Report from the NSF

Jim Thomas
June 6th, 2019
Extreme Physics – Event Horizon Telescope

- M87 Observed w/1.3 mm radio network
- Shadow due to photon orbits that terminate on the event horizon
- Extreme lensing and doppler shift
- Rotating w/axis 163° wrt line of sight
The chirp heard around the world

LIGO/Virgo release first catalog of gravitational-wave events

- 12 “confident detections”
- Including 1 binary neutron star merger which was observed optically, w/ γ rays and across the E&M spectrum
- A new candidate every 3 or 4 days
  - https://gracedb.ligo.org/latest/
- A tremendous stimulus for NAp community
- Theory & Exp – bright future for FRIB
Physics Division – within Mathematical and Physical Sciences

- Nucleosynthesis in accreting white dwarfs at JINA
- Black hole – Black hole mergers observed in LIGO
- Ultracold Molecules at JILA
- Ultracold atom three particle states at JQI
- Active Galactic Nuclei produce HE cosmic rays in Pierre Auger Observatory
- LHCb at CERN – tetraquarks, pentaquarks
- Heavy Ion collisions at RHIC
- Quantum Networks at Caltech
- Brain Wave Images with diffusion MRI
- Broadening Participation In STEM
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NSF in context

• The NSF responds to proposals from a broad community
  – Extraordinary science from outstanding University groups + Labs
  – Extraordinary science from small Colleges
  – with compelling Broader Impacts

• Two review criteria
  – Intellectual Merit
  – Broader Impacts
    • Education & Outreach
    • Building the economy & workforce of the future through STEM
    • Broadening participation
    • Impact on other fields of science & engineering
    • National Security … more

• Appreciation for everyone who reviewed proposals and sat on panels
  – The government shutdown lasted 35 days
  – This put us behind schedule – you worked on short deadlines, thank you!
New measures to protect research community from harassment

- News Release 18-082: September 19, 2018 Effective October 22, 2018

- New term and condition "Notification Requirements Regarding Findings of Sexual Harassment, Other Forms of Harassment, or Sexual Assault" requires awardee organizations to notify NSF of:
  - Any findings or determinations that an NSF-funded principal investigator or co-principal investigator committed harassment, including sexual harassment or sexual assault.
  - The placement of the principal investigator or co-principal investigator on administrative leave, or of the imposition of any administrative action relating to a harassment or sexual assault finding or investigation.

- NSF will consult with the awardee organization, and determine what action is necessary under NSF's authority.
  - NSF actions may include substituting or removing principal investigators or co-principal investigators, reducing award funding, and – where neither of those options is available or adequate – suspending or terminating awards.
Funding opportunities

- Standard research grants
- Career Proposals
- Opportunities to broaden participation through co-funding
  - AGEP
  - EPSCoR
  - HBCU
- MRIs, Physics MidScale, MSRI-1, MSRI-2, MREFC
  - Construction funds to build instrumentation and facilities
  - (limited resources for design … it is usually assumed that early R&D is supported by the base program)

A few examples in the following slides; but not a comprehensive review
Faculty Early Career Development Program (CAREER)

• CAREER - Awards in support of early-career faculty who have the potential to serve as academic role models in research and education

• PECASE - Presidential Early Career Awards for Scientists and Engineers from among the most meritorious recent CAREER awardees

• Selection for these awards is based on two important criteria:
  – Innovative research (IM)
  – Community service [...] through leadership in education & outreach (BI)

• Eligibility – must be assistant professor, untenured …
  – NSF 17-537
  – 5 year awards
  – Deadline: Third Friday in July ⇒ July 19, 2019
  – PECASE nominees are chose from within pool of CAREER winners
Standard Grants

• Investigator Initiated Research Projects         NSF 18-564

• Deadlines:
  – Proposals due the first Tuesday in December ⇒ December 3rd, 2019
  – Note: new Proposal & Award Policies & Procedures Guide (PAPPG)
  – Follow the Proposal Preparation checklist

• Collaborators and Other Affiliations Template
  – List conflicts of interest … not everyone in your collaboration

• Follow instructions that are specific to this solicitation

All proposals submitted to the Division of Physics programs must go through this solicitation
MRI – Major Research Instrumentation

• Two tracks:
  – Track 1  $100 k < $ from NSF < $1 M; max of 2/university
  – Track 2  $1 M < $ from NSF < $4 M; max of 1/university

• Two types: development and acquisition

• Deadlines & details
  – January 1 – January 19, annually
  – NSF 18-513
  – contact your program directors well ahead of time to discuss & avoid pitfalls

• Maximum award is $4M
  – 30% cost share req’d for PhD granting institutions
  – Awards above $1M compete across the entire Foundation
Mid-Scale Instrumentation

• Physics Midscale
  – $4M - $15M  NSF 14-116
  – non-renewable one time grant
  – Grants are awarded annually
  – Design, Construction or Acquisition of Instrumentation
    • Although early R&D is expected to be funded by the base program

• Midscale Research Infrastructure-1 (MSRI-1)
  – $6M - $20M  NSF 19-537
  – Grants are awarded every other year (not this year)
  – Two types: Implementation & Design
    • Implementation proposals are usually “shovel ready” projects
    • Design proposals may request as little as $600k

• Midscale Research Infrastructure-2 (MSRI-2)
  – $20M - $70M  NSF 19-542  “shovel ready” only
  – Grants are awarded every other year (not this year)
The 10 Big Ideas in the FY2020 request

**RESEARCH IDEAS**

- Harnessing Data for 21st Century Science and Engineering
- Work at the Human-Technology Frontier: Shaping the Future
- Navigating the New Arctic
- Windows on the Universe: The Era of Multi-messenger Astrophysics
- The Quantum Leap: Leading the Next Quantum Revolution
- Understanding the Rules of Life: Predicting Phenotype

**PROCESS IDEAS**

- Mid-scale Research Infrastructure
- NSF 2026
- Growing Convergence Research at NSF
- NSF INCLUDES: Enhancing STEM through Diversity and Inclusion

$75M → $30M → $30M → $30M → $75M
Money – where does it come from, where does it go?

• The NSF is a little different than other Departments of the government
  – Congress makes appropriations for the NSF budget with respect to six broad categories … rather than line by line
  – So developing the NSF’s final ‘operating plan’ requires an extra step

• The President’s office prepares a budget in consultation with the NSF and the Office of Management and Budget

• Congress passes an appropriation for the NSF
  – Often with additional instructions and not always the same as the President’s request
  – The president signs the appropriations bill

• The NSF proposes an operating plan based on the final budget and submits it to Congress via OMB

• Congress approves the operating plan
# FY20 Request for the NSF Physics Division (FY18 Reference)

<table>
<thead>
<tr>
<th>(Dollars in Millions)</th>
<th>FY 2018 Actual</th>
<th>FY 2019 (TBD)</th>
<th>FY 2020 Request</th>
<th>Change over FY 2018 Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>$310.75</td>
<td>-</td>
<td>$247.50</td>
<td>-$63.25</td>
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<tr>
<td>Research</td>
<td>182.35</td>
<td>-</td>
<td>145.63</td>
<td>-36.72</td>
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<td>CAREER</td>
<td>10.14</td>
<td>-</td>
<td>6.78</td>
<td>-3.36</td>
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<tr>
<td>Centers Funding (total)</td>
<td>4.81</td>
<td>-</td>
<td>5.00</td>
<td>0.19</td>
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<tr>
<td>STC: Center for Bright Beams</td>
<td>4.81</td>
<td>-</td>
<td>5.00</td>
<td>0.19</td>
</tr>
<tr>
<td>Education</td>
<td>4.50</td>
<td>-</td>
<td>4.70</td>
<td>0.20</td>
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<tr>
<td>Infrastructure</td>
<td>123.90</td>
<td>-</td>
<td>97.17</td>
<td>-26.73</td>
</tr>
<tr>
<td>IceCube</td>
<td>3.50</td>
<td>-</td>
<td>3.50</td>
<td>-</td>
</tr>
<tr>
<td>LHC</td>
<td>15.86</td>
<td>-</td>
<td>20.00</td>
<td>4.14</td>
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<td>LIGO</td>
<td>39.43</td>
<td>-</td>
<td>44.60</td>
<td>5.17</td>
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<td>Midscale Research Infrastructure</td>
<td>14.42</td>
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<td>6.67</td>
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<td>NSCL</td>
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<td>-2.00</td>
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<td>Research Resources</td>
<td>0.09</td>
<td>-</td>
<td>-</td>
<td>-0.09</td>
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<tr>
<td>Facilities Design Stage Activities (total)</td>
<td>26.60</td>
<td>-</td>
<td>0.40</td>
<td>-26.20</td>
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<tr>
<td>High Luminosity-LHC¹</td>
<td>16.60</td>
<td>-</td>
<td>-</td>
<td>-16.60</td>
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<tr>
<td>Advanced LIGO Plus (LIGO A+)</td>
<td>10.00</td>
<td>-</td>
<td>0.40</td>
<td>-9.60</td>
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</tbody>
</table>

¹ FY 2018 Actual reflects $7.50 million of funding for FY 2019 and FY 2020 development and design. No additional funds are expected in these years.
# FY20 Budget Request to Congress (M$) (FY18 Reference)

<table>
<thead>
<tr>
<th>NSF by Account</th>
<th>FY 2018 Actual</th>
<th>FY 2019 Annualized CR</th>
<th>FY 2019 Enacted</th>
<th>FY 2020 Request</th>
<th>Amount</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research &amp; Related Activities</td>
<td>$6,380.38</td>
<td>$6,334.48</td>
<td>$6,520.00</td>
<td>$5,662.96</td>
<td>-$717.42</td>
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<td>Education &amp; Human Resources</td>
<td>$903.87</td>
<td>$902.00</td>
<td>$910.00</td>
<td>$823.47</td>
<td>-$80.40</td>
<td>-8.9%</td>
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<td>Major Research Equipment &amp; Facilities</td>
<td>$186.30</td>
<td>$182.80</td>
<td>$295.74</td>
<td>$223.23</td>
<td>$36.93</td>
<td>19.8%</td>
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<tr>
<td>Construction</td>
<td>$328.51</td>
<td>$328.51</td>
<td>$329.54</td>
<td>$336.89</td>
<td>$8.38</td>
<td>2.6%</td>
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<td>Agency Operations &amp; Award Management</td>
<td>$4.30</td>
<td>$4.37</td>
<td>$4.37</td>
<td>$4.10</td>
<td>-$0.20</td>
<td>-4.6%</td>
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<tr>
<td>National Science Board</td>
<td>$15.09</td>
<td>$15.20</td>
<td>$15.35</td>
<td>$15.35</td>
<td>$0.26</td>
<td>1.7%</td>
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<tr>
<td>Total, NSF</td>
<td>$8,039.91</td>
<td>$8,031.35</td>
<td>$8,338.99</td>
<td>$7,226.00</td>
<td>-$813.91</td>
<td>-10.1%</td>
</tr>
</tbody>
</table>

Source for House Mark: www.aip.org/fyi/

A note of caution, however. Using an FY19 reference would make the FY2020 MREFC look like -25%
FY20 Proposed NSF Budget  (FY19 Reference)

- The President’s budget is a low bid
- We have to show our IM and BI
- The House (and Senate) will respond
- Then we have to be patient to see what develops

![Graph showing the proposed NSF budget compared to FY19 amounts](image-url)
Patience and Grace ⇒ Great Science

- Do good science with high intellectual merit
- Acknowledge your funding agencies in your publications and talks
- Pursue the broader impacts of your work
  - Education and outreach
  - When possible, open your lab to the community for tours
  - Talk to the 10 year old who lives next door
- Don’t get into trouble
  - Be mindful of your implicit biases
  - Broaden participation of all groups in your activities
More information

• News & updates

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