

Welcome to the OKLAHOMA SUPERCOMPUTING SYMPOSIUM 2012



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Henry Neeman, OSCER Director

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OU Supercomputing Center for Education & Research
A Division of OU Information Technology



Wednesday October 3 2012
University of Oklahoma



Preregistration Profile 2012

- Organizations: 67 preregistered
 - **Academic**: preregistered 26 institutions in 9 states (AR,GA,IL,KS,LA,MI,NC,OK,TX)
 - Includes 19 institutions in 4 EPSCoR states (AR,KS,LA,OK)
 - **Industry**: preregistered 28 firms
 - **Government**: preregistered 9 agencies (federal, state)
 - **Non-governmental**: preregistered 4 organizations
- Demographics (241 preregistered)
 - 35% OU, 65% non-OU
 - 72% Oklahoma, 28% non-Oklahoma
 - 81% from EPSCoR states, 19% non-EPSCoR
 - 74% academic, 26% non-academic





Attendee Profile 2002-2012

- Over 2500 attendees at 11 Symposia
 - 69 in 2002, 225-325 per year thereafter
- Organizations: 251
 - **Academic**: from 98 institutions in 27 US states & territories
 - 60+ institutions in 14 EPSCoR jurisdictions
 - 28 institutions in Oklahoma
 - PhD-granting, masters-granting, bachelors-granting, community college, career tech, high school
 - Historically Black University, Tribal College
 - public, private, for-profit
 - **Industry**: attendees from 107 firms
 - **Government**: attendees from 32 agencies (federal, state, municipal, foreign)
 - **Non-governmental**: attendees from 14 organizations



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Symposium 2012 Sponsors

- Academic sponsors
 - Oklahoma EPSCoR
 - Great Plains Network
- Industry sponsors
 - Platinum: Intel
 - Gold: Cray, Dell, DataDirect Networks, NetApp, NVIDIA
 - Silver: Advanced Clustering Technologies, Appro, GovConnection, Panasas
 - Bronze: Avere, Gnodal, Oracle

Thank you all! Without you, the Symposium couldn't happen. Over the past 11 Symposia, we've had a total of 64 companies as sponsors.



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Some Accomplishments

- Submitting OK's NSF EPSCoR RII Track-1 proposal today!
 - The most ambitious – yet very achievable – CI plan in Oklahoma history!
- Over 500,000 batch jobs run already on Boomer (opened to users in May).
- “Supercomputing in Plain English” overview talk has reached every public university and every private university with relevant degree programs except one.
 - If anyone has a contact at OK Wesleyan U, let me know
- “A Day in the Life of an IT Professional” talks: so far 53 visits to over 1000 students, faculty, staff and guests at 27 institutions.



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Outline

- OU
 - Resources
 - Accomplishments
- OCII



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Resources



Dell Intel Xeon Linux Cluster

1,076 Intel Xeon CPU chips/4288 cores

- 528 dual socket/quad core Harpertown 2.0 GHz, 16 GB each
- 3 dual socket/quad core Harpertown 2.66 GHz, 16 GB each
- 3 dual socket/quad core Clovertown 2.33 GHz, 16 GB each
- 2 x quad socket/quad core Tigerton, 2.4 GHz, 128 GB each

8,800 GB RAM

~130 TB globally accessible disk

QLogic Infiniband

Force10 Networks Gigabit Ethernet

Red Hat Enterprise Linux 5

Peak speed: 34.5 TFLOPs*

*TFLOPs: trillion calculations per second



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Dell Intel Xeon Linux Cluster

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8,800 GB RAM

~130 TB globally accessible disk

QLogic Infiniband

Force10 Network Gigabit Ethernet

Red Hat Enterprise Linux 5

Peak speed of 5 TFLOPs*

*TFLOPs: trillion floating point operations per second



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Dead Supercomputer Club



<http://www.cp-tel.net/pasqualy/kingmole/242F.jpg>



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NEW SUPERCOMPUTER!

874 Intel Xeon CPU chips/6992 cores

Photo: Jawanza Bassue

412 dual socket/oct core Sandy Bridge 2.0 GHz, 32 GB

23 dual socket/oct core Sandy Bridge 2.0 GHz, 64 GB

1 quad socket/oct core Westmere, 2.13 GHz, 1 TB

15,680 GB RAM

~360 TB global disk

QLogic Infiniband

(16.67 Gbps, ~1 microsec latency)

Dell Force10 Gigabit/10G Ethernet

Red Hat Enterprise Linux 6

Peak speed: 111.6 TFLOPs*

*TFLOPs: trillion calculations per second



Just over 3x (300%) as fast as our 2008-12 supercomputer.

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Just over 100x (10,000%) as fast as our first cluster supercomputer in 2002.



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NEW SUPERCOMPUTER!

874 Intel Xeon CPU chips/6992 cores

Photo: Jawanza Bassue

412 dual socket/oct core Sandy Bridge 2.0 GHz, 32 GB

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Red Hat Enterprise Linux 6

Peak speed: 111.6 TFLOPs*

*TFLOPs: trillion calculations per second



19% of the nodes are

“condominium” (owned by individual research teams): ~4x as many as all OSCER’s previous clusters combined.

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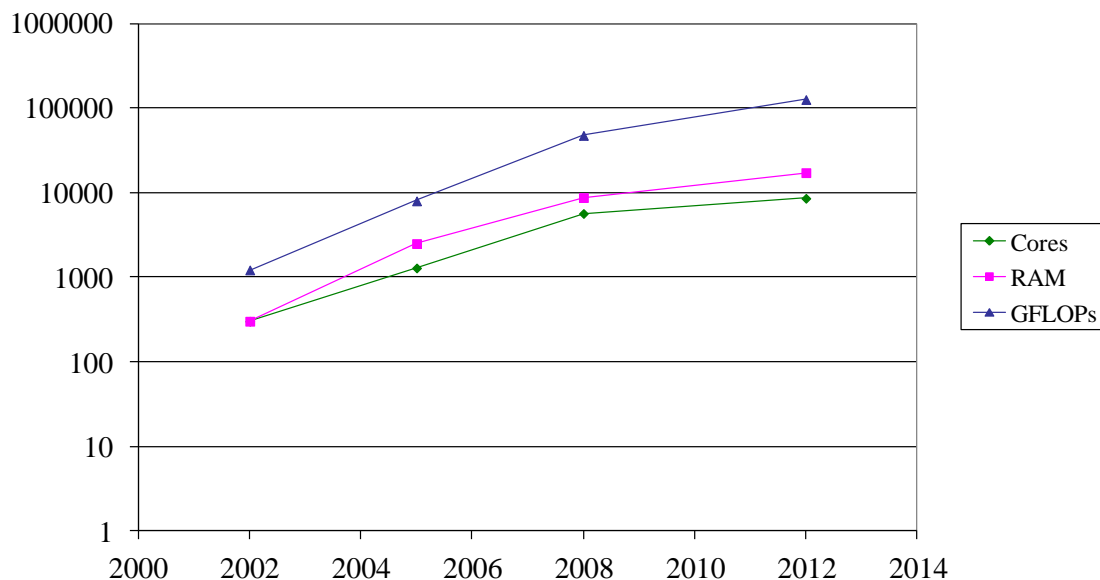
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Improvement in OSCER Hardware

OSCER Hardware



GFLOPs:

2012 = 103 x 2002

RAM:

2012 = 57 x 2002

CPU cores:

2012 = 28 x 2002

Moore's Law:

2012 = 32 x 2002



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OU Research IT Personnel

- OSCER
 - Director: Henry Neeman
 - Associate Director for Remote & Heterogeneous Computing: Horst Severini
 - Manager of Operations: Brandon George
 - Senior System Administrator: David Akin
 - Senior System Administrator: Brett Zimmerman
 - HPC Application Software Specialist: Josh Alexander
 - Administrative Specialist: Debi Gentis
 - Petascale Storage Administrator: Patrick Calhoun
 - **NEW! Deputy Director Brian Cremeans**



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OU Research IT Personnel

- Informatics
 - Brian Cremeans
 - Jonah Duckles
 - Mark Stacy



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New Building!

Four Partners Place: just past SRTC, where we were last night

- We'll be moving in very soon.



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Accomplishments





External Research Grants

1. I.Y. Akkutlu, J. Callard, C. Rai, C. Sondergeld, "OU Shale Gas and Unconventional Reservoir Research Cooperative," \$2.8M per year
2. J. P. Shaffer, T. Pfau, "A Rydberg Atom Electric Field Sensor," DARPA-ARO, \$1.18M (total), \$1.06M (OU)
3. Y. Luo, "Data Synthesis and Data Assimilation at Global Change Experiments and Fluxnet toward Improving Land Process Models," DOE, \$1.05M
4. F. Kong, M. Xue, K. Brewster, "Establishment of an Improved Numerical Weather Forecasting System for Chongqing Meteorological Service," Chongqing Institute of Green and Intelligent Technology, China, \$852K
5. G. Zhang, M. Xue, B. L. Cheong, T. J. Schurr, "Advanced Study of Precipitation Microphysics with Multi-Frequency Polarimetric Radar Observations and Data Assimilation," NSF, \$637K
7. J. P. Shaffer, "A Quantum Hybrid System for Linking Rydberg Atom Quantum Gates. NSF, \$465K
8. J. P. Shaffer, "Rydberg Atom Interactions and Collective Behavior," NSF, \$436K
9. J. P. Shaffer, "Interactions in Cold Rydberg Gases," NSF, \$422K
10. J. Cruz, "CIF: Small: Two-Dimensional Channel Modeling, Detection and Coding for Shingled Magnetic Recording," NSF, \$418K
11. M. Yuan, "Supplement to Developing and Evaluating the Effectiveness of the Location-based Offender Monitoring System for Offender Supervision," National Institute of Justice, \$396K
12. X. Wang, M. Xue, F. Kong, "Optimal Design of Multi-scale Ensemble Systems for Convective-Scale Probabilistic Forecasting," NSF, \$359K
13. F. Kong, M. Xue, "Further Development of the Storm-Scale Numerical Weather Prediction Capability for Shenzhen Meteorological Bureau," Shenzhen Institute of Advanced Technology, China, \$251K
14. J. Snow & F. Fondjo Fotou (Langston U), "MRI: Acquisition of a High Performance Computing Cluster for Research and Education," NSF, \$250K
15. M. Xue, K. Brewster, Y. Jung, "Advanced Data Assimilation and Prediction Research for Convective-Scale Warn-on-Forecast," NOAA, \$243K
16. I.Y. Akkutlu, "Multi-scale Characterization of Transport Phenomena in Shales for Improved Gas Recovery," Devon Energy, \$200K

OSKER-RELATED FUNDING TO DATE:
\$206M total, \$116M to OU

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E M E W





External Research Grants (cont'd)

- 17. R. Voronov, "Intra-Thrombus Chemo-Transport and Local Stress Mechanics under Flow," American Heart Association Postdoctoral Fellowship, \$150K
- 18. X. Wang, M. Xue, "Improving High Resolution Tropical Cyclone Prediction using GSI-based Hybrid Ensemble-Variational Data Assimilation System for HWRF," NOAA, \$150K
- 19. I. Y. Akkutlu, "Molecular Theory of Capillarity in Kerogen - A Multi-component Approach to Predict Shale Gas/Liquid In-place and Transport in Nanopores," Devon Energy, \$150K
- 20. S. Dhall, L. Gruenwald, "Autonomous Database Partitioning using Data Mining for High End Computing," NSF, \$150K
- 21. M. Xue, K. Brewster, F. Kong, "Ensemble Simulation of GOES-R Proxy Radiance Data from CONUS Storm-Scale Ensemble Forecasts, Product Demonstration and Assessment at the Hazardous Weather Testbed GOES-R Proving Ground," NOAA, \$126K
- 22. M. Xue, K. Brewster, F. Kong, "Ensemble Simulation of GOES-R Proxy Radiance Data from CONUS Storm-Scale Ensemble Forecasts, Product Demonstration and Assessment at the Hazardous Weather Testbed GOES-R Proving Ground," NOAA, \$94K
- 23. K. Brewster, M. Xue, "High Resolution Data Assimilation for Trajectory Improvement," DOD-Air Force, \$79K
- 24. F. Kong, "CAPS support to the WRF Lightning Forecast Algorithm for the NOAA R3 effort," NOAA GOES-R/Universities Space Research Assn, \$48K
- 25. R. McPherson, M. Shafer, Y. Hong, "Utilization of Regional Climate Science Programs in Reservoir and Watershed Impact Assessments," OSU Water Resources Responses to Climate Change: Pilot Study, \$43K
- 26. P. Attar, "Numerical Simulation of a Membrane Micro Air Vehicle in a Gust Field, Ohio Aerospace Institute, \$35K
- 27. J.R. Cruz, "Signal Processing for Magnetic Recording Channels," Hitachi Global Storage Technologies, Inc., Director, \$30K
- 28. J.R. Cruz, "Equalization, Detection, and Coding Algorithms for Bit Patterned Media Recording," Advanced Storage Technology Consortium, \$17K
- 29. L. Sells, J. Goulden, H. Aboudja, "LittleFe grant," LittleFe project, \$2.5K
- 30. L. Sells, J. Goulden, "Early Adopter Grant," NSF/TCPP, \$2.5K

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External Research Grants (cont'd)

- 31. B. Moore III et al, "Department of the Interior South-Central Regional Climate Science Center," US Dept of the Interior, \$3.5M (total), \$1.4M (OU)
- 32. A. Striolo, D. Resasco et al, "Center for Application of Single-Walled Carbon Nanotubes," DOE, \$1M
- 33. J. K. Shen, "CAREER: Electrostatic Mechanisms in Protein Stability and Folding, NSF, \$773K
- 34. Y. Kogan, "Parameterization of cumulus convective cloud systems in mesoscale forecast models," ONR, \$594K
- 35. X. Wang, M. Xue, F. Kong, "Optimal Design of Multi-scale Ensemble Systems for Convective-Scale Probabilistic Forecasting," NSF, \$395K
- 36. R. D. Palmer, T.-Y. Yu, "NMQ and WDSS-II for the KMA radar network: Real-time, effective, and integrated weather products," Space Environment Laboratory, Inc., \$361K
- 37. B. Grady, A. Striolo, "Novel Supramolecular Structures of Laterally Confined Amphiphilic Molecules," NSF, \$335K
- 38. D. Resasco, D. Papavassiliou et al, "Interfacially active SWNT/silica nanohybrids," Advanced Energy Consortium, \$331K
- 39. C. Y. Tang , R. Ramakumar, N. Jiang , "Control and Operation of Large-Scale Wind Farms in the Power System", NSF, \$231K
- 40. J. Shen, "Electrostatic Modulation of Protein Stability and Folding," NIH, \$1.4M
- 41. Y. Wang, "Theoretical Tools for Measuring Dark Energy from Galaxy Clustering," DOE, \$230K
- 42. F. Kong, M. Xue, "Further Enhancement to the Hourly Assimilation and Prediction System (HAPS) for Shenzhen Meteorological Bureau." Shenzhen Institute of Advanced Technology, Chinese Academy of Science, \$228K
- 43. P. Attar, P. Vedula, "Multi-fidelity Modeling and Simulation (M&S) Tool for Nonlinear Aeroelasticity," Advanced Dynamics, \$160K
- 44. B. Eskridge, "CDI-TYPE I: RUI: Emergent Hierarchies of Leaders in Multi-Robot Systems," NSF, \$159K
- 45. A. Striolo, "Mixed-Volatile Fluids Relevant to Subsurface Energy Systems," DOE, \$120K
- 46. P. Skubic, M. Strauss, "OU Contribution to the ATLAS Southwest Tier 2 Computing Center (Supplement)," NSF, \$110K
- 47. P. Attar, "High-Fidelity Computational Aeroelastic Solver Research," Ohio Aerospace Institute, \$53K
- 48. P. Skubic, M. Strauss, "OU Contribution to the ATLAS Southwest Tier 2 Computing Center (Supplement)," NSF, \$50K

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External Research Grants (cont'd)

49. P. Skubic, M. Strauss, "University of Oklahoma Contribution to OSG Software Development," Brookhaven National Laboratory, \$50K.
50. P. Attar, "Computational Model Development and Experimental Validation Measurements for Membrane-Batten Wing," Ohio Aerospace Institute, \$43K
51. A. Striolo, "Reduced Carbon in Earth's Crust and Mantle I," Alfred P. Sloan Foundation, \$39K.
52. J. Gao, "Advancing Research on Realtime Weather-Adaptive 3DVAR Analyses with Automatic Storm Positioning and On-demand Capability," NOAA, \$36K
53. M. Xue, "Probabilistic Forecasting for Aviation Decision Aid Applications," Impact Technologies, \$20K
54. P. Attar, P. Vedula, "Towards Better Modeling and Simulation of Nonlinear Aeroelasticity On and Beyond Transonic Regimes," Advanced Dynamics, \$20K
55. P. Attar, P. Vedula, "High-Fidelity Computational Aeroelastic Models in Support of Certification Airworthiness of Control Surfaces with Freeplay and Other Nonlinear Features," Advanced Dynamics, \$9K

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External Research Grants (cont'd)

- 56. H. Neeman, D. Brunson (OSU), J. Deaton (OneNet), J. He (Noble Foundation), D. Schoenefeld (TU), J. Snow (Langston U), M. Strauss (OU), X. Xiao (OU), M. Xue (OU), "Oklahoma Optical Initiative," NSF, \$1.17M
- 57. H. Neeman, M. Jensen, M. Strauss, X. Xiao, M. Xue, E. Baron, K. Dresback, R. Kolar, A. McGovern, R. Palmer, D. Papavassiliou, H. Severini, P. Skubic, T. Trafalis, M. Wenger, R. Wheeler (Duquesne U), "MRI: Acquisition of Extensible Petascale Storage for Data Intensive Research," NSF, \$793K
- 58. D. Resasco, J. Harwell, F. Jentoft, K. Gasem, S. Wang, "Center for Interfacial Reaction Engineering (CIRE)," DOE EPSCoR, \$2.4M (\$1.97M OU)
- 59. P. Skubic, M. Strauss, B. Abbott, P. Gutierrez, "Experimental Physics Investigations Using Colliding Beam Detectors at Fermilab and the Large Hadron Collider (LHC) (TASK A) 2010-2013 Renewal," DOE, \$2.8M
- 60. R. Palmer, Y. Zhang, G. Zhang, T. Yu, M. Yeary, Y. Hong, J. Crain, P. Chilson, "Next Generation Phased Array," NSSL, \$2M
- 61. P. Skubic, M. Strauss, B. Abbott, P. Gutierrez, "Experimental Physics Investigations Using Colliding Beam Detectors at Fermilab and the Large Hadron Collider (LHC) (TASK A) 2010-2013 Renewal-Revision," DOE, \$1.52M
- 62. D. Cole, Alberto Striolo, "Structure and Dynamics of Earth Materials, Interfaces and Reactions," DOE, \$1.5M (\$90K OU)
- 63. R. Sigal, F. Civan, D. Devegowda, "Simulation of Shale Gas Reservoirs Incorporating the Correct Physics of Capillarity and Fluid Transport," Research Partnership to Secure Energy for America (RPSEA), \$1.05M
- 64. M. Biggerstaff, J. Straka, L. Wicker, Zrnica, Zahari, "MRI Development of C-Band Mobile Polarimetric Weather Radars," NSF, \$989K (\$439K OU)
- 65. D. Resasco, D. Papavassiliou et al, "Carbon Nanotube Technology Center," DOE, \$925K
- 66. M. Saha, D. Papavassiliou, A. Striolo, K. Mullen, B. Grady, C. Altan, D. Resasco, "Experimental and theoretical studies of carbon nanotube hierarchical structures in multifunctional polymer composites," DoD-EPSCoR, \$897K
- 67. E. Mansell, J. Straka, C. Ziegler, D. MacGorman, "Numerical modeling studies of storm electrification and lightning," NSF, \$817K
- 68. E. Rasmussen, J. Straka, K. Kanak, "Collaborative Research: Challenges in understanding tornadogenesis and associated phenomena, \$755K (\$489K OU)
- 69. J. Straka, K. Kanak, "Challenges in tornadogenesis and associated phenomena," NSF, \$584K

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E M E W





External Research Grants (cont'd)

- 70. M. Xue, F. Kong, "Advanced Multi-Moment Microphysics for Precipitation and Tropical Cyclone Forecast Improvement with COAMPS," ONR, \$592K
- 71. J. Straka, K. Kanak, "Collaborative Research: Challenges in Understanding Tornadoogenesis and Associated Phenomena," NSF, \$515K
- 72. D. MacGorman, E. Mansell, C. Ziegler, A. Fierro, M. Xue, "Techniques for Assimilating Geostationary Lightning Mapper Data and Assessment of the Resulting Impact on Forecasts," NOAA, \$415K
- 73. M. Xue, F. Kong, K. Brewster, X. Wang, "A Partnership to Develop, Conduct, and Evaluate Realtime High-Resolution Ensemble and Deterministic Forecasts for Convective-scale Hazardous Weather: Moving to the Next Level," NOAA CSTAR, \$375K
- 74. M. Xue, K. Brewster, J. Gao, X. Wang, "Advanced Data Assimilation and Prediction Research for Convective-Scale 'Warn-on-Forecast,'" \$500K, NOAA
- 75. X. Wang, "Improving satellite radiance data assimilation using a hybrid ensemble-Gridpoint Statistical Interpolation (GSI) method for global numerical weather prediction," NASA, \$276K
- 76. X. Wang, M. Xue, "Improving NOAA operational global numerical weather prediction using a hybrid-ensemble Kalman filter data assimilation and ensemble forecast system," NOAA, \$207K
- 77. D. Resasco, D. Papavassiliou et al, "Interfacially active SWNT/silica nanohybrids," Advanced Energy Consortium (AEC), \$333K
- 78. D. Oliver, "Data analysis and inversion for mobile nanosensors," AEC, \$320K
- 79. R. Palmer, T. Yu, G. Zhang, M. Yearly, P. Chilson, Y. Zhang, J. Crain, "Advancements in Phased Array Weather Radar Research at OU," NOAA National Severe Storms Laboratory (NSSL), \$270K
- 80. A. Striolo, "The Emergent Behavior of Solid Nanoparticles at Oil-Water Interfaces: A Multi-Scale Thermodynamic Approach to Enable Bio-Oil Upgrade," NSF, \$238K
- 81. M. Xue, K. Brewster, F. Kong, "Development of a Short-Range Realtime Analysis and Forecasting System based on the ARPS for Taiwan Region," NOAA, \$200K
- 82. J. Straka, K. Kanak, "Formative dynamics of the mammatus clouds in thunderstorm cirrus," NSF, \$318K
- 83. M. Yearly, C. Tang, "Computationally Efficient Linear Transforms for Remote Sensing Systems," NSF, \$299K
- 84. A. Striolo, "Probing regular solution theory for mixed amphoteric/ionic surfactant systems by molecular dynamics simulations," ACS, \$100K

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External Research Grants (cont'd)

- 85. K. Brewster, M. Xue, F. Kong, meteorology project, \$211K
- 86. M. Xue, meteorology project, \$120K
- 87. A. McGovern, "Learning to guide search in large state spaces," IBM DARPA, \$95K
- 88. J. Straka, K. Kanak, "Supplement: Challenges in tornadogenesis and associated phenomena (VORTEX2)," NSF, \$87K
- 89. F. Kong, M. Xue, "Establishment of an Experimental Real-Time Short-Term Storm Prediction System for Shenzhen Meteorological Bureau," \$58K
- 90. J. Straka, "Improved Understanding/Prediction of Severe Convective Storms and Attendant Phenomena through Advanced Numerical Simulation," NSF, \$58K
- 91. M. Xue, "Assimilation of NEXRAD Radial Winds in a Regional Mesoscale Model," Miss State U, \$79K
- 92. J. Cruz, R. Todd, "Medium-Density Parity-Check Codes for Tape Systems," INSIC, \$36K
- 93. M. Xue, D. Stensrud, J. Gao, "Advancing Warn on Forecast – Storm-scale Analysis of Vortex 2 Thunderstorms," NSSL, \$70K
- 94. P. Attar, "High-Fidelity Computational Aeroelastic Solver Research," Ohio Aerospace Institute, \$60K
- 95. J. Straka, K. Kanak, "Development of Unmanned Aircraft System for Research in a Severe Storm Environment and Deployment within the VORTEX 2," NSF, \$44K
- 96. J. Cruz, "Equalization, Detection, and Coding Algorithms for Bit Patterned Media Recording Channels," International Storage Industry Consortium (INSIC), \$35K
- 97. J. Cruz, R. Todd, "Signal Processing for Magnetic Recording Channels," private company, \$30K
- 98. P. Attar, P. Vedula, "Deterministic and Statistical Characterization of the Impact of Control Surface Freeplay on Flutter and Limit-Cycle Oscillation (LCO) using Efficient Computational Modeling," Advanced Dynamics, \$30K
- 99. P. Attar, P. Vedula, "Novel Reduced Order in time Models for Problems in Nonlinear Aeroelasticity," Advanced Dynamics, \$29K
- 100. F. Carr, J. Straka, "Severe storm research," Jonathon Merage Foundation, \$21K
- 101. F. Carr, J. Straka, "Severe storm research," Jonathon Merage Foundation, \$20K

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External Research Grants (cont'd)

- 102. A. Striolo, "Electrolytes at Solid-Water Interfaces: Theoretical Studies for Practical Applications," DOE EPSCoR, \$450K
- 103. A. Striolo, Saha, "Experimental and Theoretical Studies of Carbon Nanotube Hierarchical Structures in Multifunctional Polymer Composites," DOD EPSCoR, \$450K
- 104. D. Cole (ORNL), A. Striolo, "Structure and Dynamics of Earth Materials, Interfaces and Reactions," DOE, \$1.5M (\$75K OU)
- 105. D. Papavassiliou, A. Striolo, "Effects of Hydrophobicity-Induced Wall Slip on Turbulence Drag and Turbulence Structure," NSF, \$230K
- 106. A. Striolo, D. Resasco, U. Nollert, "Understanding the Interactions between Carbon Nanotubes and Cellular Membranes," NSF, \$380K
- 107. M. Xue, Y. Hong, X. Hu (GSU), "Integrated Weather and Wildfire Simulation and Optimization for Wildfire Management," NSF, \$997K (\$483K OU)
- 108. Y. Hong, "Next Generation QPE: Toward a Multi-Sensor Approach for Integration of Radar, Satellite, and Surface Observations to Produce Very High-resolution Precipitation Data," NOAA/OAR/NSSL via CIMMS, \$83K
- 109. R. Palmer, Y. Hong, "Phased Array Technology for Weather Radar Applications," NOAA/OAR/NSSL via CIMMS, \$426K
- 110. Y. Hong, Baski (OSU), "Proactive approach to transportation resource allocation under severe winter weather emergencies," OK-DOT/OTC, \$261K (\$101K OU)
- 111. R. Palmer, Y. Hong, "Atmospheric Observations using PhasedArray Technology," \$340K
- 112. Y. Hong, "Toward Improved Flood Prediction and Risk Mitigation: Capacity Building for Africa," NASA, \$87K
- 113. Y. Hong, "Improving NASA Global Hazard System and Implementing SERVIR-Africa," NASA, \$272K
- 114. Y. Hong, "Link SERVIR-Africa Work to NASA Land Information System: Workshop Training and Data Assimilation of GRACE to NASA-OU Hydrologic Model," NASA, \$10K
- 115. R. Adler (NASA), Y. Hong, "Global Hazard (Flood-Landslide) Decision-Support System," NASA, \$900K
- 116. S. Schroeder, "CAREER: Advancing Viral RNA Structure Prediction," NSF, \$750K

OSKER-RELATED FUNDING TO DATE:

\$206M total, \$116M to OU **E M E W**

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External Research Grants (cont'd)

- 117. P. Attar, "High Fidelity Computational Aeroelastic Analysis of a Flexible Membrane Airfoil Undergoing Dynamic Motion," Ohio Aerospace Institute, \$35K
- 118. P. Attar, "Computational Model Development and Experimental Validation Measurements for Membrane-Batten Wing" Flexible Membrane Airfoil Undergoing Dynamic Motion," Ohio Aerospace Institute, \$43K
- 119. K. Droegemeier, F. Kong, P. Attar, "A Partnership to Develop, Conduct, and Evaluate Realtime High-Resolution Ensemble and Deterministic Forecasts for Convective-scale Hazardous Weather," NOAA, \$375K
- 120. M. Xue, G. Zhang, K. Brewster, F. Kong, "Prediction and Predictability of Tropical Cyclones over Oceanic and Coastal Regions and Advanced Assimilation of Radar and Satellite Data for the Navy Coupled Ocean-Atmosphere Mesoscale Prediction System," ONR/DOD EPSCoR, \$476K; OK Board of Regents \$100K
- 121. S. Ahalt, A. Apon, D. Lifka, H. Neeman, "NSF Workshop High Performance Computing Center Sustainability," NSF, \$49K (\$0 OU)
- 122. Y. Luo, S. Lakshmivarahan, "Development of a Data Assimilation Capability towards Ecological Forecasting in a Data-Rich Era," NSF, \$1.08M
- 123. Y. Luo, D. Schimmel (NEON), J. Clark (Duke U.), Kiona Ogle (U. Wyoming), S. LaDeau (Cary Institute of Ecosystem Study), "RCN: Forecasts Of Resource and Environmental Changes: Data Assimilation Science and Technology (FORECAST)," NSF, \$500K
- 124. J. Straka, K. Kanak, Davies-Jones, H. Neeman, "Challenges in understanding tornadogenesis and associated phenomena," NSF, \$854K
- 125. P. Risser et al, "A cyberCommons for Ecological Forecasting," NSF, \$6M (\$2.78M OU)
- 126. M. Xue, X. Wang, X. Li (OSU), R. Barnes, S. Sanielevici (PSC), H. Neeman, "Enabling Petascale Ensemble-Based Data Assimilation for the Numerical Analysis and Prediction of High-Impact Weather," NSF, \$1.2M (\$902K OU)
- 127. P. Skubic, B. Abbott, P. Gutierrez, M. Strauss, "ATLAS Southwest Tier 2 Computing Center," NSF, \$600K/year (\$60K/year OU)
- 128. Y. Hong, "Evaluation of NASA Global Hazard System," NASA, \$45K

OSKER-RELATED FUNDING TO DATE:

\$206M total, \$116M to OU **E M E W**

OSKER State of the Center Address

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External Research Grants (cont'd)

- 129. J Wicksted, F. Waxman et al, "Building Oklahoma's Leadership Role in Cellulosic Bioenergy," NSF EPSCoR, \$15M (\$5.7M OU)
- 130. D.S. Oliver, software, \$16.7M
- 131. K.K. Muraleetharan, G. Miller, and A. Cerato, "Understanding and Improving the Seismic Behavior of Pile Foundations in Soft Clays," NSF, \$1.15M (\$500K OU)
- 132. K. Droegemeier, F. Kong, "Multisensor Studies of Precipitation for Model Verification and Data Assimilation," U Minn, (\$7K OU)
- 133. K. Droegemeier, M. Xue, F. Kong, "Observing System Simulation Experiments for Airborne Weather Sensors," HRL, (\$33K OU)
- 134. M. Nollert, Scholarship, FD-OMRF, \$12K
- 135. R. Sigal, R. Philp, C. Rai., S. Shah, R. Slatt, C. Sondergeld, D. Zhang, energy company, \$1.9M
- 136. B. Grady, D. Schmidtke, A. Striolo, A. Cheville, D. Teeters, "Polymer Nanostructures on Solid Surfaces," \$208K (\$125K OU)
- 137. T. Conway, "E. coli Model Organism Resource," UN-Purdue, (\$685K OU)
- 138. R. Kolar, "Storm Surge Modeling in SE Louisiana - 2006," ARCADIS, (\$37K OU)
- 139. D. Cole (ORNL), A. Striolo, "Rates and Mechanisms of Mineral-Fluid Interactions at the Nanoscale," DOE, \$1.65M (total), (\$55K OU)
- 140. R. Kolar, "A Prototype Operational Modeling System for Waves, Coastal Currents, Inundation and Hydrologic Flooding for Eastern North Carolina," UN-UNC-CH, (\$209K OU)
- 141. R. Kolar, "A Coupled Regional-Coastal Ocean Model: HYCOM/CG-ADCIRC," DOD-NRL, (\$333K OU)
- 142. M. Xue, "Contribution to WRF Model Development by the Center for Analysis and Prediction of Storms," DOC-NOAA, \$821K
- 143. K. Marfurt, "Improving Geologic and Engineering Models of Midcontinent Fracture and Karst Modified Reservoirs Using 3-D Seismic Attributes," UKCRINC, (\$61K OU)
- 144. P. Attar, P. Vedula, "Novel, Optimal, Physics-based Reduced Order Models for Nonlinear Aeroelasticity," Advanced Dynamics, \$49K
- 145. S. Dhall, "Autonomous Data Partitioning using Data Mining for High Performance Computing," NSF, (\$125K OU)

OSKER-RELATED FUNDING TO DATE:

\$206M total, \$116M to OU E M E W

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External Research Grants (cont'd)

- 146. M. Xue, K. Brewster, J. Gao, "Ensemble-based Data Assimilation for Tropical Storms, and Realtime 3DVAR Analysis for Initial Proof of 'Warn-on-Forecast' Concept: Collaborative Research between CAPS and NSSL," DOC-NOAA, \$100,000
- 147. M. Xue, "Contribution to Model Development and Enhancement Research Team by the Center for Analysis and Prediction of Storms," DOC-NOAA, \$620K
- 148. M. Xue, K. Brewster, "Ensemble-based Data Assimilation for Convective Storms and Hurricanes," DOC-NOAA, \$100,000
- 149. S. Schroeder, "Discovering Satellite Tobacco Mosaic Virus Structure," OCAST, \$85K
- 150. S. Schroeder, "Computational Advances Toward Predicting Encapsidated Viral RNA Structure," Pharmaceutical Research and Manufacturer's Association of America, \$60K
- 151. R. Kolar, "Outer Boundary Forcing for Texas Coastal Models," Texas Water Development Board, \$20K
- 152. K. Milton, "Collaborative Research: Quantum Vacuum Energy", NSF, \$250K
- 153. A. McGovern, "Developing Spatiotemporal Relational Models to Anticipate Tornado Formation," NSF, \$500K
- 154. Y. Kogan, "Midlatitude Aerosol-Cloud-Radiation Feedbacks in Marine Boundary Layer Clouds", ONR, \$638K
- 155. J. Straka, K. Kanak, Davies-Jones, "Challenges in understanding tornadogenesis and associated phenomena," NSF, \$854K (total), \$584K (OU)
- 156. Y. Hong, "Improvement of the NASA Global Hazard System and Implement Server-Africa," NASA, \$272K
- 157. J. Antonio, S. Lakshmivarahan, H. Neeman, "Predictions of Atmospheric Dispersion of Chemical and Biological Contaminants in the Urban Canopy." Subcontract No. 1334/0974-01, Prime Agency DOD-ARO, Subcontract through Texas Tech University, Lubbock, TX, Sep. 29, 2000 to Nov. 3, 2001, \$75K
- 158. A. Striolo, "Electrolytes at Solid-Water Interfaces: Theoretical Studies for Practical Applications," OSRHE Nanotechnology, \$15K
- 159. D. Papavassiliou, "Turbulent transport in non-homogeneous turbulence," NSF, \$320K

OSKER-RELATED FUNDING TO DATE:

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External Research Grants (cont'd)

- 160. K. Droegemeier et al., "Engineering Research Center for Collaborative Adaptive Sensing of the Atmosphere," NSF, \$17M (total), \$5.6M (OU)
- 161. K. Droegemeier et al., "Linked Environments for Atmospheric Discovery (LEAD)," NSF, \$11.25M (total), \$2.5M (OU)
- 162. M. Strauss, P. Skubic et al., "Oklahoma Center for High Energy Physics", DOE EPSCoR, \$3.4M (total), \$1.6M (OU)
- 163. M. Richman, A. White, V. Lakshmanan, V. DeBrunner, P. Skubic, "Real Time Mining of Integrated Weather Data," NSF, \$950K
- 164. D. Weber, K. Droegemeier, H. Neeman, "Modeling Environment for Atmospheric Discovery," NCSA, \$435K
- 165. H. Neeman, K. Droegemeier, K. Mish, D. Papavassiliou, P. Skubic, "Acquisition of an Itanium Cluster for Grid Computing," NSF, \$340K
- 166. J. Levit, D. Ebert (Purdue), C. Hansen (U Utah), "Advanced Weather Data Visualization," NSF, \$300K
- 167. D. Papavassiliou, "Turbulent Transport in Wall Turbulence," NSF, \$165K
- 168. L. Lee, J. Mullen (Worcester Polytechnic), H. Neeman, G.K. Newman, "Integration of High Performance Computing in Nanotechnology," NSF, \$400K
- 169. R. Wheeler, "Principal mode analysis and its application to polypeptide vibrations," NSF, \$385K
- 170. R. Kolar, J. Antonio, S. Dhall, S. Lakshmivaran, "A Parallel, Baroclinic 3D Shallow Water Model," DoD - DEPSCoR (via ONR), \$312K
- 171. R. Luettich (UNC), R. Kolar, B. Vieux, J. Gourley, "The Center for Natural Disasters, Coastal Infrastructure, and Emergency Management," DHS, \$699K
- 172. D. Papavassiliou, M. Zaman, H. Neeman, "Integrated, Scalable MBS for Flow Through Porous Media," NSF, \$150K
- 173. Y. Wang, P. Mukherjee, "Wavelet based analysis of WMAP data," NASA, \$150K
- 174. E. Mansell, C. L. Ziegler, J. M. Straka, D. R. MacGorman, "Numerical modeling studies of storm electrification and lightning," \$605K

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External Research Grants (cont'd)

- 175. K. Brewster, J. Gao, F. Carr, W. Lapenta, G. Jedlovec, "Impact of the Assimilation of AIRS Soundings and AMSR-E Rainfall on Short Term Forecasts of Mesoscale Weather," NASA, \$458K
- 176. R. Wheeler, T. Click, "National Institutes of Health/Predocortical Fellowships for Students with Disabilities," NIH/NIGMS, \$80K
- 177. K. Pathasarathy, D. Papavassiliou, L. Lee, G. Newman, "Drag reduction using surface-attached polymer chains and nanotubes," ONR, \$730K
- 178. D. Papavassiliou, "Turbulent transport in non-homogeneous turbulence," NSF, \$320K
- 179. C. Doswell, D. Weber, H. Neeman, "A Study of Moist Deep Convection: Generation of Multiple Updrafts in Association with Mesoscale Forcing," NSF, \$430K
- 180. D. Papavassiliou, "Melt-Blowing: Advance modeling and experimental verification," NSF, \$321K
- 181. R. Kol,ar et al., "A Coupled Hydrodynamic/Hydrologic Model with Adaptive Gridding," ONR, \$595K
- 182. D. Papavassiliou, "Scalar Transport in Porous Media," ACS-PRF, \$80K
- 183. M. Xue, F. Carr, A. Shapiro, K. Brewster, J. Gao, "Research on Optimal Utilization and Impact of Water Vapor and Other High Resolution Observations in Storm-Scale QPF," NSF, \$880K.
- 184. J. Gao, K. Droegemeier, M. Xue, "On the Optimal Use of WSR-88D Doppler Radar Data for Variational Storm-Scale Data Assimilation," NSF, \$600K.
- 185. K. Mish, K. Muraleetharan, "Computational Modeling of Blast Loading on Bridges," OTC, \$125K
- 186. V. DeBrunner, L. DeBrunner, D. Baldwin, K. Mish, "Intelligent Bridge System," FHWA, \$3M
- 187. D. Papavassiliou, "Scalar Transport in Porous Media," ACS-PRF, \$80K
- 188. Y. Wang, P. Mukherjee, "Wavelet based analysis of WMAP data," NASA, \$150K
- 189. R. Wheeler et al., "Testing new methods for structure prediction and free energy calculations (Predocortical Fellowship for Students with Disabilities)," NIH/NIGMS, \$24K
- 190. L. White et al., "Modeling Studies in the Duke Forest Free-Air CO2 Enrichment (FACE) Program," DOE, \$730K

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External Research Grants (cont'd)

- 191. Neeman, Severini, "Cyberinfrastructure for Distributed Rapid Response to National Emergencies", NSF, \$132K
- 192. Neeman, Roe, Severini, Wu et al., "Cyberinfrastructure Education for Bioinformatics and Beyond," NSF, \$250K
- 193. K. Milton, C. Kao, "Non-perturbative Quantum Field Theory and Particle Theory Beyond the Standard Model," DOE, \$150K
- 194. J. Snow, "Oklahoma Center for High Energy Physics", DOE EPSCoR, \$3.4M (total), \$169K (LU)
- 195. M. Xue, F. Kong, "OSSE Experiments for airborne weather sensors," Boeing, \$90K
- 196. M. Xue, K. Brewster, J. Gao, A. Shapiro, "Storm-Scale Quantitative Precipitation Forecasting Using Advanced Data Assimilation Techniques: Methods, Impacts and Sensitivities," NSF, \$835K
- 197. Y. Kogan, D. Mechem, "Improvement in the cloud physics formulation in the U.S. Navy Coupled Ocean-Atmosphere Mesoscale Prediction System," ONR, \$889K
- 198. G. Zhang, M. Xue, P. Chilson, T. Schuur, "Improving Microphysics Parameterizations and Quantitative Precipitation Forecast through Optimal Use of Video Disdrometer, Profiler and Polarimetric Radar Observations," NSF, \$464K
- 199. T. Yu, M. Xue, M. Yeay, R. Palmer, S. Torres, M. Biggerstaff, "Meteorological Studies with the Phased Array Weather Radar and Data Assimilation using the Ensemble Kalman Filter," ONR/Defense EPSCOR/OK State Regents, \$560K
- 200. B. Wanner, T. Conway, et al., "Development of the www.EcoliCommunity.org Information Resource," NIH, \$1.5M (total), \$150K (OU)
- 201. T. Ibrahim et al., "A Demonstration of Low-Cost Reliable Wireless Sensor for Health Monitoring of a Precast Prestressed Concrete Bridge Girder," OK Transportation Center, \$80K
- 202. T. Ibrahim et al., "Micro-Neural Interface," OCAST, \$135K
- 203. J. Snow, "Langston University High Energy Physics," \$155K (LU)

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External Research Grants (cont'd)

- 204. L.M. Leslie, M.B. Richman, C. Doswell, "Detecting Synoptic-Scale Precursors Tornado Outbreaks," NSF, \$548K
- 205. L.M. Leslie, M.B. Richman, "Use of Kernel Methods in Data Selection and Thinning for Satellite Data Assimilation in NWP Models," NOAA, \$342K
- 206. J. Gao, K. Brewster, M. Xue, K. Droegemeier, "Assimilating Doppler Radar Data for Storm-Scale Numerical Prediction Using an Ensemble-based Variational Method," NSF, \$200K
- 207. E. Chesnokov, "Fracture Prediction Methodology Based On Surface Seismic Data," Devon Energy, \$1M
- 208. E. Chesnokov, "Scenario of Fracture Event Development in the Barnett Shale (Laboratory Measurements and Theoretical Investigation)," Devon Energy, \$1.3M
- 209. M. Xue, K. Brewster, J. Gao, "Study of Tornado and Tornadoic Thunderstorm Dynamics and Predictability through High-Resolution Simulation, Prediction and Advanced Data Assimilation," NSF, \$780K
- 210. A. Striolo, "Heat Transfer in Graphene-Oil Nanocomposites: A Molecular Understanding to Overcome Practical Barriers." ACS Petroleum Research Fund, \$40K
- 211. D.V. Papavassiliou, "Turbulent Transport in Anisotropic Velocity Fields," NSF, \$292.5K
- 212. D. Oliver, software license grant, \$1.5M
- 213. R. Broughton et al, "Assembling the Eutelost Tree of Life – Addressing the Major Unresolved Problem in Vertebrate Phylogeny," NSF, \$3M (\$654K to OU)
- 214. A. Fagg, "Development of a Bidirectional CNS Interface or Robotic Control," NIH, \$600K
- 215. M. Xue, J. Gao, "An Investigation on the Importance of Environmental Variability to Storm-scale Radar Data Assimilation," NSSL, \$72K
- 216. JV. Sikavistsas and D.V. Papavassiliou , "Flow Effects on Porous Scaffolds for Tissue Regeneration," NSF, \$400K
- 217. P. Skubic, M. Strauss, et al., "Experimental Physics Investigations Using Colliding Beam Detectors at Fermilab and the LHC," DOE, \$503K

OSKER-RELATED FUNDING TO DATE:

\$206M total, \$116M to OU **E M E W**

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External Funding Summary

- External research funding facilitated by OSCER (Fall 2001- Fall 2012): **\$206M total, \$116M to OU**
- Funded projects: **217**
- **111** OU faculty and staff in **19** academic departments and 2 other non-academic organizations
- Comparison: Fiscal Year 2002-12 (July 2001 – June 2012):
OU Norman externally funded research expenditure: \$793M

Since being founded in fall of 2001, OSCER has enabled research projects comprising more than

1 / 7 of OU Norman's total externally funded research expenditure, with a 7-to-1 return on investment.



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Publications Facilitated by Research IT

- Publications facilitated by Research IT resources

- **2012: 119** (so far)

- 2011: 115

- 2010: 122

- 2009: 107

- 2008: 105

- 2007: 73

- 2006: 93

- 2005: 65

- 2004: 27

- 2003: 9

- 2002: 8

- 2001: 3

**TOTAL SO FAR:
846 publications**

http://www.oscer.ou.edu/papers_from_rounds.php

Includes: 25 MS theses, 23 PhD dissertations



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Blue Ribbon Panel

- In early August, OU hosted a Blue Ribbon panel of experts from across the US, mostly academic but also industry, to help us understand how to strategize for the coming decade.
- Non-panelist participants included:
 - several dozen from OU;
 - about a dozen other Oklahoma institutions;
 - about a dozen institutions in 10 other EPSCoR jurisdictions;
 - about a dozen from institutions in non-EPSCoR jurisdictions.
- Major realization: collaboration!
 - with researchers, instead of only providing service;
 - among OU's CIO, VPR and Dean of Libraries.

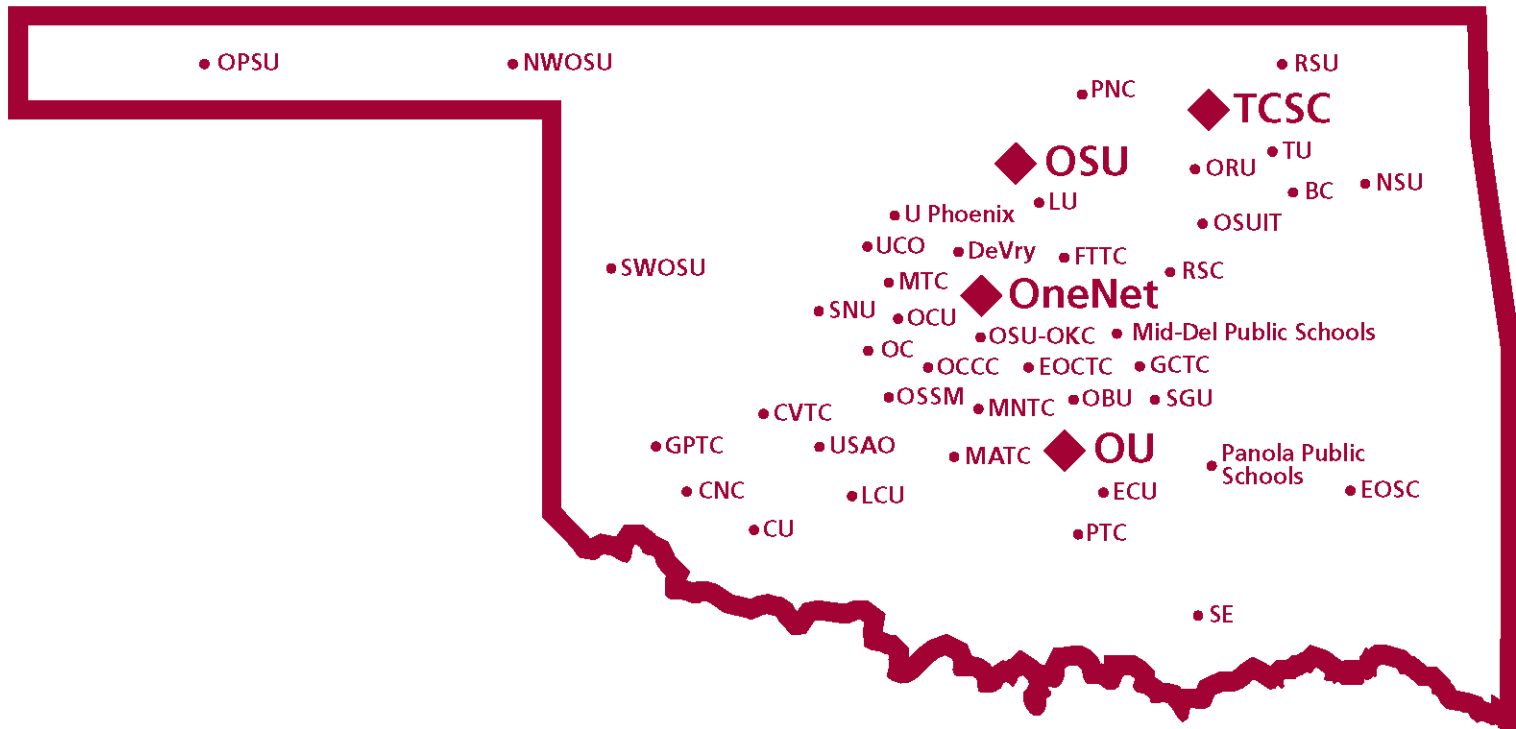


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Oklahoma



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OK Cyberinfrastructure Initiative

- All academic institutions in Oklahoma are eligible to sign up for free use of OU's and OSU's centrally-owned CI resources.
- Other kinds of institutions (government, NGO, commercial) are eligible to use, though not necessarily for free.
- Everyone can participate in our CI education initiative.
- The Oklahoma Supercomputing Symposium, our annual conference, continues to be offered to all.



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OCII Goals

- **Reach** institutions outside the mainstream of advanced computing.
- **Serve** every higher education institution in Oklahoma that has relevant curricula.
- **Educate** Oklahomans about advanced computing.
- **Attract** underrepresented populations and institution types into advanced computing.



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OCII Service Methodologies Part 1

- **Access (A)**: to supercomputers and related technologies (20 academic institutions to date).
- **Dissemination (D)**: Oklahoma Supercomputing Symposium – annual advanced computing conference at OU (25 Oklahoma academic institutions to date).
- **Education (E)**: “Supercomputing in Plain English” (SiPE) workshop series: 11 talks about advanced computing, taught with stories, analogies and play rather than deep technical jargon. Have reached 166 institutions (academic, government, industry, nonprofit) in 42 US states and territories and 5 other countries (14 academic institutions in OK to date) – **coming again in Spring 2013!**



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OCII Service Methodologies Part 2

- **Faculty Development (F)**: Workshops held at OU and OSU on advanced computing and computational science topics, sponsored by the National Computational Science Institute, the SC supercomputing conference series, the Linux Clusters Institute, the Virtual School for Computational Science & Engineering. Oklahoma is the only state to have hosted multiple events sponsored by each of these (18).
- **Outreach (O)**: “Supercomputing in Plain English” (SiPE) overview talk (24 OK academic).
- **Proposal Support (P)**: Letters of commitment for access to OCII resources; collaborations with OCII lead institutions (4 OK academic, 1 nongovernmental).



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OCII Service Methodologies Part 3

- **Technology (T)**: Got or helped get technology (e.g., network upgrade, mini-supercomputer, hi def video camera for telepresence) for that institution (14 OK academic).
- **Workforce Development (W)** – (27 OK academic)
 - Oklahoma Information Technology Mentorship Program (OITMP)
 - “A Day in the Life of an IT Professional” presentations to courses across the full spectrum of higher education.
 - Job shadowing opportunities and direct mentoring of individual students.
 - Institution Types: career techs, community colleges, regional universities, PhD-granting universities.
- Special effort to reach underrepresented populations: underrepresented minorities, non-PhD-granting, rural





OCII Institution Profile

To date, OCII has served 92 Oklahoma institutions, agencies and organizations:

- 45 OK academic
- 47 OK non-academic



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OCII Institution Profile

To date, OCII has served:

- 45 OK academic
 - Universities & Colleges: 3 PhD-granting, 21 regional
 - Community Colleges: 9
 - Career techs: 8
 - High schools: 2
 - Public school systems: 2
- 47 OK non-academic



OSCAR State of the Center Address
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OCII Institution Profile

To date, OCII has served:

- 45 OK academic
 - 8 Minority Serving Institutions:
 - Oklahoma's only Historically Black University: Langston U
 - Native American Serving Non-tribal Institutions
 - East Central U (Ada)
 - Northeastern State U (Tahlequah)
 - Southeastern Oklahoma State U (Durant)
 - Tribal Colleges
 - College of the Muscogee Nation (Okmulgee)
 - Comanche Nation College (Lawton)
 - Pawnee Nation College (Pawnee)
 - Other MSI
 - Bacone College (Muskogee)
 - 47 OK non-academic



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OCII Institution Profile

To date, OCII has served:

- 45 OK academic institutions
- 47 OK non-academic organizations
 - 17 commercial
 - 20 government (including 2 military)
 - 10 non-governmental



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OCII Academic Institutions

1. **Bacone College (MSI, 30.9% AI, 24.0% AA): T**
2. **Cameron U (8.1% AI, 15.4% AA):
A, D, E, F, O, T, W**
Teaching advanced computing course using OSCER's supercomputer.
3. **Canadian Valley Technology Center: W**
4. **College of the Muscogee Nation (Tribal): O, T**
5. **Comanche Nation College (Tribal): D, O, T**
6. **DeVry U Oklahoma City: D, F, O**
7. **East Central U (NASNI, rural, 20.4% AI):
A, D, E, F, O, P, T, W**
Taught advanced computing course using OSCER's supercomputer.
8. **Eastern Oklahoma State College (24.5% AI): W**
Average: ~3 (mean 3.4, median 3, mode 1)
9. **Eastern Oklahoma County Tech Center (10.4% AI): W**
10. **Francis Tuttle Technology Center: D**
11. **Gordon Cooper Technology Center (18.5% AI): D, O, W**
12. **Great Plains Tech Center (11.7% AI): T, W**
13. **Langston U (HBCU, 82.8% AA):
A, D, E, F, O, P, T, W**
NSF Major Research Instrumentation grant for supercomputer awarded in 2012.

Note: Langston U (HBCU) and East Central U (NASNI) are the only two non-PhD-granting institutions to have benefited from every category of service that OCII provides.

AA = African American (7.4% OK population, 12.6% US population)
 AI = American Indian (8.6% OK, 0.9% US)
 H = Hispanic (8.9% OK, 16.3% US)
 ALL = 24.9% OK, 29.8% US

HBCU: Historically Black College or University
 NASNI = Native American Serving Non-Tribal Institution
 MSI = Minority Serving Institution



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OCII Academic (cont'd)

- 14. Lawton Christian School (high school): W
 - 15. **Metro Technology Centers (30.6% AA): D**
 - 16. **Mid-America Technology Center (23.5% AI): D, T, W**
 - 17. Mid-Del Public Schools: D
 - 18. Moore Norman Technology Center: D
 - 19. **Northeastern State U (NASNI, 28.3% AI): A, D, E, F, O, T, W**
Taught computational chemistry course using OSCER's supercomputer.
 - 20. Northwestern Oklahoma State U: A, F, O
 - 21. Oklahoma Baptist U (nonmetro): A, D, E, F, O
 - 22. Oklahoma Christian U: W
 - 23. Oklahoma City U: A, D, E, F, O, T, W
*Educational Alliance for a Parallel Future mini-supercomputer proposal **funded** in 2011.*
Teaching advanced computing course using OSCER's supercomputer (several times).
 - 24. Oklahoma City Community College: W
 - 25. **Oklahoma Panhandle State U (rural, 15.4% H): A, D, O, W**
 - 26. Oklahoma School of Science & Mathematics (high school): A, D, E, O, W
 - 27. **Oklahoma State U (PhD, 8.3% AI): A, D, E, F, O, T, W**
*NSF Major Research Instrumentation proposal for supercomputer **funded** in 2011.*
 - 28. **Oklahoma State U Institute of Technology (Comm College, 24.2% AI): W**
- Average: ~3 (mean 3.4, median 3, mode 1)

AA = African American (7.4% OK population, 12.6% US population)

AI = American Indian (8.6% OK, 0.9% US)

H = Hispanic (8.9% OK, 16.3% US)

ALL = 24.9% OK, 29.8% US

HBCU: Historically Black College or University

NASNI = Native American Serving Non-Tribal Institution

MSI = Minority Serving Institution



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OCII Academic (cont'd)

- 29. Oklahoma State U Oklahoma City (Comm College): O, W
 - 30. Oral Roberts U: A, F, O, W
 - 31. Panola Public Schools: D
 - 32. **Pawnee Nation College (Tribal): T**
 - 33. **Pontotoc Technology Center (30.4% AI): W**
 - 34. **Rogers State U (13.9% AI): A, D, F, O**
 - 35. **Rose State College (17.4% AA): W**
 - 36. St. Gregory's U: A, D, E, F, O
 - 37. **Southeastern Oklahoma State U (NASNI, 29.6% AI): A, D, E, F, O, T, W**
*Educational Alliance for a Parallel Future mini-supercomputer grant **funded** in 2011.*
 - 38. Southern Nazarene U: A, D, F, O, P, T, W
Teaching computational chemistry course using OSCER's supercomputer.
 - 39. Southwestern Oklahoma State U (rural): A, D, E, F, O
 - 40. Tulsa Community College: W
 - 41. U Central Oklahoma: A, D, E, F, O, W
NSF Major Research Instrumentation proposal for supercomputer submitted in 2011-12.
 - 42. U Oklahoma (PhD): A, D, E, F, O, P, T, W
*NSF Major Research Instrumentation proposal for large scale storage **funded** in 2010.*
 - 43. U Phoenix: D
 - 44. **U of Science & Arts of Oklahoma (14.1% AI): A, O**
 - 45. U Tulsa (PhD): A, D, E, F, O
Taught bioinformatics course using OSCER's supercomputer.
- Average: ~3 (mean 3.4, median 3, mode 1)

AA = African American (7.4% OK population, 12.6% US population)

AI = American Indian (8.6% OK, 0.9% US)

H = Hispanic (8.9% OK, 16.3% US)

ALL = 24.9% OK, 29.8% US

HBCU: Historically Black College or University

NASNI = Native American Serving Non-Tribal Institution

MSI = Minority Serving Institution



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OCII Non-academic

- Commercial (17)
 - Andon Corp : D, F
 - Chesapeake Energy Corp : D
 - Creative Consultants : D
 - Fusion Geophysical: D
 - Indus Corp: D, E
 - Information Technologic: D
 - KANresearch: D
 - KeyBridge Technologies: D
 - Lumenate: D
 - OGE Energy Corp: D
 - Perfect Order (now defunct): D
 - PowerJam Production Inc: D
 - Versatile: D
 - Visage Production Inc: D, E
 - Weather Decision Technologies Inc : A
 - Weathernews Americas Inc.: A, D
 - Zeus Analytics (now defunct): A
- Government (18)
 - City of Duncan: D
 - City of Edmond: D
 - City of Nichols Hills: D
 - NOAA National Severe Storms Laboratory: A, D, E, F
 - NOAA Storm Prediction Center: D
 - NOAA National Weather Service: D
 - NOAA Radar Operations Center: D
 - OK Climatological Survey: D
 - OK Department of Health: D, E
 - OK Department of Human Services: D, E
 - OK Department of Libraries: D
 - OK Department of Mental Health and Substance Abuse Services: D
 - OK Office of State Finance: D
 - Oklahoma State Chamber of Commerce: D
 - OK State Regents for Higher Education: A, D
 - OK State Supreme Court: D
 - OK Tax Commission: D
 - Tulsa County Court Services: D



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OCII Non-academic (cont'd)

- Military (2)
 - Fort Sill Army Base: E
 - Tinker Air Force Base: A, D, E, F, O
- Non-governmental/non-profit (10)
 - American Society of Mechanical Engineers, Oklahoma City chapter: O
 - Lions Club of Norman OK: O
 - Lions Club of Shawnee OK: O
 - Norman Science Café: O
 - Oklahoma EPSCoR: D
 - Oklahoma Historical Society: D
 - Oklahoma Innovation Institute: D
 - Oklahoma Medical Research Foundation: A, D, P
 - Oklahoma Nanotechnology Initiative: D
 - Samuel Noble Roberts Foundation (**rural**): A, D, E, F, T



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OCII Outcomes: Teaching

Teaching: 7 + 1 institutions including 2 MSIs

- Teaching/taught parallel computing using OSCER resources:
 - Cameron U
 - East Central U (NASNI)
 - Oklahoma City U
- Taught parallel computing via LittleFe baby supercomputer:
 - Southeastern Oklahoma State U (NASNI, breakout talk)
- Taught computational chemistry using OSCER resources:
 - Northeastern State U (NASNI)
 - Southern Nazarene U
 - Rogers State U is about to.



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OCII Outcomes: Resources

6 institutions including 2 MSIs, plus C2 institutions

- NSF Major Research Instrumentation grants
 - OU: Oklahoma PetaStore, \$792,925 (in production)
 - Oklahoma State U: Cowboy cluster, \$908,812 (deployed)
 - Langston U: cluster, \$250,000 (to be acquired)
- LittleFe baby supercomputer grants
 - OU: Ron Barnes
 - Oklahoma City U: Larry Sells & John Goulden
 - Southeastern Oklahoma State U: Mike Morris & Karl Frinkle
- Networking: C2 grant



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NSF EPSCoR RII C2 Grant

- The National Science Foundation in 2010 created a new program under EPSCoR (the Experimental Program to Stimulate Competitive Research), known as Intra- and Inter-campus Cyber Connectivity (C2).
- Oklahoma's C2 grant focuses on providing resources to both research-intensive institutions and minority serving institutions.



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NSF EPSCoR C2 Upgrades

- Statewide ring: replaced routed mux/demuxes a 3 ring sites with optical components at 5 ring sites.
 - Suddenly, adding more 10G circuits is cheap and simple.
- Institutional upgrades
 - OU, OSU: to 10 Gbps from 1 Gbps
 - U Tulsa: to 1 Gbps from 200 Mbps
 - Samuel Roberts Noble Foundation: research 1 Gbps, commodity Internet 100 Mbps, both from 45 Mbps
 - Langston U: High Energy Physics and new MRI cluster to 10 Gbps from 100 Mbps
 - Tribal Colleges and Tribal mission



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NSF EPSCoR C2 Tribal Colleges

- Institutional upgrades: Tribal Colleges and Tribal mission
 - Tribal Colleges
 - College of the Muscogee Nation: networking equipment for their residence hall
 - Comanche Nation College: distance learning
 - Pawnee Nation College: online radio station and tv station
 - Tribal-serving mission
 - Bacone College: campus backbone upgrade to 100 Mbps



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NSF EPSCoR C2 Unanticipated

- OU/OU+OSU Shared Services initiative
 - Without the C2, Shared Services would have had to buy a C2's worth of equipment.
- Bandwidth increase for OU via either multiple 10G connections or 1 40G connection.
 - OU's Center for Analysis & Prediction of Storms can consume an aggregate of 12 Gbps during spring storm season.
 - OU's High Energy Physics can consume around 5 – 10 Gbps, plus whatever Langston U will be able to consume.



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OK IT Mentorship Program

The Oklahoma Information Technology Mentorship Program is sending networking professionals to universities, colleges, career techs and even a high school statewide.

These professionals will give talks on the practicalities of being a networking professional – what that career choice means day by day.

We also provide both live and virtual job shadowing opportunities – students can follow networking professionals around to see what their work looks like, either in person or via Twitter and Facebook.



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OK IT Mentorship Program

Completed 53 visits to and from 27 institutions

Comprehensive Universities (PhD-granting)

1. Oklahoma State U (Stillwater campus)
2. U Oklahoma (Norman and Tulsa campuses)
3. U Tulsa (private)

Regional Colleges and Universities (masters- and bachelors-granting)

1. Cameron U (Lawton)
2. East Central U (Ada)

Native American Serving Non-tribal Institution

3. Langston U (Langston)

Historically Black University

4. Northeastern State U (Tahlequah)

Native American Serving Non-tribal Institution

5. Oklahoma Christian U (Oklahoma City, private)
6. Oklahoma City U (private)
7. Oklahoma Panhandle State University (Goodwell)
8. Oral Roberts U (Tulsa, masters-granting, private)
9. Southeastern Oklahoma State U (Durant)

Native American Serving Non-tribal Institution

10. Southern Nazarene U (Bethany, private)
11. U Central Oklahoma (Edmond)

Community Colleges

1. Eastern Oklahoma State College (Wilburton)
2. Oklahoma City Community College
3. Oklahoma State U - Oklahoma City
4. Oklahoma State U Institute of Technology (Okmulgee)
5. Rose State College (Midwest City)
6. Tulsa Community College

Career Techs

1. Canadian Valley Technology Center (Chickasha)
2. Eastern Oklahoma County Technology Center (Choctaw)
3. Gordon Cooper Technology Center (Shawnee)
4. Great Plains Technology Center (Lawton)
5. Mid-America Technology Center (Wayne)
6. Pontotoc Technology Center (Ada)

K – 12

1. Lawton Christian School (pre-K - 12, private) -- at OU only, not visited
2. Oklahoma School of Science & Mathematics (Oklahoma City, high school)



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What a Bargain!

When you hand in a completed **EVALUATION FORM**, you'll get the following amazing swag:

- **A lovely t-shirt!**
- **A capacious coffee mug!**
- **A plastic bag!**

What a bargain!



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Thanks!

- Academic sponsors
 - Oklahoma EPSCoR
 - Great Plains Network
- Industry sponsors
 - Platinum: Intel
 - Gold: Cray, Dell, DataDirect Networks, NetApp, NVIDIA
 - Silver: Advanced Clustering Technologies, Appro, GovConnection, Panasas
 - Bronze: Avere, Gnodal, Oracle

Thank you all! Without you, the Symposium couldn't happen.



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Thanks!

- OU IT
 - OU CIO/VPIT Loretta Early
 - Symposium committee: Josh Alexander (OU), Dana Brunson (OSU), Debi Gentis (OU), Jeff Pummill (U Ark)
 - Symposium coordinator: Debi Gentis
 - Sponsorship coordinator: Chance Grubb
 - OSCER Operations Team: Brandon George, Dave Akin, Brett Zimmerman, Josh Alexander, Patrick Calhoun
 - All of the OU IT folks who helped put this together
- CCE Forum
 - Kristin Livingston, Deborah Haddock
 - The whole Forum crew who helped put this together



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Thanks!

- Keynote Speaker
 1. Thom Dunning, NCSA
- Plenary Speakers
 2. Bob Panoff
 3. Stephen Wheat, Intel
 4. Dan Stanzione, TACC
- Gold Sponsor Speakers
 5. Greg Clifford, Cray
 6. Bob Crovella, NVIDIA
 7. Dave Ellis, NetApp
 8. Jan Jitze Krol, DataDirect Networks
- Breakout speakers
 9. Accelerating Science Group, Louisiana School for Math, Science, and the Arts
 10. Kate Adams, Great Plains Network
 11. Dan Andresen, Kansas State U
 12. Dana Brunson, Oklahoma State U
 13. Larry Fisher, Creative Consultants
 14. Karl Frinkle & Mike Morris, Southeastern Oklahoma State U
 15. Erin M. Hodgess, U Houston-Downtown
 16. Jeff Pummill, U Arkansas
 17. Dan Weber & James Stevens, Tinker Air Force Base
 18. Eva Yi, OU



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Thanks!

To all of you for participating, and to those many of you who've shown us so much loyalty over the past 11 years.



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**Thanks for your
attention!**



Questions?