CINT Budget

Quanxi Jia, Director
Sean J. Hearne, Co-Director (Acting)

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Los Alamos NATIONAL LABORATORY | U.S. DEPARTMENT OF ENERGY | Office of Science | Sandia National Laboratories

Topics to Be Discussed

- CINT's staffing model
  - About 75% of our annual budget is spent on people
  - Institutional leverage enhances our impact
- Balance on people expenses and M&S as well as equipment necessary for experimental science
- Recapitalization is a challenge for CINT as it is for all NSRCs
- Response to BES budget review recommendations
- Opportunities and challenges for continued operation at our current funding level

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CINT Staffing Model

- Program management team
- Thrust Leaders/Partner Science Leads
- Scientific staff
- Technical and professional staff
- Postdocs

CINT Program Management Structure

Director – Quanxi Jia
Co-Director (acting) – Sean J. Hearne
User Program Manager – Heather Brown
Communications & Outreach Manager – Antonya Sanders

- Complementary roles of Director and Co-Director as defined in original LANL/SNL MOU
- Non-technical responsibilities of the User Program and Communication Managers
- Primary support for PMT provided by institutional indirect

CINT's Most Valuable Resource

	Nanoscale Electronics & Mechanics	Nanophotonics & Optical Nanomaterials	Soft, Biological & Composite Nanomaterials	Theory & Simulation of Nanoscale Phenomena
Thrust leaders	 Brian Swartzentruber	 Steve Doorn	 Millie Firestone	 Gary Grest
Partner science leaders	 Nathan Mara	 Igal Brener	 George Bachand	 Jianxin Zhu

Thrust Leaders (Partner Science Leaders) supported at 0.75 FTE (0.6 FTE)

CINT's Most Valuable Resource

32 CINT Scientists (supported at 50%)

- single largest support for each
- encourages links to DOE/Lab missions
- allows links to leveraged programs that feed back to CINT

Technologists

- 11 FTE supported

Postdoctoral Associates

- 13 FTE CINT supported in FY15 (**8 in FY16**)

This model enables more individuals to contribute to CINT's science and user programs.

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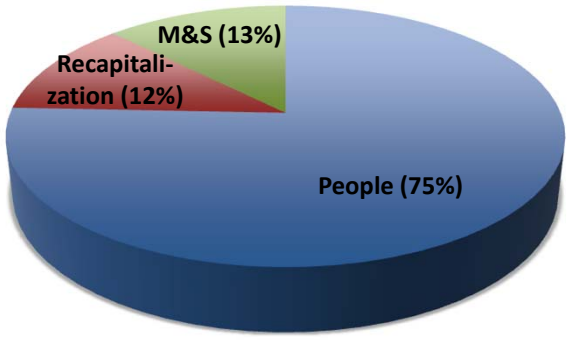
CINT's FY15 Budget through Various Lenses



Total: FY15 $20.773M

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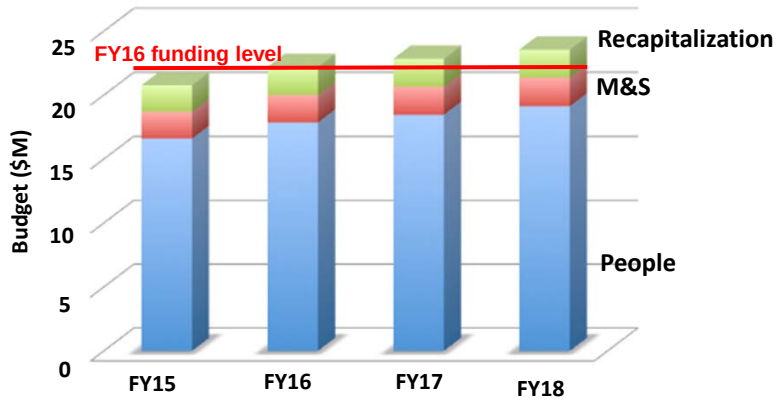
FY15 – FY18 Actuals/Projected Budget



Inflation and increased labor cost will reduce our buying power.

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Budget Review Recommendations

I: CINT should adjust the scope of the science programs and the staffing level to reserve at least 10% annually from the BES operating budget for equipment recapitalization. CINT should develop a prioritized list of equipment and a timeline for recapitalization in line with BES operating budget and the CINT strategic plan.

II: BES expects that the primary role of postdoctoral research associates is to advance research programs at the NSRCs and as such they should have a limited role in direct support of the user community. CINT should adjust the level of BES-funding allocated to postdoctoral research associates and redirect those funds to support the user program. Research grants secured by CINT staff should be the primary source of funding of postdoctoral research associates.

III: The number of users during FY12-14 exhibited some growth. CINT management should provide an assessment of the potential future growth of the CINT user community including any perceived limitations such as user demand, equipment bottlenecks, staff overloading, etc.

IV: CINT is encouraged to provide an assessment of how the balance between the core and external funding may impact the availability of the center for user activates

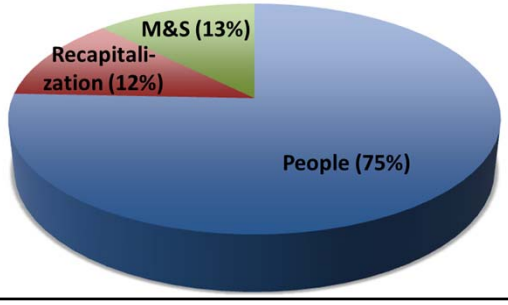
(1) 10% Budget for Recapitalization

"CINT should adjust the scope of the science programs and the staffing level to reserve at least 10% annually from the BES operating budget for equipment recapitalization. CINT should develop a prioritized list of equipment and a timeline for recapitalization in line with BES operating budget and the CINT strategic plan."

Response:

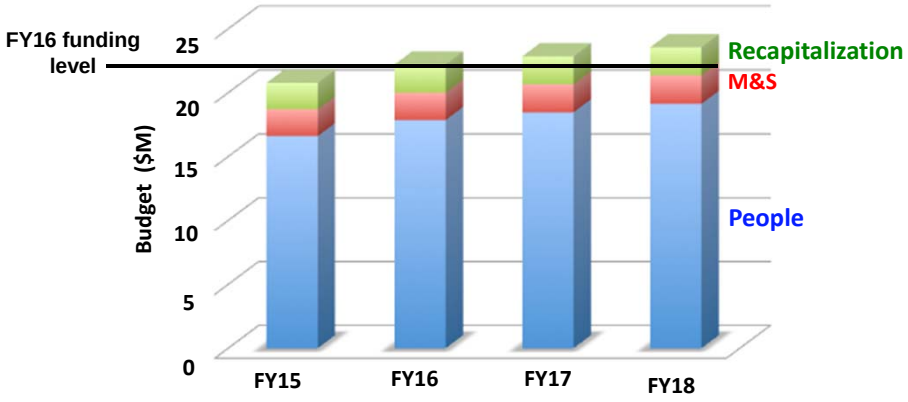
- As of FY15 CINT, was recapitalizing at 12% / year. We will continue to target 10%.
- CINT has developed a prioritized recapitalization plan for FY16 and FY17.

Total: FY15 $20.773M



(1) 10% Budget for Recapitalization – cont.

- We will continue to maintain the 10% recapitalization, but…a 6% funding shortfall is projected by FY18.
- In F17 the 3% shortfall will be made up using excess carryover.



Prioritized Recapitalization FY16 / FY17

FY16 Recapitalization

Funded dedicated to thrusts for small item ($5k - $25k) recapitalization - $500k

1. Single-electron high-speed TEM camera Gatan K2 ~ $1,150k
2. Coherent Inc. laser of metamaterials program ~ $220k
3. Laser light source for PEEM ~ $125k
4. LEEM/PEEM system move and lab modifications ~ $250k
5. Stratasys 3D polyjet (UV curable custom ink jet printer) ~ $300K
6. ArrayIT (2D noncontact biomolecule pin printers ~ $300K
7. Akta pure protein chromatography system ~ $70K
8. ICP-OES system ~ $90K
9. Raman spectroscopy ~ $40K
10. Ion Mill for cleanroom metal deposition system - $73k

FY17 Recapitalization

Funded dedicated to thrusts for small item ($5k - $25k) recapitalization - $500k

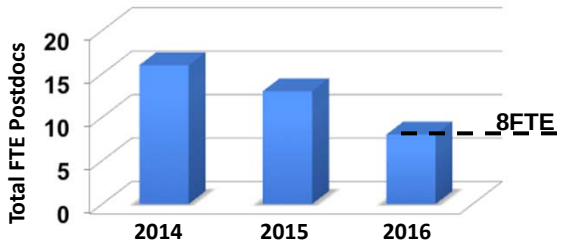
1. LEEM / PEEM room modifications and tool move ~$200K
2. Superconducting Nanowire Detector system ~$140K
3. Keyence 3D microscope as an addition to compliment SEM. $250K
4. Reggae laser repair ~ $100K
5. Liquid chromatography – mass spectrometry (IC-MS) ~ $120K
6. Simultaneous, multi-color total internal reflectance fluorescence (TIRF) microscope ~ $300K
7. ICP ~ $110K
8. Actively controlled dye laser system ~ $100K
9. 3D Profilometer ~ $120K
10. Magnetometer ~ $120K
11. Heidelberg - benchtop Direct Write Laser lithography tool ~ $175K,
12. XActix - XeF2 Si etch reactor. ~ $150K

(2) Postdocs

"CINT should adjust the level of BES-funding allocated to postdoctoral research associates and redirect those funds to support the user program."

Response:

- In anticipation of this directive, CINT froze post-doc hiring in Q4 FY15.



- The post-doc hiring freeze was lifted in February 2016, at a new funding level of 8 FTE.

(3) User growth

"The number of users during FY12-14 exhibited some growth. CINT management should provide an assessment of the potential future growth of the CINT user community including any perceived limitations such as user demand, equipment bottlenecks, staff overloading, etc."

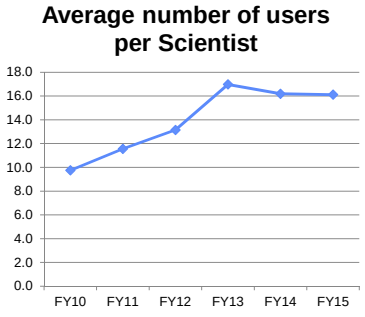
Response:

Based on equipment logs, only a few tools are operating near capacity:

- TEM
- Joel e-beam lithography
- Integration Lab

Capacity is currently limited by staffing:

- Number of users per scientists has reached an equilibrium level.
- If each User only worked with one scientist **600 Users is possible** at current staffing level.



(3) User growth – Response continued

Plans to address tool limitations:

- **TEM** – CINT Users now have access to LANL Microscopy facility, increasing available tool hours and capabilities.
- **JOEL e-beam writer** – have added low resolution e-beam writer capability available on other SEM's in the Integration Lab.
- **Integration Lab** – Continue to use recapitalization funds to provide additional capabilities.

Ways to address staffing limitations:

1.Identify opportunities to transition staff time out from under-utilized capabilities to new high-impact capabilities.

2.Increase the number of CINT scientists.

3.Rebalance staffing composition (scientists, technologist).

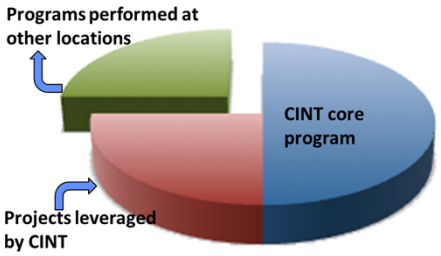
4.Decrease CINT Scientist time for research.

(4) Core vs External Funding

"*CINT is encouraged to provide an assessment of how the balance between the core and external funding may impact the availability of the center for user activates.*"

Response:

- CINT management believe that to maintain a vibrant program, every CINT Scientist should maintain at least 0.5FTE of CINT core program work.
- CINT's uniqueness is derived from the capabilities of the scientists. Maintaining the largest possible Scientific workforce ensures the largest capability base for the users.
- ~0.25 FTE of the CINT staff time is paid by other programs to work on User projects.



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Opportunities and Challenges

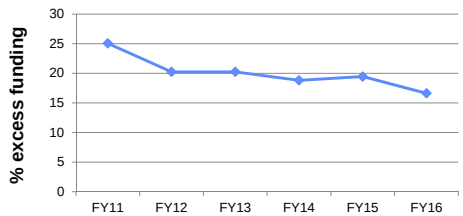
- CINT's budget model is dominated by our most valuable resource, our people
  - About 75% of our annual budget is spent on people
  - Institutional leverage enhances our impact
- (So far,) we have managed to balance people expenses and materials & supplies necessary for experimental science
- Recapitalization is a challenge for CINT as it is for all NSRCs
- Continued operation at our current funding level will cause user numbers, and thus user productivity, to plateau

CINT is efficiently and effectively using BES's investment to deliver leading nanoscience integration

BACKUP SLIDES

Funding History

- **CINT was anticipating a 10% decrease in budget and planned for spending to reduce the excess carryover from $3.8M to $1.7M in FY16 and $0 in FY18.**
- **In February CINT received a 4.7% increase in budget.**
- **We have accelerated spending, but are now anticipating $2.6M in excess carryover for FY16.**



CINT Postdoc Program

Program Intent: To develop new CINT User capabilities and to enhance connections across the thrusts.

Examples in FY12 - FY15:

Virginia VanDelinder – (1) soft lithography (replica molding), (2) microfluidic, fluorescence imaging platform, (3) design and synthesis of biomolecular motors with unnatural amino acids.

Aaron Keller – Bessel beam imaging.

K Michael Salerno – Developing Coarse Grained Models for Soft Materials.

Andrew Leenheer – Development of TEM liquid cell for battery applications.

John Watt – Micro-fluidics platform development.

Nicolai Hartmann – Simultaneous correlated 2 color PL imaging and Fourier imaging.

Xuedan Ma – Implemented superconducting nanowire detectors.

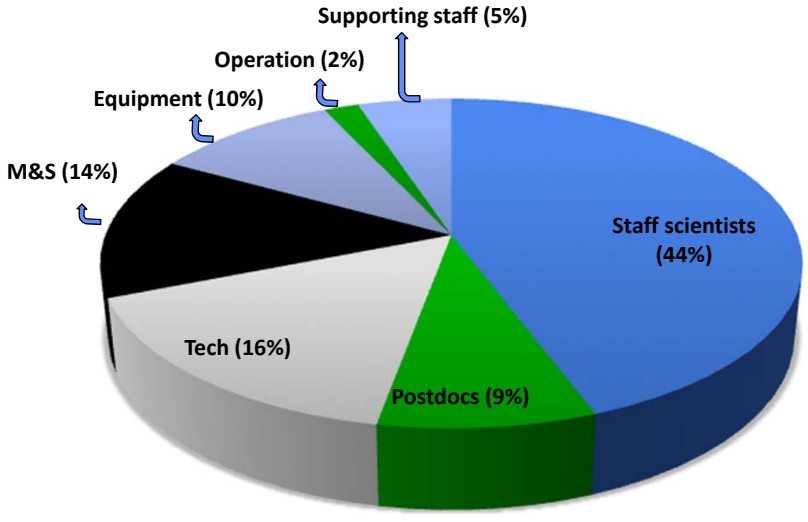
Farah Dahwood: Established dip pen nano-lithography.

Bill Mook – Developed nano-fracture technique

Sid Pathak – Developed spherical nanoindentation stress-strain curve measurement technique

Ursula Carvajal-nunez – High temperature nanomechanical testing technique development

CINT's FY15 Budget through Various Lenses



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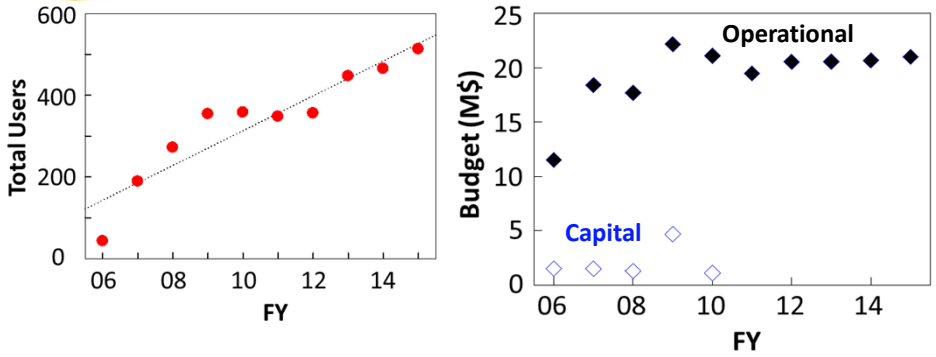

- After a decade, recapitalization is a challenge for all of the NSRCs
  - CINT is partially offsetting the need through institutional investment, but significant gaps remain
- Given current resource constraints across BES, our 'growth phase' is likely to plateau, but we remain focused on enhanced productivity and financial efficiency

Combined CINT and Other Funding Delivers 90+ FTE Effort for the User Facility