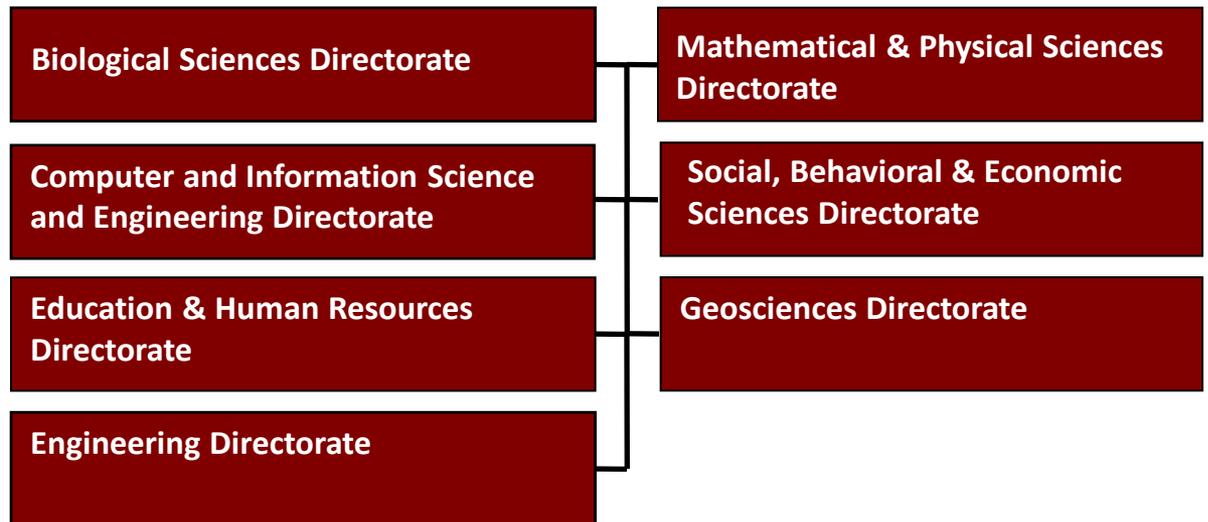
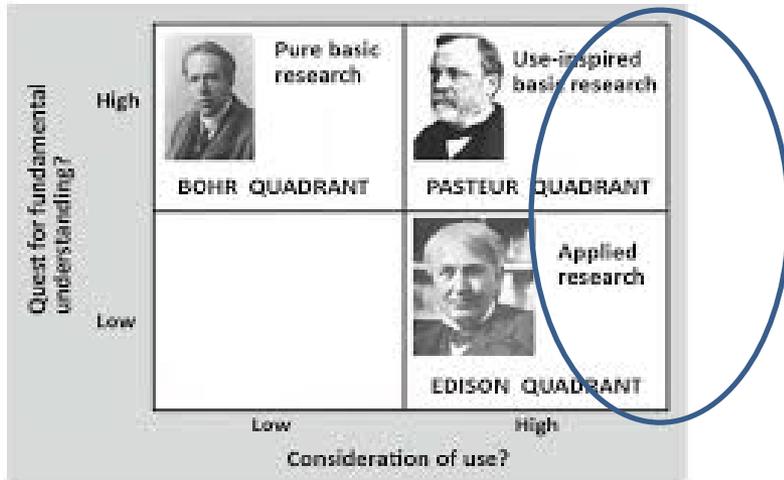




# NSF and the Future of Cyberinfrastructure

Mark Suskin  
Deputy Director  
Division of Advanced Cyberinfrastructure  
National Science Foundation (NSF)

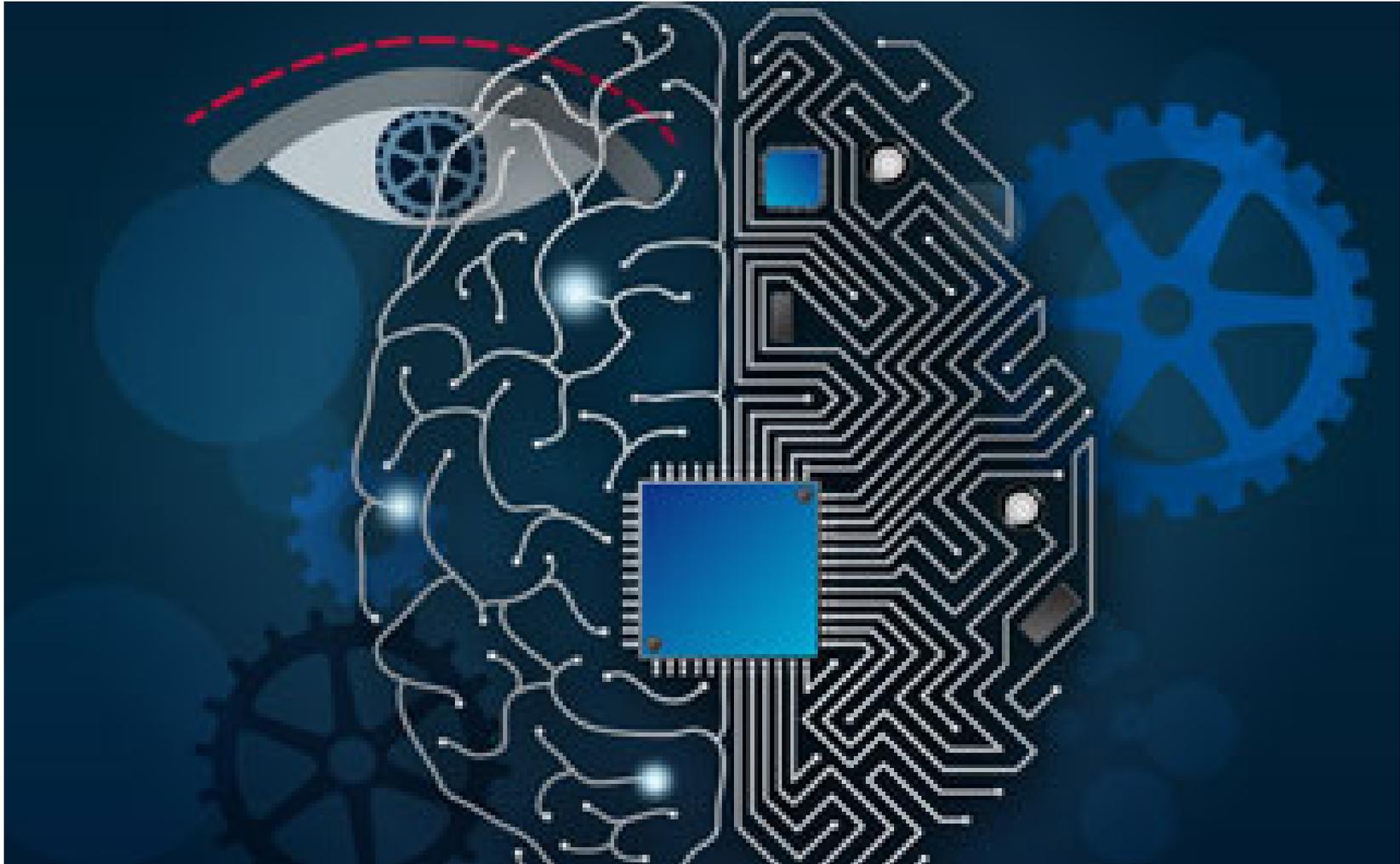
# Goal: To explore, develop, and support advanced cyberinfrastructure that enables discovery and innovation **across all disciplines**



# Software as Infrastructure

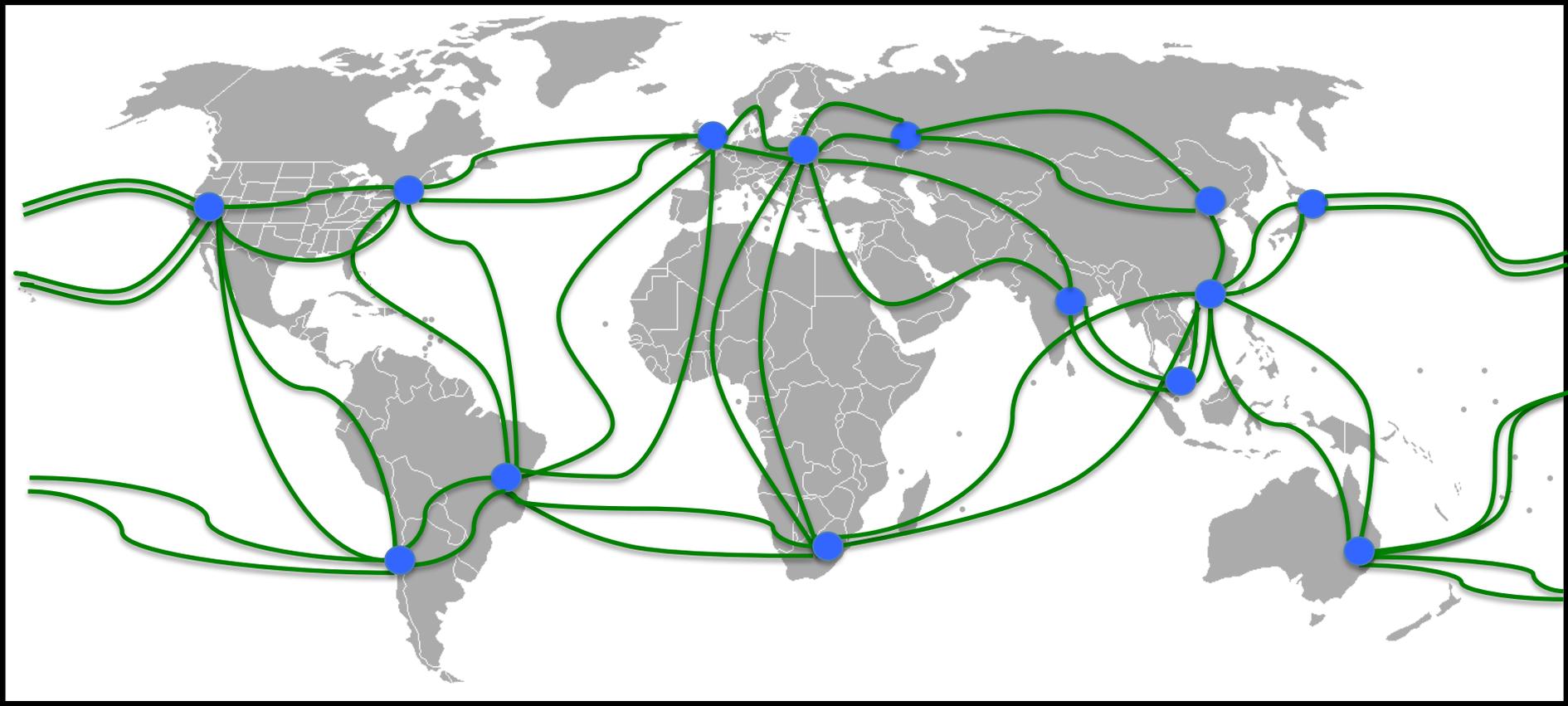
- How do we make development and reuse of scientific software sustainable?
  - Credit within academia
  - Career positions
  - Places to collect and access software
- What directions should NSF be looking at for development of process-oriented software?
  - Compilers
  - software-defined networks
  - workflow protocols
  - etc.

# Data



Credit: *Christine Daniloff/MIT*

# Networking and Cybersecurity



# High Performance Computing



**Blue Waters, UIUC**



**Stampede, UT Austin**

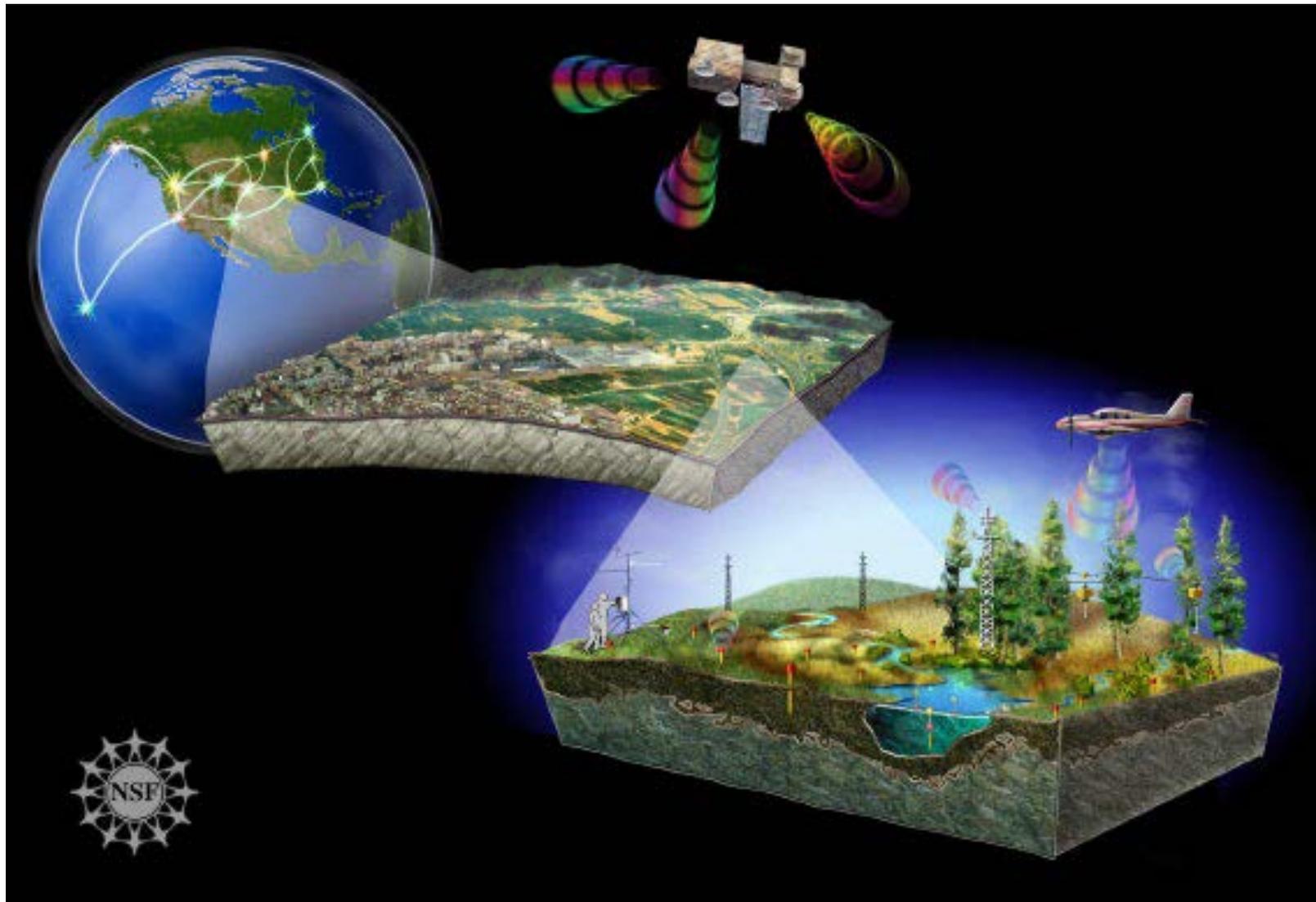


**NCAR/ Wyoming  
Supercomputing Center**

# Learning and Workforce Development

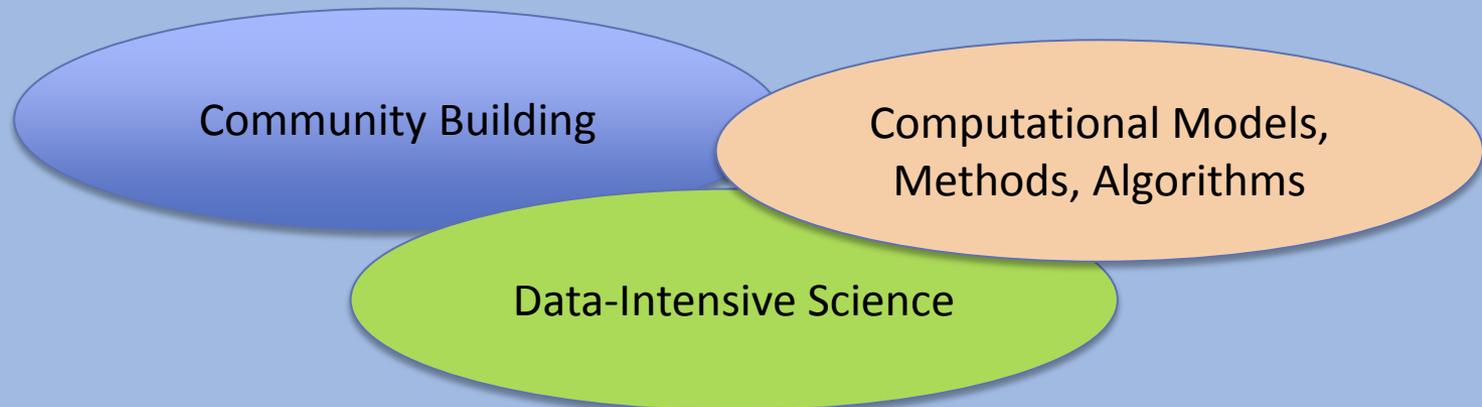
- We are responsible to two groups
  - Cyberinfrastructure experts
  - All scientists and engineers
- New career paths for the cyberinfrastructure experts within academia
  - Currently most are on soft money
  - The lack of career paths means we lose those experts to industry
- How to train scientists to know about available cyberinfrastructure and how to use it?
- How to bring the two groups together to optimize the interaction?

# EarthCube



# Description of CIF21

- An NSF-wide funding program to research, develop, and deploy cyberinfrastructure in support of new ways of doing research.
- Three primary modalities
  - *Community Building*: essential to the development of robust CI— includes workforce development
  - *Data-Intensive Science*: analysis, visualization, integration, identification, stewardship, workflows, meta-tools, storage, management
  - *Computational Models, Methods, Algorithms, Tools*: advances in new computational methods focused on complex problems



CIF21 FY14 Portfolio	BIO	CISE	EHR	ENG	GEO	MPS	SBE
Software Infrastructure for Sustained Innovation (SI2)	X	X	X	X	X	X	X
Core Technologies and Technologies for Advancing Big-Data Science and Engineering (BIGDATA)	X	X	X	X			X
Computational and Data-Enabled Science and Engineering (CDS&E)		X		X		X	
EarthCube		X			X		
Data Infrastructure Building Blocks (DIBBS)	X	X	X	X	X	X	X
Building Community and Capacity (BCC-SBE/EHR)			X				X
NSF Research Traineeships (NRT)—Data-Enabled Science and Engineering Track		X				X	X
Network for Computational Nanotechnology (NCN)		X		X			
Network for Earthquake Engineering Simulation (NEES)				X			
Theoretical and Computational Astrophysics Networks (TCAN)						X	
Strategic Integration for Life Sciences (SIBS)	X						
Advanced Biological Informatics Program (ABI)	X						
Biological and Shared Principles (BCSP)	X						

# Core FY2014 Activities in ACI

- Data Infrastructure Building Blocks (DIBBs)
  - <http://www.nsf.gov/pubs/2014/nsf14530/nsf14530.htm#toc>
- Campus Cyberinfrastructure - Infrastructure, Innovation and Engineering Program (CC\*IIE)
  - <http://www.nsf.gov/pubs/2014/nsf14521/nsf14521.htm>
- High Performance Computing System Acquisition: Continuing the Building of a More Inclusive Computing Environment for Science and Engineering
  - [http://www.nsf.gov/funding/pgm\\_summ.jsp?pims\\_id=503148](http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=503148)
- Software Infrastructure for Sustained Innovation (SI\*\*2)
  - [http://www.nsf.gov/pubs/2014/nsf14520/nsf14520.htm?WT.mc\\_id=USNSF\\_25&WT.mc\\_ev=click](http://www.nsf.gov/pubs/2014/nsf14520/nsf14520.htm?WT.mc_id=USNSF_25&WT.mc_ev=click)
- National Research Traineeships—Data Enabled Science Track

ἡ περὶ τῆς ἀληθείας θεωρία τῇ μὲν χαλεπῇ τῇ δὲ  
ῥαδίᾳ. σημεῖον δὲ τὸ μήτ' ἀξίως μηδένα δύνασθαι  
θιγεῖν αὐτῆς μήτε πάντας ἀποτυγχάνειν, ἀλλ'  
ἕκαστον λέγειν τι περὶ τῆς φύσεως, καὶ καθ' ἓνα μὲν  
ἢ μηθὲν ἢ μικρὸν ἐπιβάλλειν αὐτῇ, ἐκ πάντων δὲ  
συναθροισμένων γίνεσθαι τι μέγεθος.

*Metaphysics* 993a,b