

ORNL, Computing, & Data Science

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Director

Computational Sciences & Engineering Division

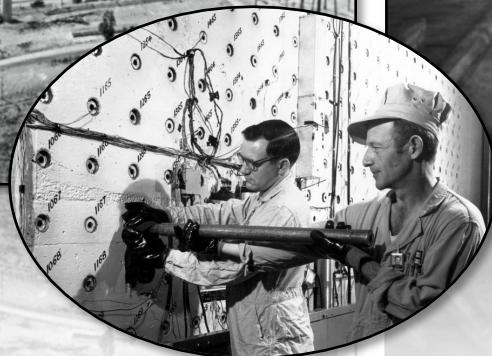
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Neuromorphic Computing Workshop
2016



Oak Ridge National Laboratory evolved from the Manhattan Project

The Clinton Pile was the world's first continuously operated nuclear reactor



Chemical processing techniques were developed to separate plutonium from irradiated fuel



Today, ORNL is DOE's largest science and energy laboratory

~\$1.4B budget

>4,000 employees

3,000 research guests annually

\$500M modernization investment

Nation's largest materials research portfolio

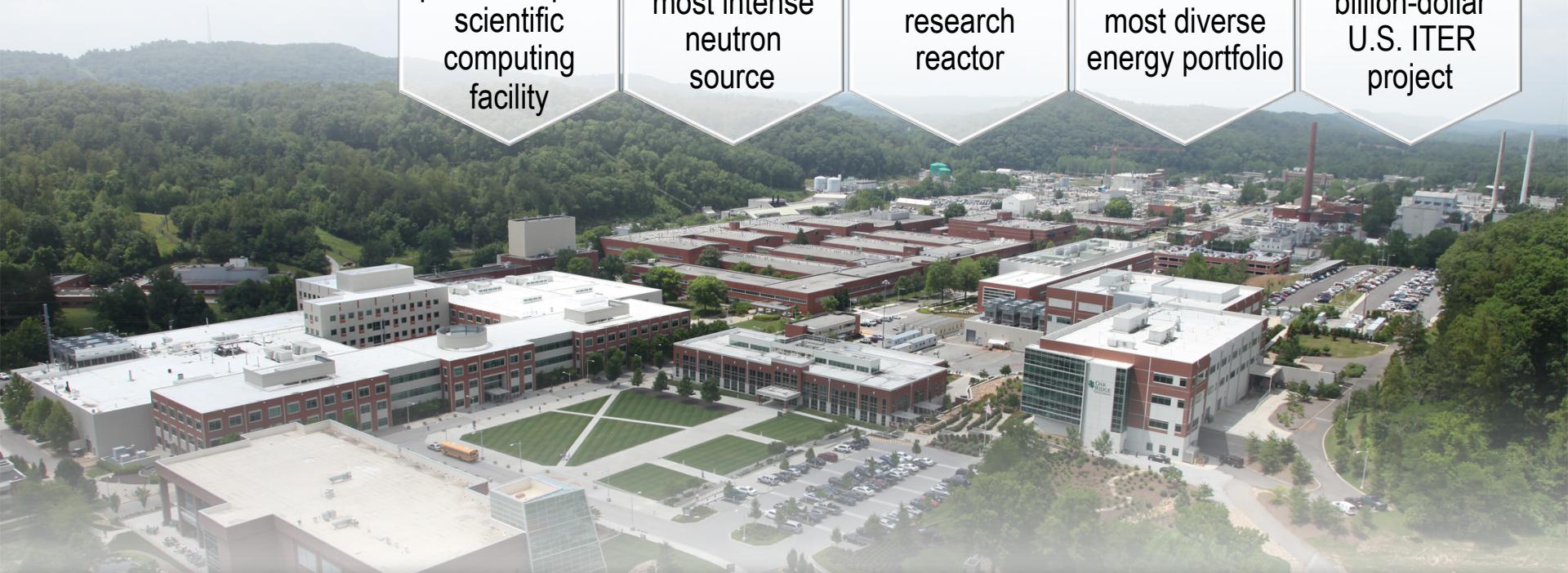
Nation's most powerful open scientific computing facility

World's most intense neutron source

World-class research reactor

Nation's most diverse energy portfolio

Managing billion-dollar U.S. ITER project

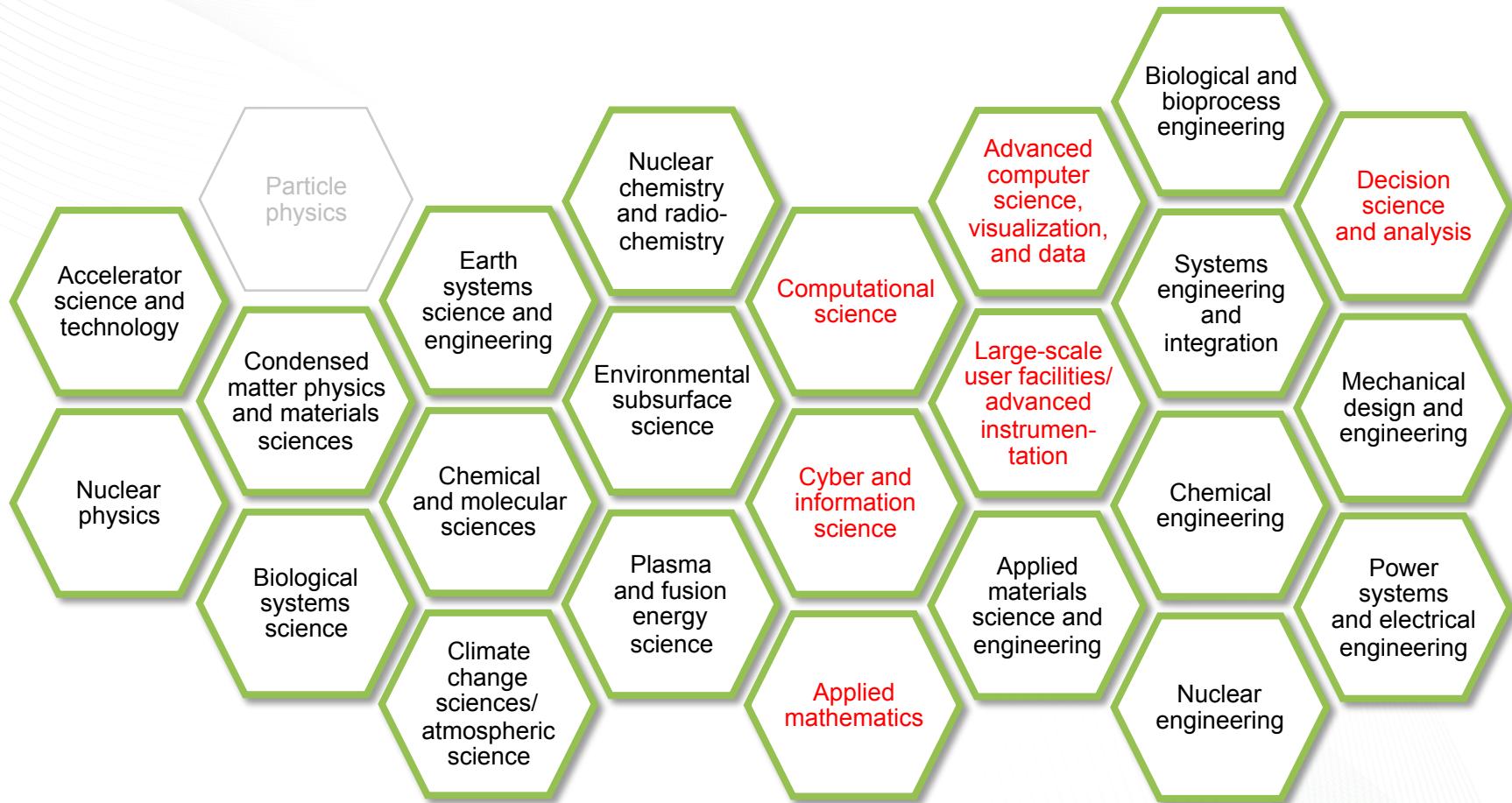


ORNL's mission

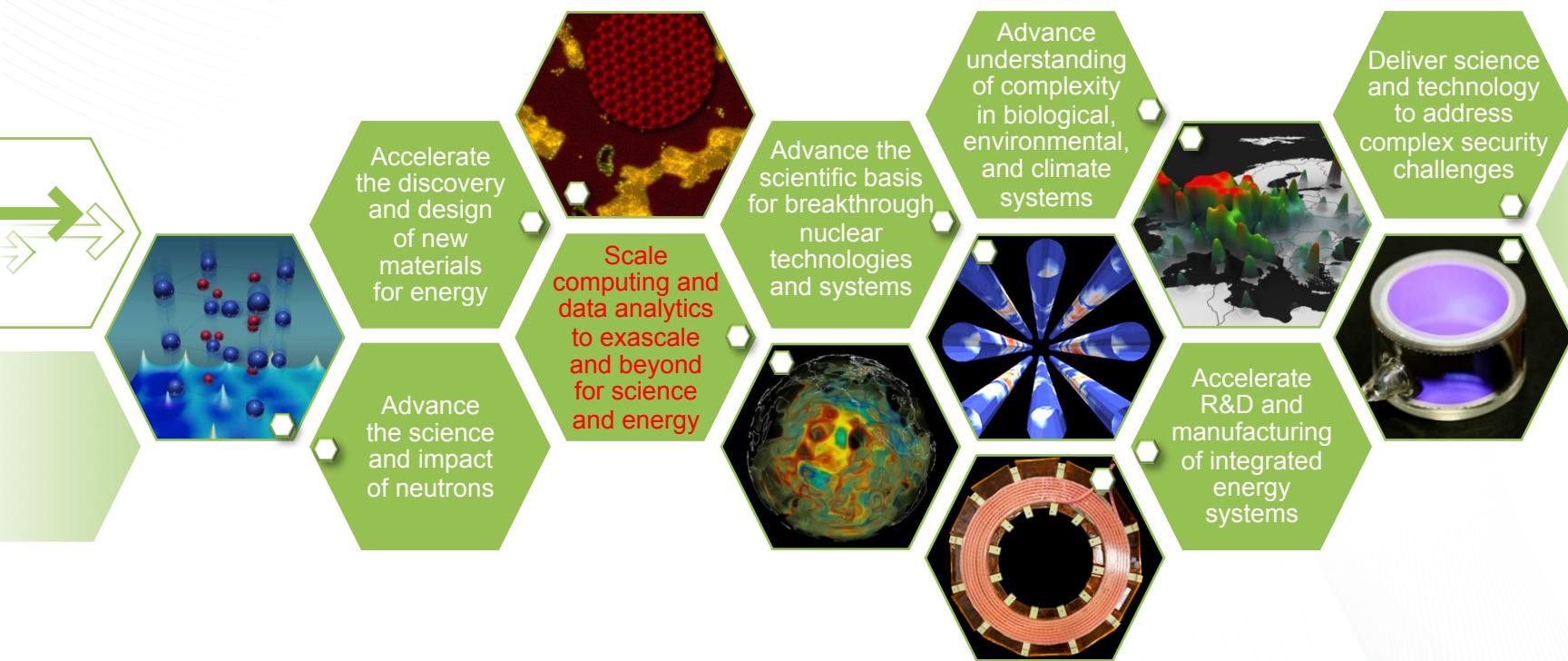
Deliver scientific discoveries and technical breakthroughs that will accelerate the development and deployment of solutions in clean energy and global security, and in doing so create economic opportunity for the nation



ORNL's core capabilities position us to tackle compelling S&T challenges

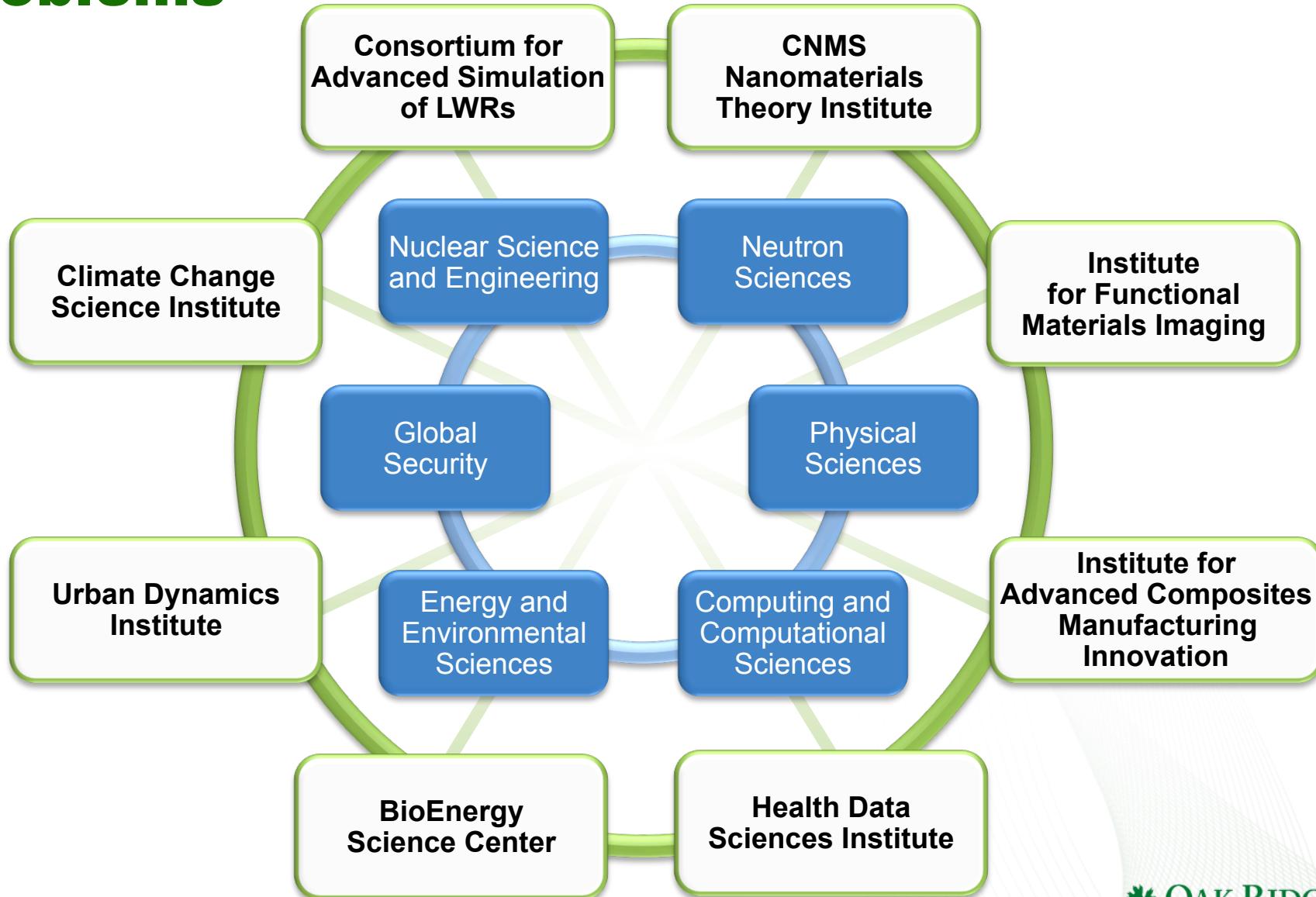


ORNL's core capabilities enable a robust laboratory R&D agenda

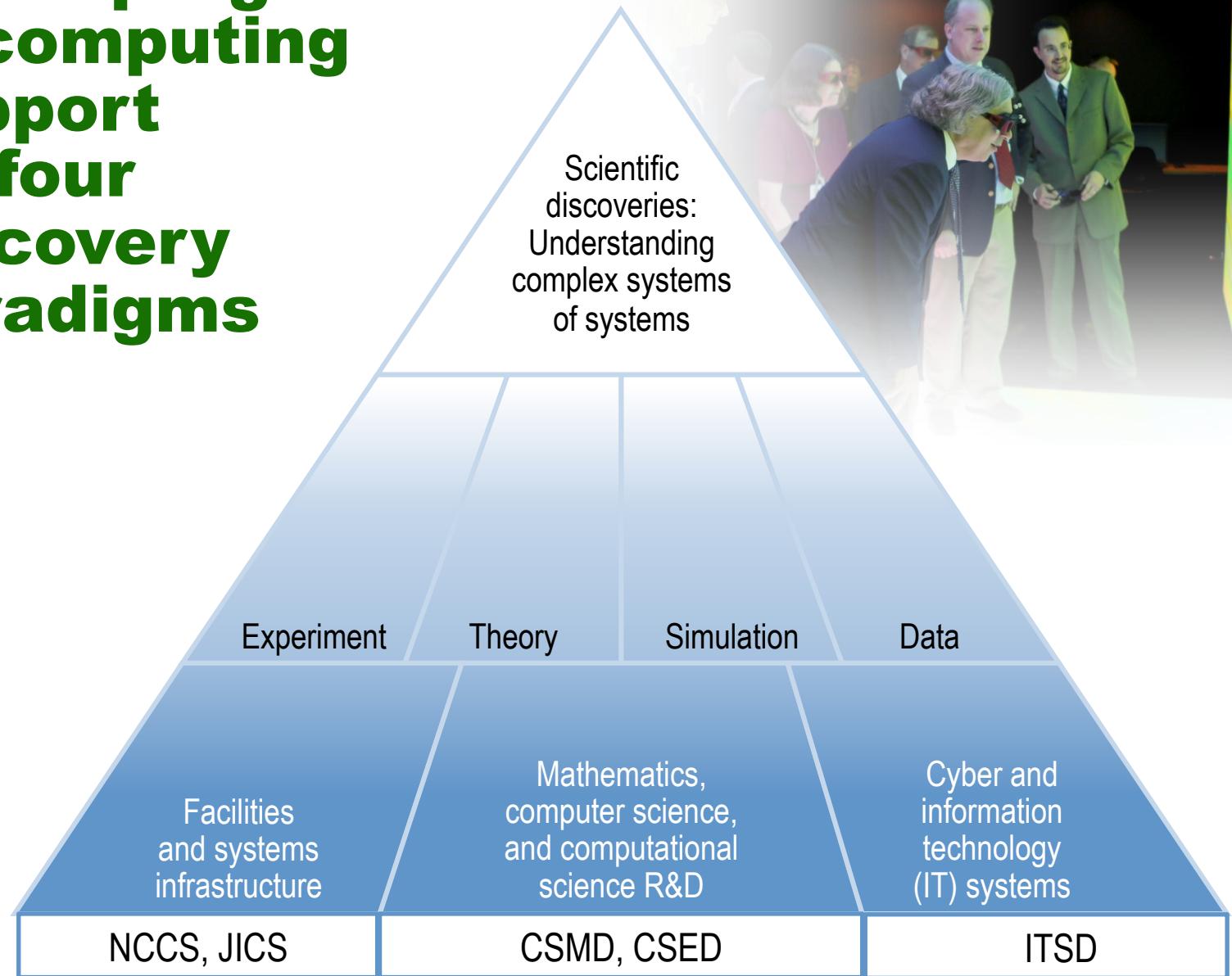


CCSD represented in red

ORNL is organized to solve grand challenge problems



ORNL programs in computing support all four discovery paradigms



Computer Science & Mathematics (CSM)

Computer Science
and Mathematics



Division
Barney Maccabe, Director

Administration
Lora Wolfe



Technical
Daniel Pack



Chief Technologist
Al Geist



Finance
Ursula Henderson



International
Thomas Schulthess

Computational
Chemical and
Material Sciences
Bobby Sumpter



Computational
Earth Sciences
Kate Evans



Computational
Biomolecular
Modeling and
Bioinformatics
Mike Leuze



Computational
Engineering
and Energy
Sciences
John Turner



Computational
and Applied
Mathematics
Clayton Webster



Complex Systems
Jacob Barhen



Staffing

125	Staff
14	Joint Faculty
6	Students
8	Admin Support

Staff Support

30%	DOE/ASCR
26%	DOE/Other
19%	US DoD
10%	LDRD
8%	WFO
5%	Joint Faculty
2%	Other

Future
Technologies
Jeffery Vetter



Computer Science
Research
David Bernholdt



Scientific Data
Scott Klasky



Computer Science and Mathematics Core Research Areas



Biology



**Complex
Systems**



**Energy
Science**



**Earth
Sciences**



**Future
Technology**



**Materials/
Chemistry**

Mathematics

$$\pi k \leq p\theta - \alpha_0 \leq \pi/2 + 2\pi k, \quad p = 2\gamma_0 + (1/2)[\operatorname{sg} A_1 - \operatorname{sg} (A_1 + 2\pi)]$$

$$f(z) = (\pi/2)(S_1 + S_2), \quad \Re[\rho''f(z)/a_n z^n] = \sum_{j=0, j \neq n}^n A_j j!, \quad (u - u_0)^{\mu} \prod_{k=1}^{n-1} (u - u_k)^{\mu_k}$$

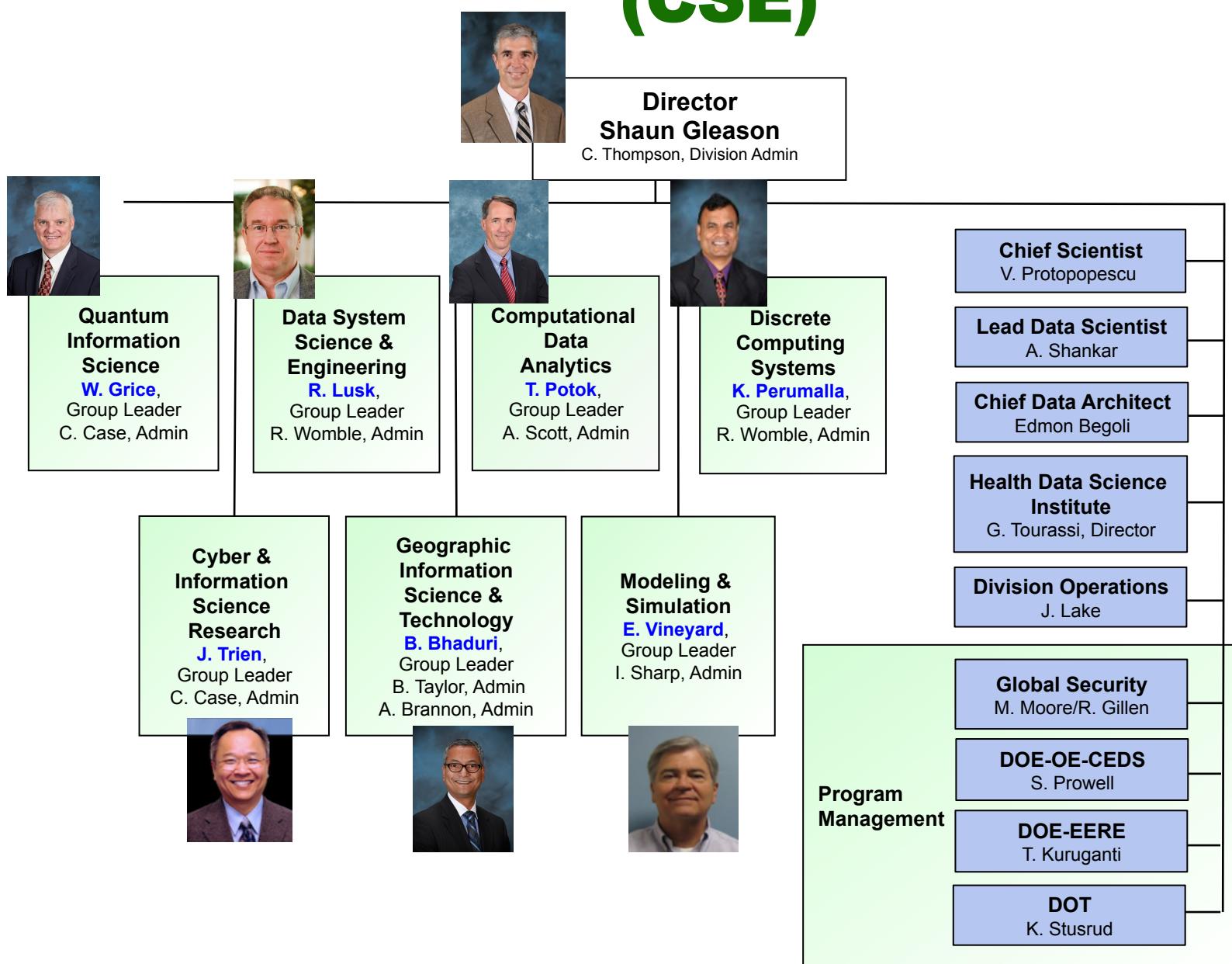
$$-\pi/2 + 2\pi k \leq p\theta - \alpha_0 \leq \pi/2 + 2\pi k, \quad p = 2\gamma_0 + (1/2)[\operatorname{sg} A_1 - \operatorname{sg} (A_1 + 2\pi)]$$

$$f(z) = (\pi/2)(S_1 + S_2), \quad \Re[\rho''f(z)/a_n z^n] = \sum_{j=0, j \neq n}^n A_j j!, \quad (u - u_0)^{\mu} \prod_{k=1}^{n-1} (u - u_k)^{\mu_k}$$

$$\sigma(u) = \prod_{k=1}^n (u + u_k)$$

Infrastructure/Deployment/Solutions

Computational Sciences & Engineering (CSE)



Data Science for Discovery

Domain Science	Scalable Computing	Sensing & Big Data		
Health & Biomedical	Novel Platforms	Leadership Computing	Sensing Science	Quantum
Urban Systems		Quantum & Neuromorphic		Data-driven Smart Sensing
Materials: SNS & CNMS, Adv Mfg		Data Architectures		UAS Platforms
Geographic Information		Text Analytics & NLP	Data Sets & Services	Chemical Security
Cyber and Information Security		Simulation		Health (PHI, MVP)
Information		Deep Learning		Energy (KDF: Biomass)
Energy: Biomass		Data Workflows		Landscan™
Environment: Climate		M&S+DA Convergence		Streaming: Facilities, Open Source, IoT

Summary

- Welcome to ORNL!
- Feel free to reach out to any of our staff to discuss collaboration opportunities while you are here.
- We hope you thoroughly enjoy your time here and have a productive workshop.