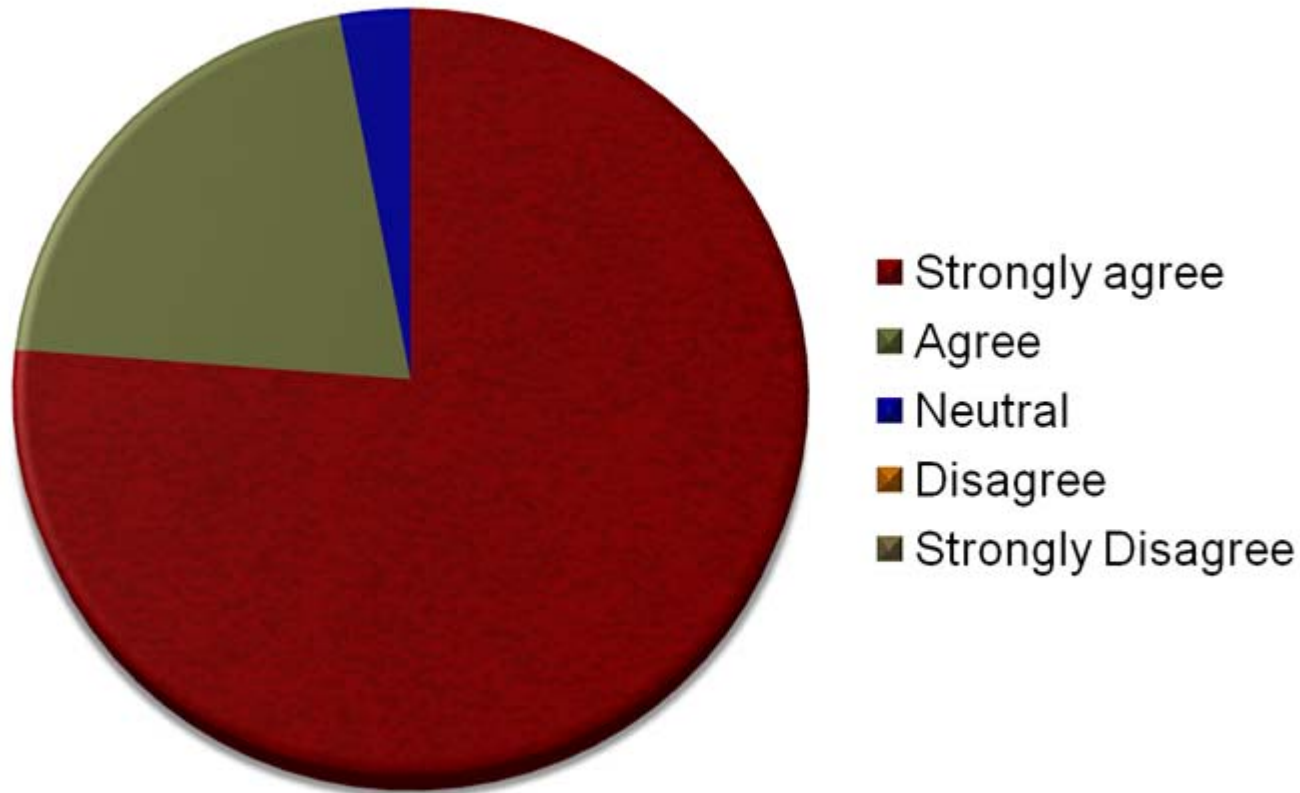
I. Background data gathering



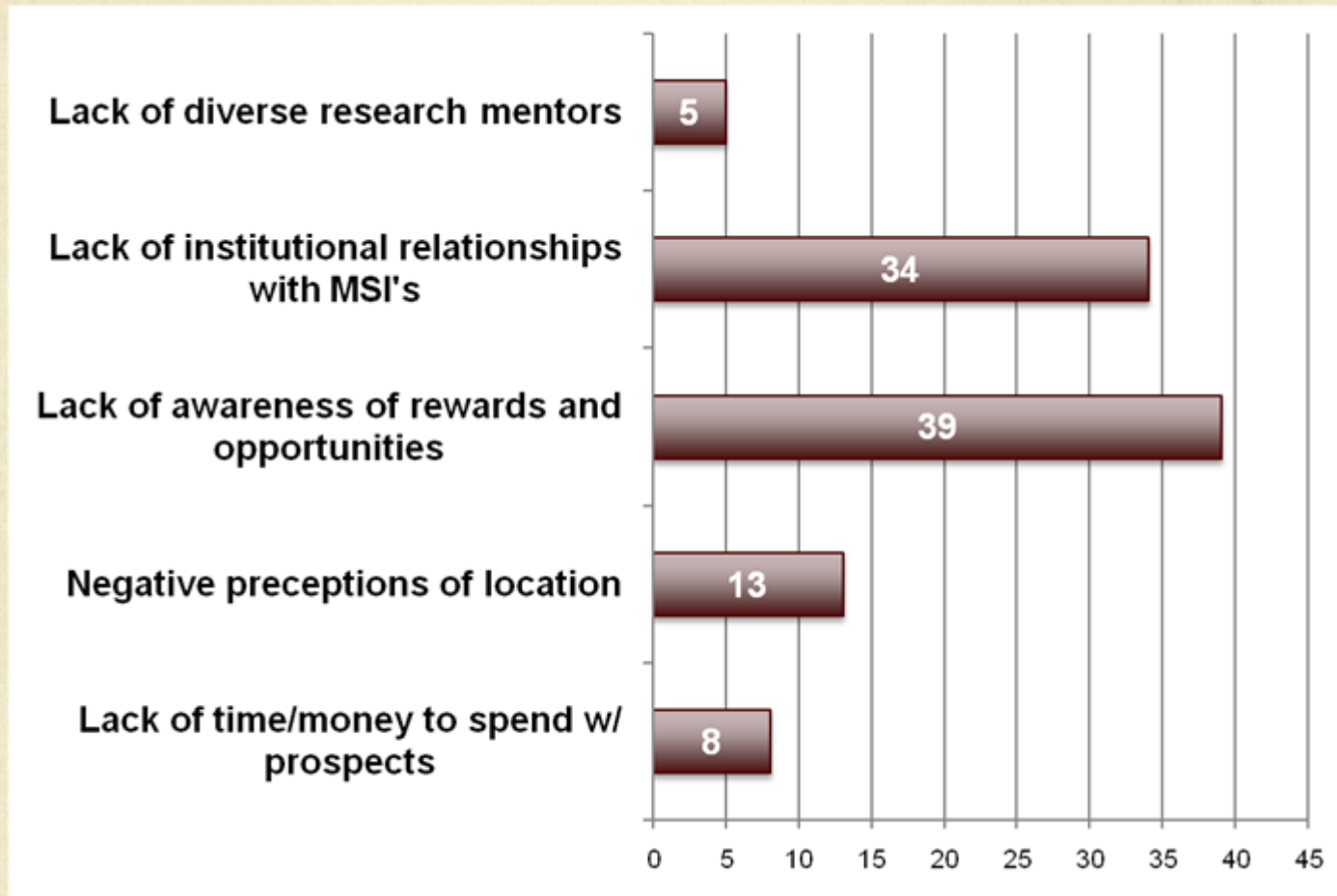
How many on-time, complete applications does your site receive each year?

II. Diversity issues

Having a diverse set of participants in an REU program is important.

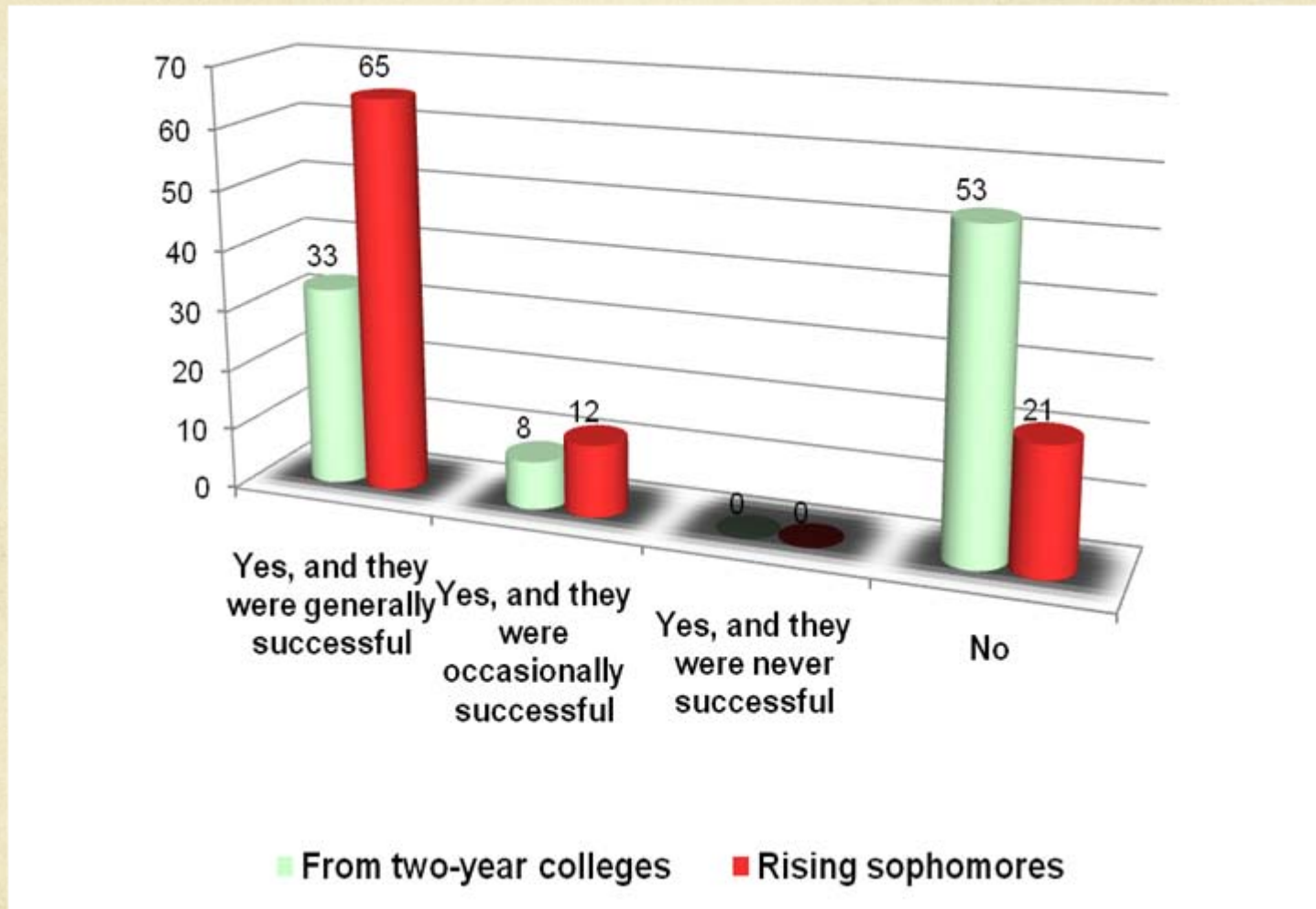


II. Diversity issues



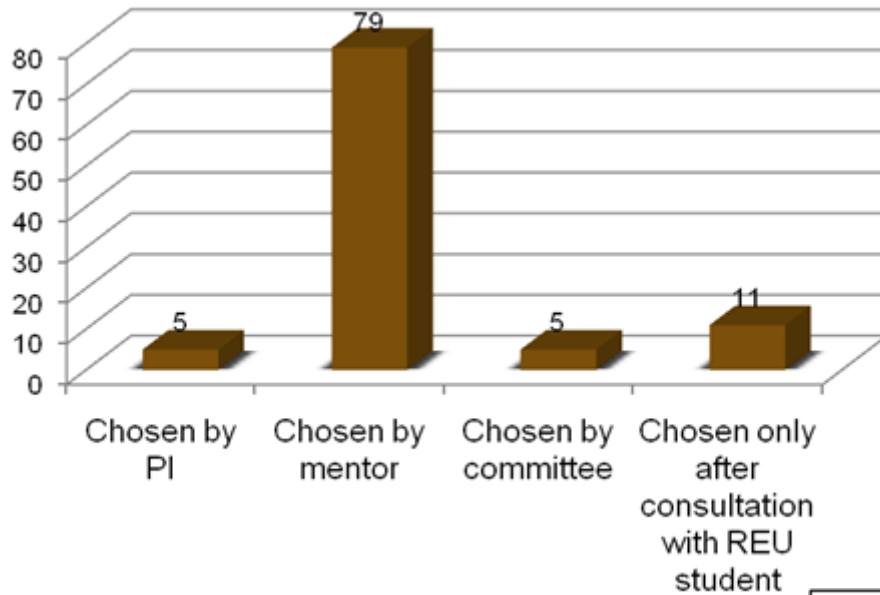
What do you believe is the biggest challenge in getting **complete** applications from underrepresented students for your program?

III. Two-year and other younger students



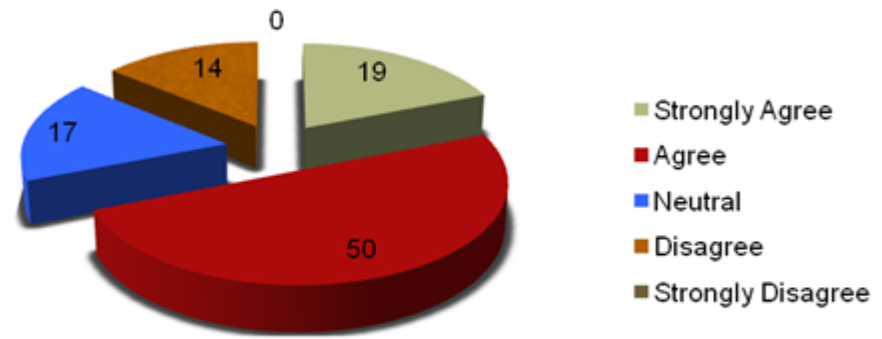
Comparison of whether two-year or rising sophomore college students had ever participated in REU site program.

IV. Effective practices

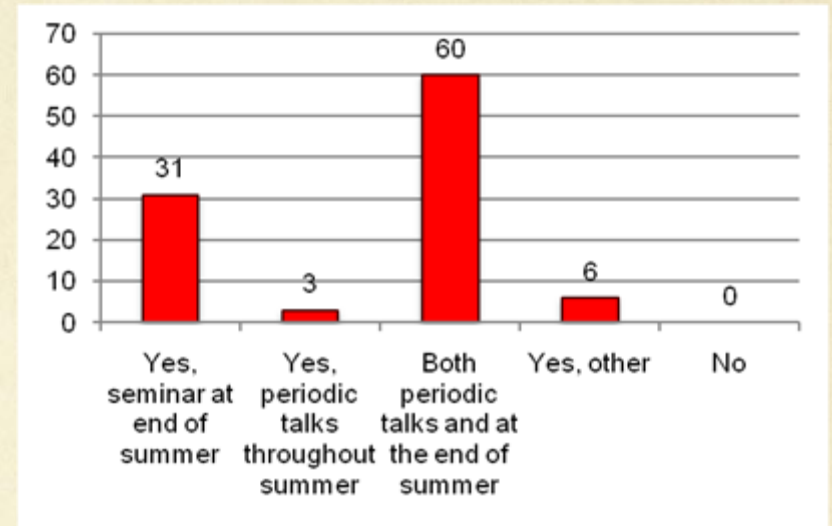
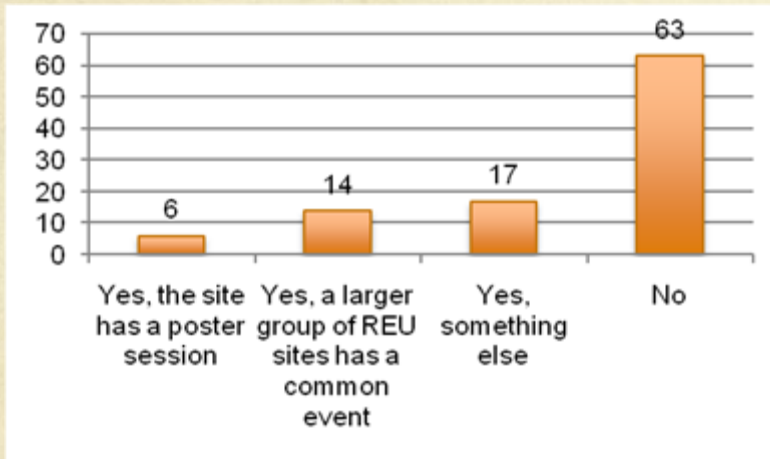


How are the actual REU scientific projects determined?

Exposure to ethics is important in an REU program.



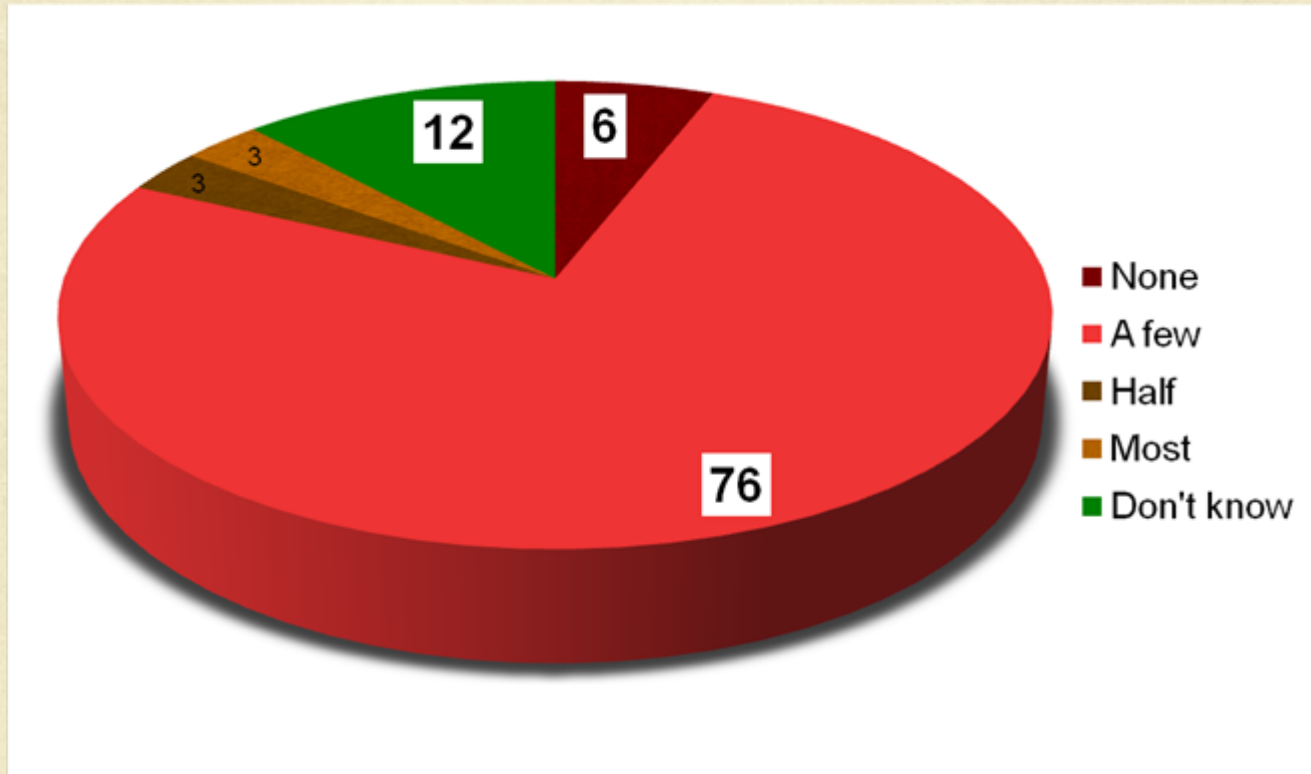
IV. Effective practices



Do the students participate in a poster session at the end of the summer?

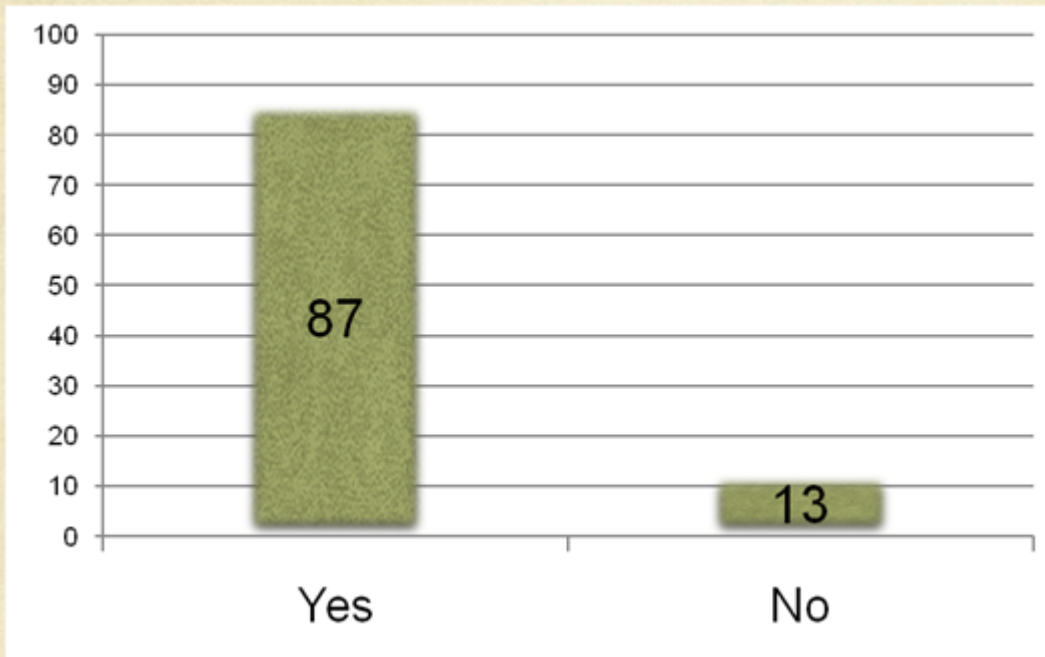
Do your students give an oral presentation?

Other information



What fraction of students are coauthors on peer reviewed articles?

And so...



Would you support forming the proposed leadership group?

The Physics REU site director leadership group members are:

- Catherine Mader, Hope College
- Theodore Hodapp, American Physical Society
- Mario Affatigato, Coe College
- David Ernst, Vanderbilt University
- Richard Galik, Cornell University
- Steven Turley, Brigham Young University
- Sherry Yennello, Texas A&M
- Eric Black, California Institute of Technology
- Thomas Kvale, The University of Toledo
- Brad Trees, Ohio Wesleyan University

What are the Steering Committee's plans?

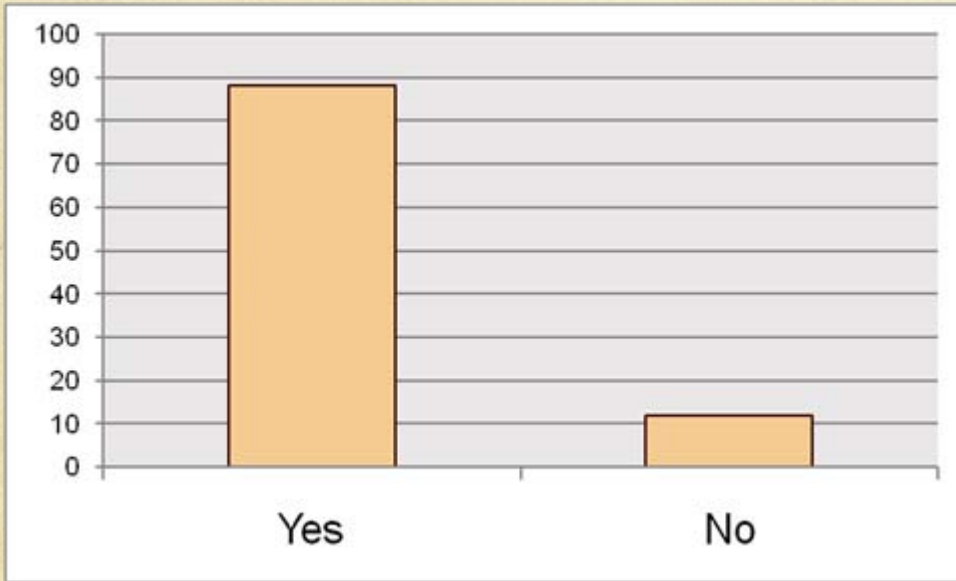
What are we doing?

The conditions

The Physics REU Leadership Committee was setup with the understanding that **no REU funds** would be invested in its operation.

This is in contrast to the model of REU Steering committees in other divisions, where an REU site is given up and the corresponding monies are used to fund the Steering committee.

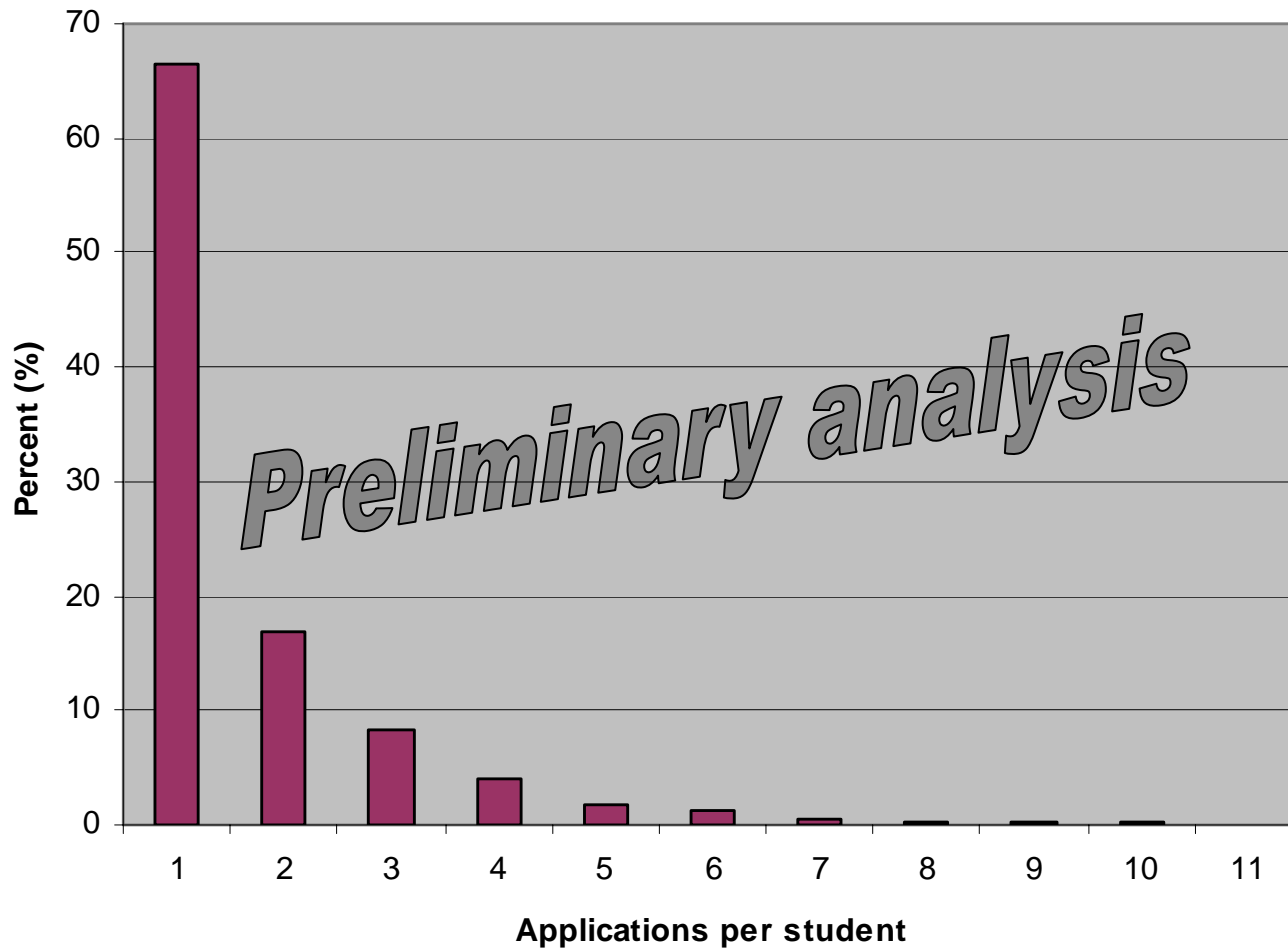
Collecting data



Do you see value in pooling application information in order to gather statistics about the application and acceptance process for REU students?

One of the outstanding questions for the Physics REU program is how well it serves the undergraduate student community. One measure relates to the difficulty of getting into a site, which in turn depends on the number of unique applicants per site. We have started to gather data to calculate this parameter.

Preliminary data



**Number of
Physics REU
sites queried:
60**

**Number of
responses:
19**

**Total number of
applications:
3148**


**Total number of
unique
applicants:
1868**

Advertising the REU program

Another goal of the Physics Leadership Committee is inform different constituencies about the REU program. This includes students who may wish to participate; faculty and entities that may wish to apply to become sites; and faculty and staff at existing sites that may wish to learn about the overall program and obtain information about best practices.

Opportunities for Undergraduate Research Experiences in Physics

NSF Physics REU Site Program



Development of Skills during Undergraduate Research Experiences

Research experiences have profound impacts on undergraduate students. Summer undergraduate research experiences provide an opportunity for students to be directly engaged in research AND to work closely with their research mentor for extended periods of time. Students report that their faculty mentors treat them as colleagues. They feel that their experience has helped them to gain skills as researchers and also to persevere in the face of obstacles and unexpected results. Whether students choose to pursue careers in research or not, undergraduate research experiences help students to grow and develop skills that will help them in their future endeavors.



Additional Benefits for Students

By participating in an REU experience, students will have the opportunity to:

- become members of a national undergraduate research community,
- explore research opportunities in a variety of sub-disciplines of physics which might not be available at the home institution,
- generate new scientific knowledge which can be presented at local, regional and national meetings,
- begin building a network of professional contacts,
- explore different environments (research university, undergraduate college, national laboratory, etc.) in which physics research is conducted,
- develop the ability to work both independently and as part of a larger research group,
- strengthen their abilities with to work with state of the art instrumentation and theoretical models,
- join a group of undergraduate peers engaged in research and social activities for an 8 to 10 week period.

The National Science Foundation funds approximately 50 Physics sites which partner undergraduate students with mentors in a wide range of research areas in Physics. All sites are a bit different due to their institutional research focus and the geographical locations. Some sites focus on particle physics, while others focus on nuclear science. Some sites have a variety of research areas. Because the types of research projects vary greatly, the background knowledge of the ideal research student is also very different. Some sites encourage students to apply at the end of their Freshman year while others encourage students to wait until they have more Physics coursework under their belt. So regardless of your background, you should check out the Physics NSF-REU sites and apply!

To find out more about specific programs, check out the Physics REU listings at the NSF website: <http://www.nsf.gov/reu/physics/>



Physics REU sites are located in states which have an NSF flag. States with more than one REU site. To find out more about the specific locations of the REU sites, please check the NSF REU site website: <http://www.nsf.gov/reu/physics/>

Physics REU Site Director Workshop

The National Science Foundation also funded a workshop for all Physics REU site directors held at the American Physical Society in June of 2008. The directors shared ideas for programmatic issues that help to provide students with the best resources to grow as physics researchers while exploring what physics research is all about. In addition, the directors explored ways in which the opportunities for students to become engaged in undergraduate research can reach more students across the country.


There are many questions left to ask about how to reach more students and how to reach more potential mentors. To learn more about how to become involved in finding these answers, visit the Physics REU Site Workshop resource page or contact the leadership group at leader@aps.org.

Acknowledgements and Collaborators

The Physics REU site program and website are funded by the National Science Foundation. The REU website website and content are licensed by the American Physical Society.

The Physics REU site director working group members are:


• California State San Diego	• Brown Taylor, Rutgers University
• Princeton Institute, Princeton University	• Santa Fe Institute, Santa Fe, NM
• Texas A&M, Texas A&M	• Eric Black, California Institute of Technology
• Ohio State, Ohio State University	• Thomas Kuhn, The University of Idaho
• Richard Lath, Cornell University	• Paul Tynes, Ohio Western University




Development of Faculty Mentoring Skills

Research experiences have profound impacts on faculty research mentors. Unlike classroom experiences, faculty members commit to spending a great deal of time working together with the undergraduate research student. It is very rewarding to watch the student learn and grow. In addition, you will build connections with young students which will help you to "stay in touch" not only with future research students, but future students.

In addition, new research collaborations always lead to fresh ideas and expand your professional network. Not only is a mentor helping to develop a future research scientist, they are helping to develop a potential post research scientist. It is a bit of work, but it is well worth it!

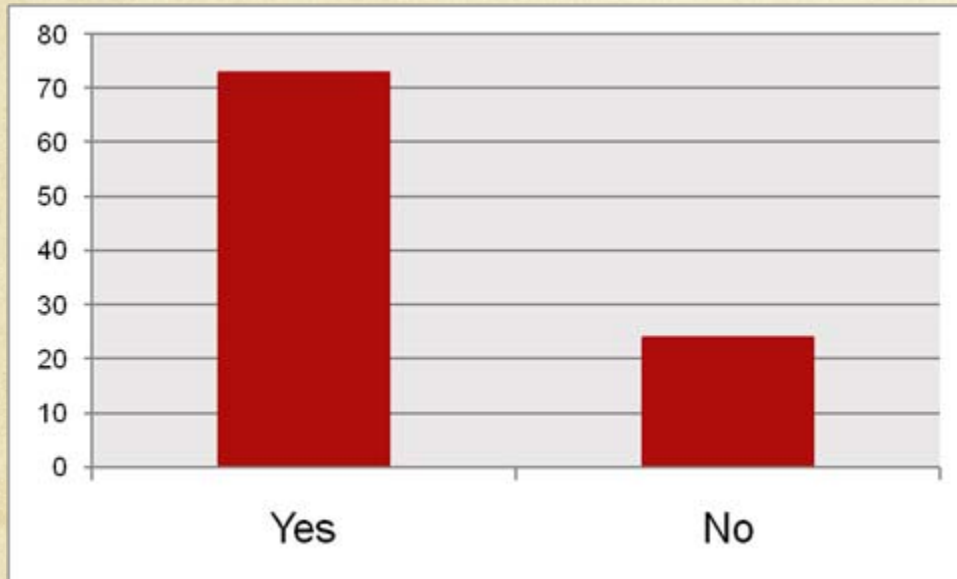


Additional Benefits of REU Participation for Faculty Mentors

By participating in an REU experience, faculty will:

- have the opportunity to share their excitement about physics researchers with young future physicists,
- find enthusiastic and capable assistants to help them make progress on their research projects,
- help to increase the profile of their institution and department within the undergraduate education community.

Discussing issues



Would you like a common deadline for accepting REU offers on the first round?

The idea of a common deadline for accepting offers seemed logical, but it is not simple. It has to be late enough to allow for conferences where REU sites do recruitment, but not too late. It also has to accommodate the schedules of different sites.

The committee has also set up a wiki page for ongoing discussions between the members, and perhaps others in the future.

Conclusions

The Physics REU Site Directors Workshop was a success. It led to some initial data gathering on the REU programs, and to the establishment of a Leadership Committee. The Committee will continue efforts to gather data and explore ideas for common endeavors and guidelines.

Acknowledgments

We would like to thank the National Science Foundation for its longstanding funding and support, the Department of Defense (DoD-Assure), site directors, the REU student participants, and other partners of the REU program.

Thanks!