



NATIONAL  
SCIENCE  
FOUNDATION

FISCAL  
YEAR  
2017

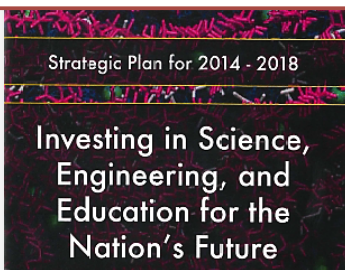
BUDGET  
REQUEST



F. Fleming Crim  
Assistant Director for  
Mathematical and Physical  
Sciences

# NSF Core Mission: Fundamental Research

## Strategic Goals



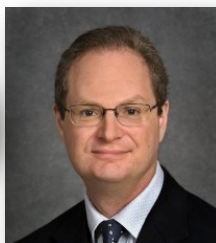
Transform the Frontiers  
Innovate for Society  
Perform as a Model Organization



## Transforming and Innovating

### National Medal of Science

Alivisatos



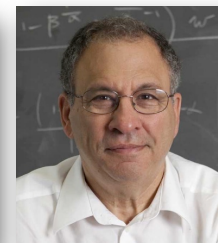
DMR

Artin



DMS

Levin



DMS

Richmond



CHE



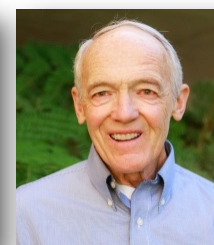
### National Medal of Technology and Innovation

DeSimone



DMR/CHE

Gossard

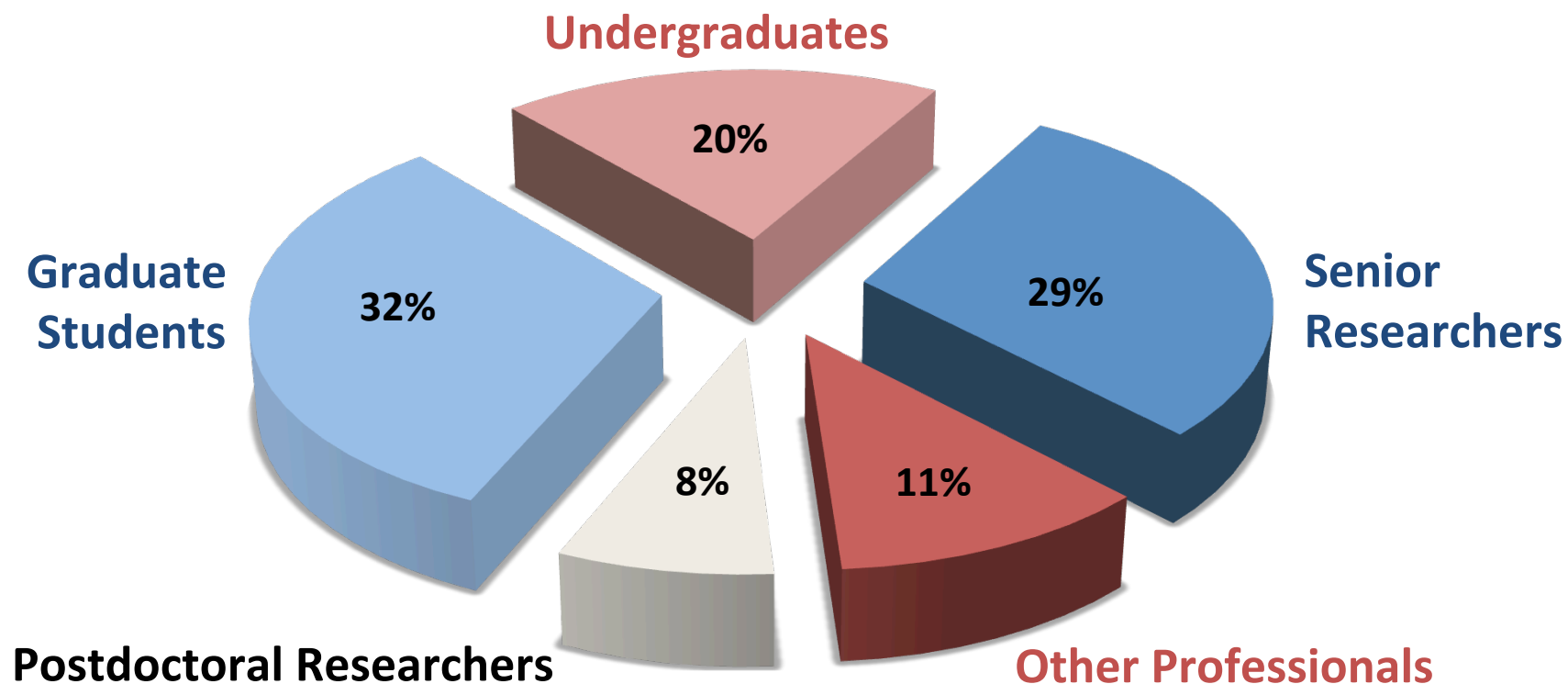


DMR



Mathematical and Physical Sciences

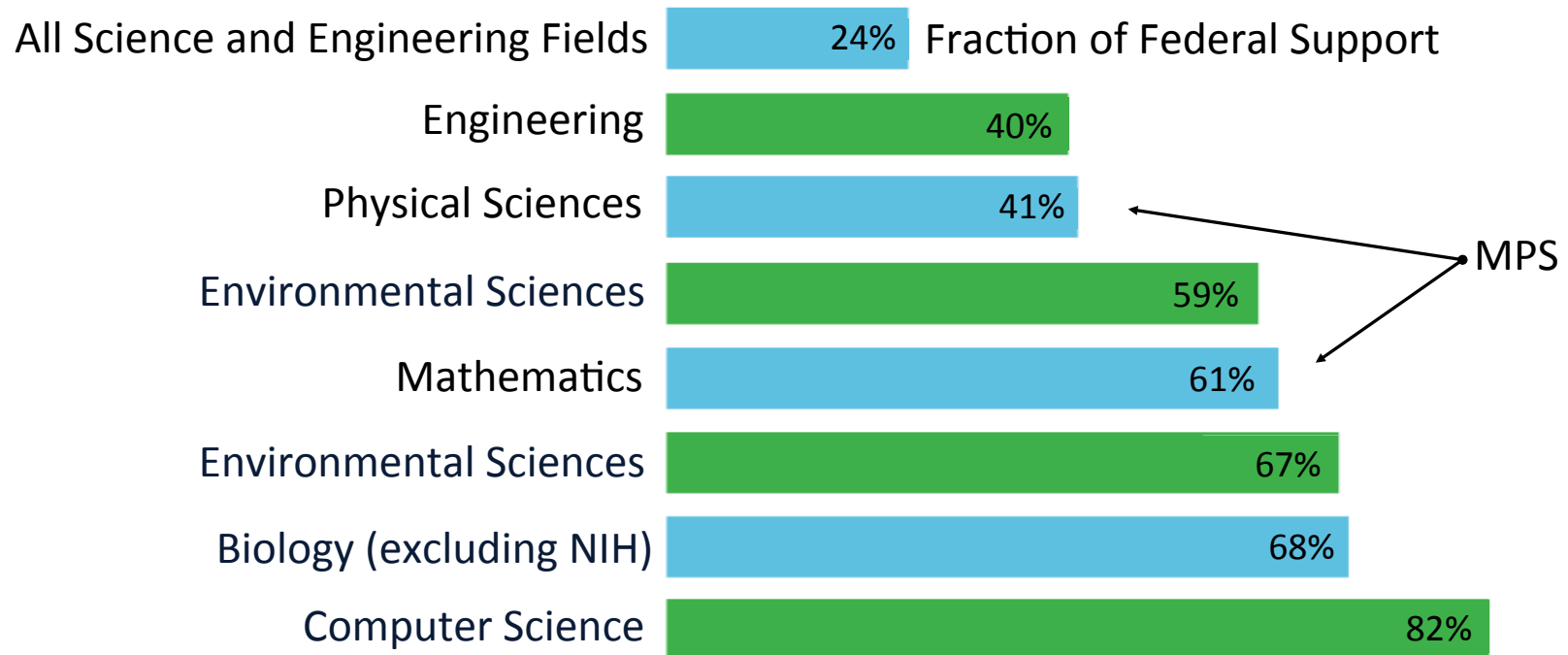
## People Do Science: 29,300 People in MPS Activities\*



\*Estimated for FY 2017

Mathematical and Physical Sciences

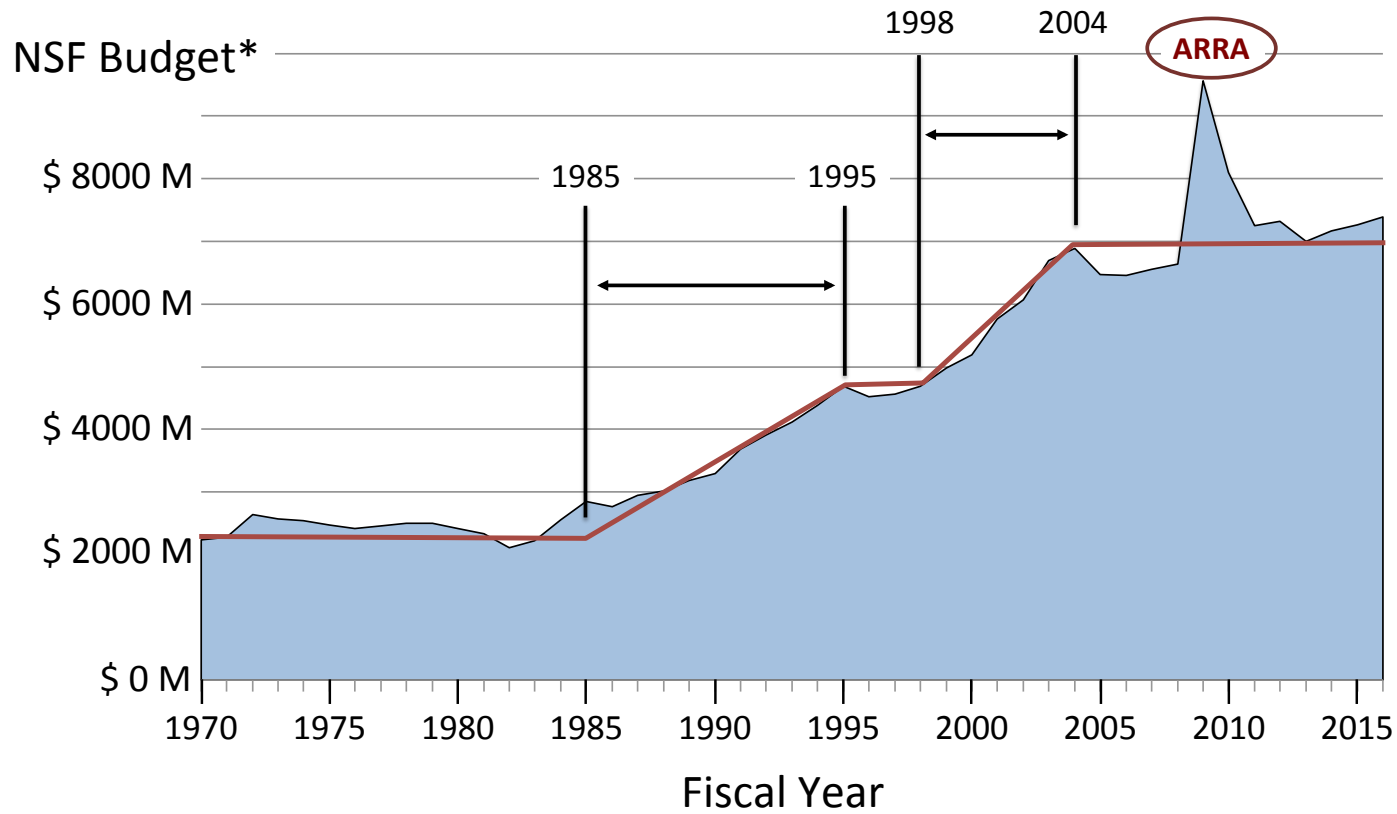
## NSF Supports Academic Research



Source: NSF/ Center for National Science and Engineering Statistics, FY 2014

Mathematical and Physical Sciences

# NSF Funding History

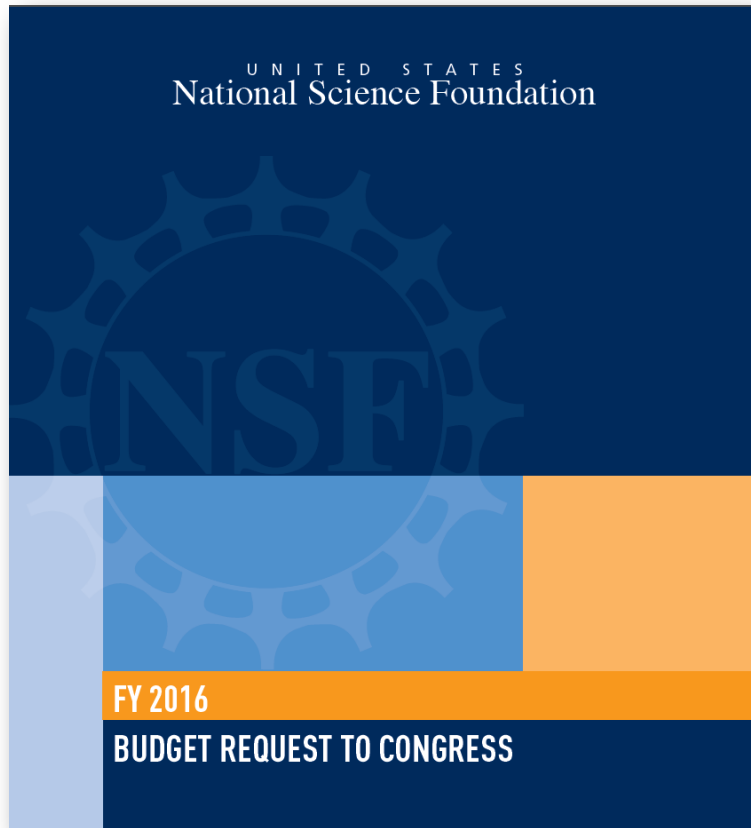


\*Constant 2014\$



Mathematical and Physical Sciences

## FY 2016 Omnibus Bill

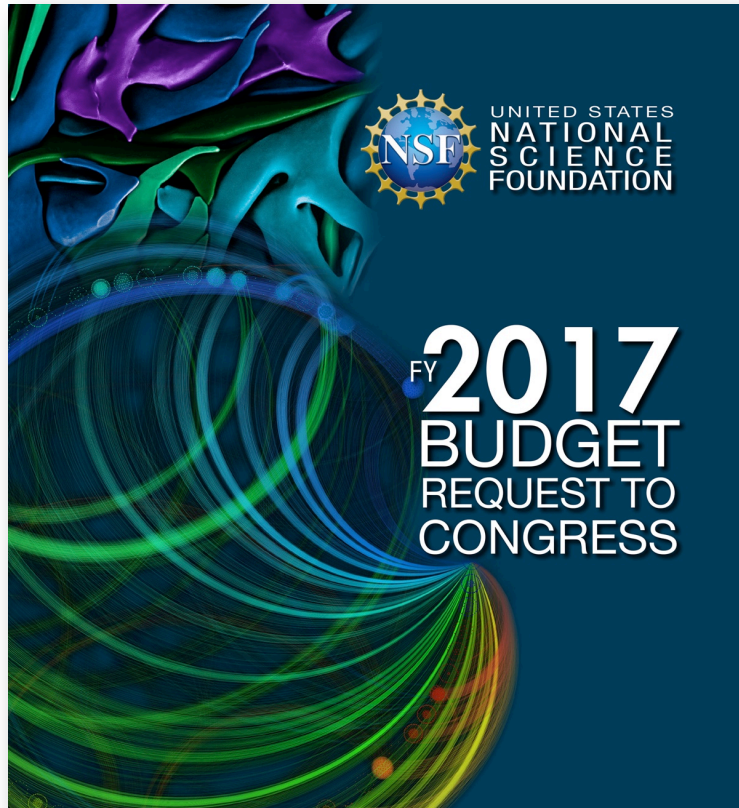


	FY 2015	FY 2016 (request)
NSF	\$ 7344 M	\$ 7724 M 5.2%
R&RA	\$ 5934 M	\$ 6186 M 4.2%

	FY 2016 (estimate)	
NSF	\$ 7463 M	1.6%
R&RA	\$ 6034 M	1.7%



## The President's Request to Congress



	FY 2016 (Estimate)	FY 2017 (Total Request)	
NSF	\$ 7463 M	\$ 7964 M	6.7%
R&RA	\$ 6034 M	\$ 6425 M	6.5%
<b>Two Components to R&amp;RA</b>			
Discretionary	\$ 6034 M	\$ 6079 M	0.8%
<b>Mandatory*</b>	--	<b>\$ 346 M</b>	--
<b>Total</b>	<b>\$ 6034 M</b>	<b>\$ 6425 M</b>	<b>6.5%</b>

\*Direct spending (not subject to discretionary caps)  
One-year duration

## FY 2017 Request by Appropriation

	FY 2016 Estimate	FY 2017 Discretionary		FY 2017 Mandatory	FY 2017 Total	
Research & Related Activities	\$ 6034	\$ 6079	0.8%	\$ 346	\$ 6425	6.5%
Education & Human Resources	880	899	2.1%	54	953	8.3%
Major Res Equip & Facilities Const.	200	193	-3.6%		193	-3.6%
Agency Operations & Award Mgmt.	330	373	13%		373	13%
National Science Board	4	4			4	
Office of the Inspector General	15	15			15	
<b>Total NSF</b>	<b>\$ 7463</b>	<b>\$ 7564</b>	<b>1.3%</b>	<b>\$ 400</b>	<b>\$ 7964</b>	<b>6.7%</b>

Totals may not add because of rounding (\$ in millions)





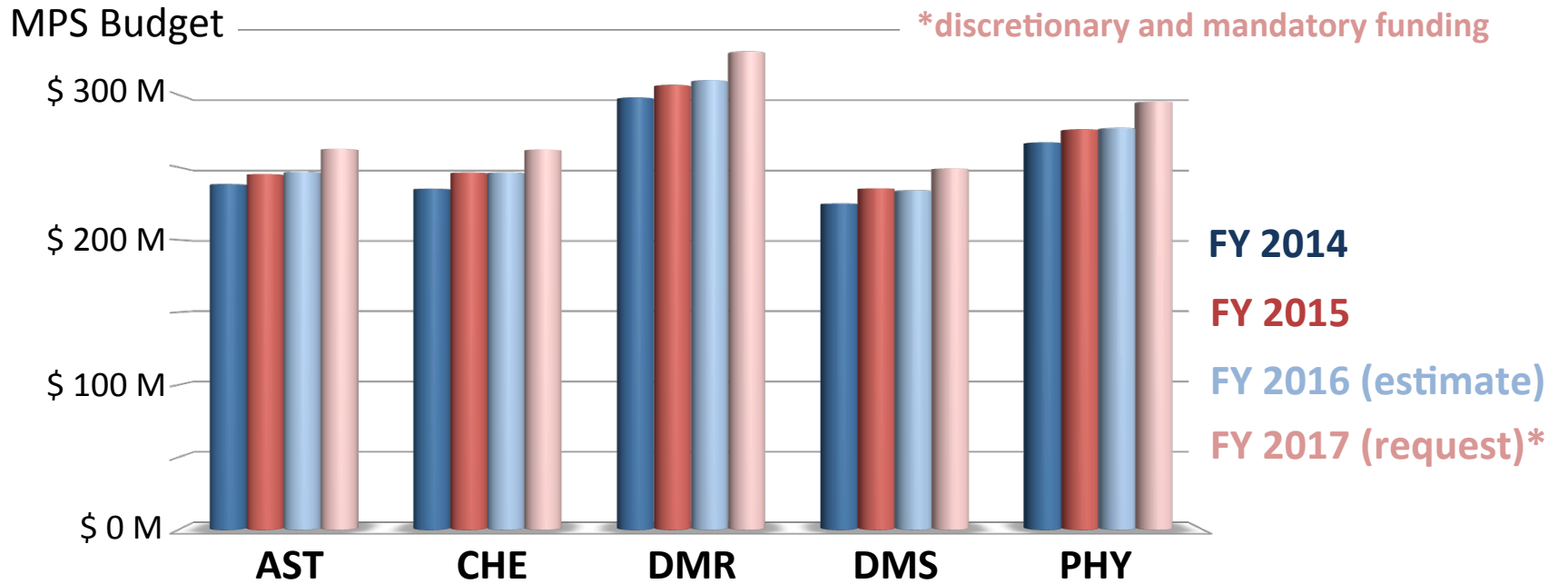
# MPS Budgets by Divisions

**FY 2014**  
**\$ 1300 M**

3.5% → **FY 2015**  
**\$ 1345 M**

0.3% → **FY 2016**  
**\$ 1349 M (estimate)**

6.5% → **FY 2017**  
**\$ 1436 M (request)\***



## MPS FY 2017 Request by Division

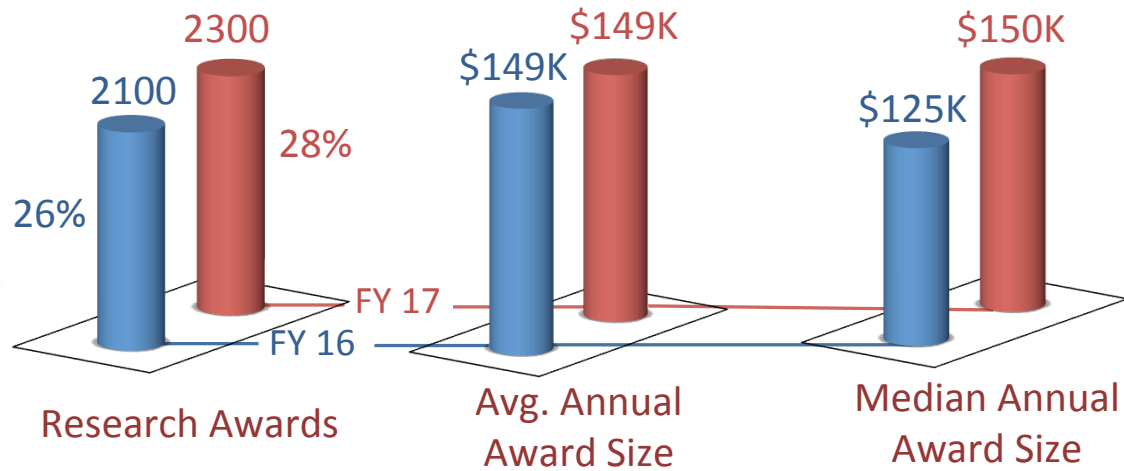
	FY 2016 Estimate	FY 2017 Discretionary		FY 2017 Mandatory	FY 2017 Total	
Astronomical Sciences (AST)	\$ 246.73	\$ 247.73	0.4%	\$ 14.88	\$ 262.61	6.4%
Chemistry (CHE)	246.31	247.31	0.4%	14.85	262.16	6.5%
Materials Research (DMR)	310.03	311.03	0.3%	18.68	329.71	6.3%
Mathematical Sciences (DMS)	234.05	235.05	0.4%	14.12	249.17	6.5%
Physics (PHY)	277.03	278.53	0.5%	16.73	295.26	6.6%
Multidisciplinary Activities (OMA)	35.00	35.41	1.2%	2.13	37.54	7.3%
<b>Total MPS</b>	<b>\$ 1349.15</b>	<b>\$ 1355.06</b>	<b>0.4%</b>	<b>\$ 81.39</b>	<b>\$ 1436.45</b>	<b>6.5%</b>

Totals may not add because of rounding (\$ in millions)



**Mandatory Spending Category \$ 81 M**

**Individual investigators**  
**Early career investigators**  
**Unsolicited proposals (“core”)**  
**Computation and data**



**Three Promising Topics**

**Quantum Information Science**

**Optics and Photonics**

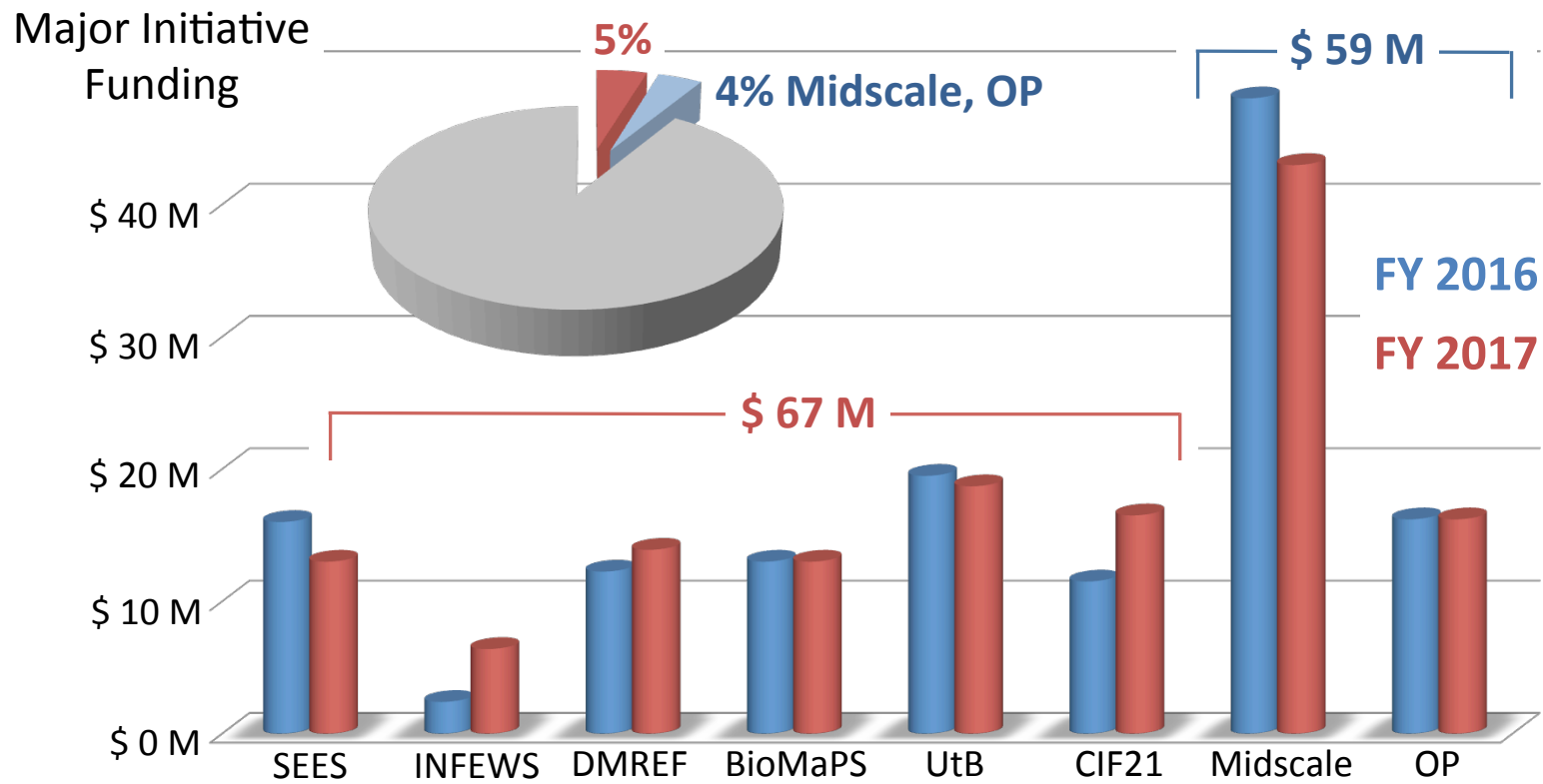
**Clean Energy**

**National Strategic Computing Initiative (NSCI)**

**Presidential Priority**



## Selected Investments in Initiatives



## MPS Participation in NSF-Wide Initiatives

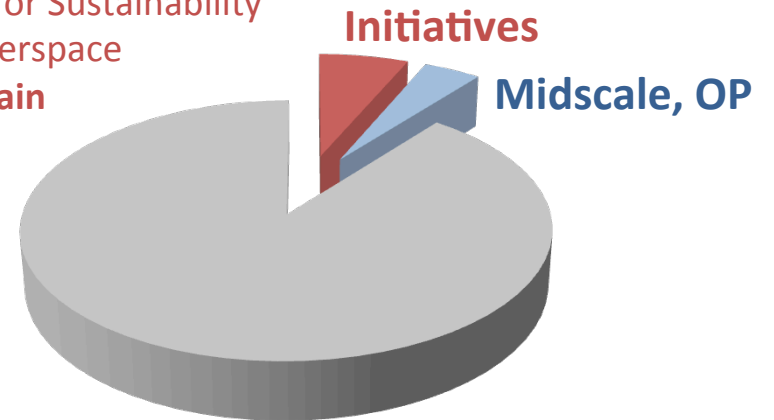
- Biology, Mathematical, and Physical Sciences Interface
  - Cyberinfrastructure Framework for the 21<sup>st</sup> Century
- Designing Materials to Revolutionize and Engineer our Future
  - Innovation Corps
    - **INCLUDES**
- **Innovations at the Nexus of Food, Energy, and Water Systems**
  - National Science Foundation Research Traineeship
    - **Risk and Resilience**
  - Science, Engineering, and Education for Sustainability
    - Secure and Trustworthy Cyberspace
      - **Understanding the Brain**

BioMaPS, CIF21, DMREF, I-Corps, INCLUDES,  
INFEWS, NRT, R&R, SEES, SaTC, UtB

\$ 92.5 M

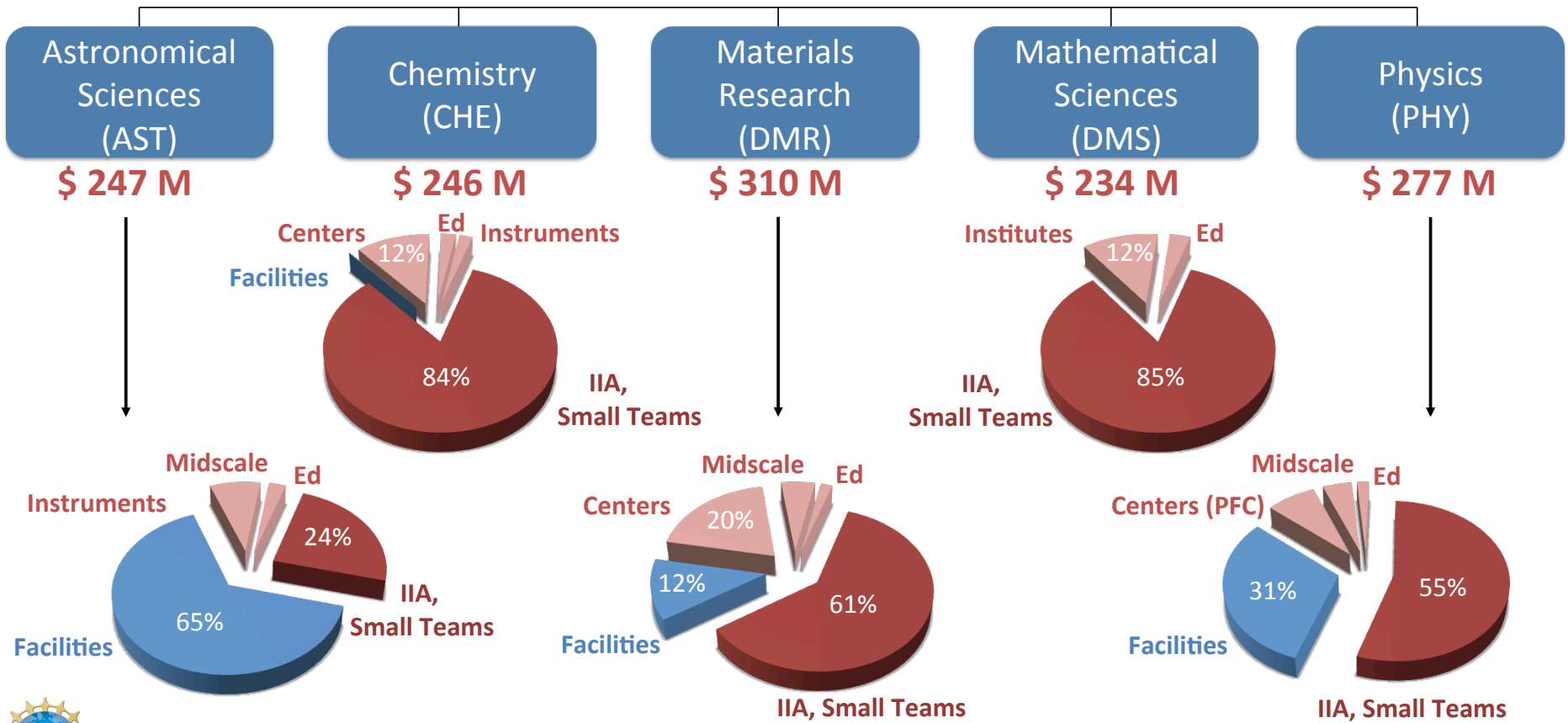


**6.4% of MPS Request**

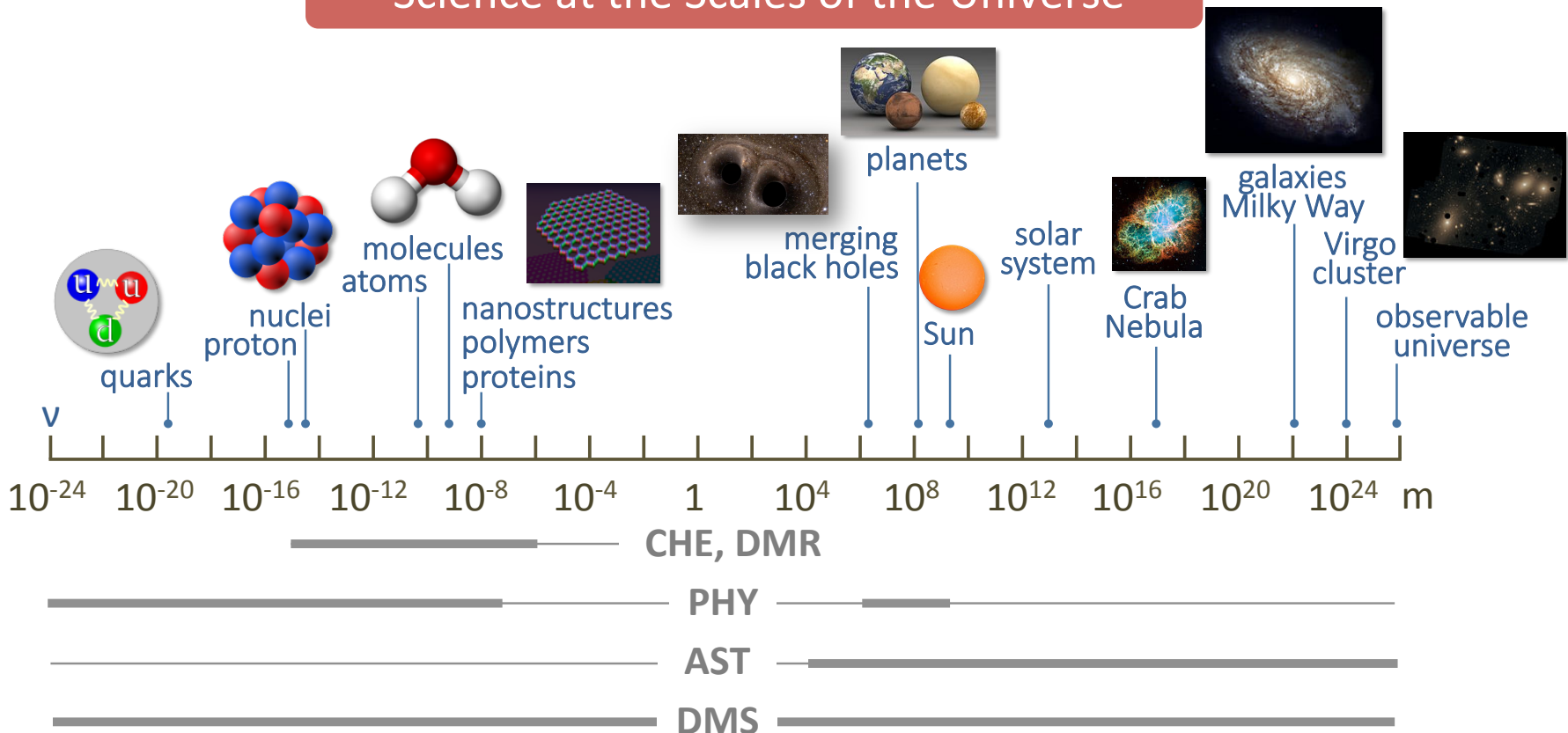


FY 2016

Mathematical and Physical Sciences (MPS)



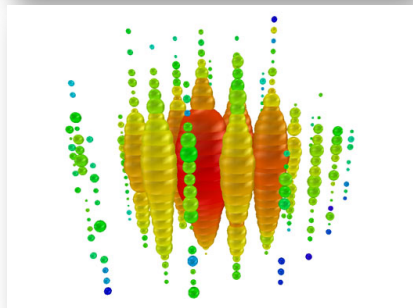
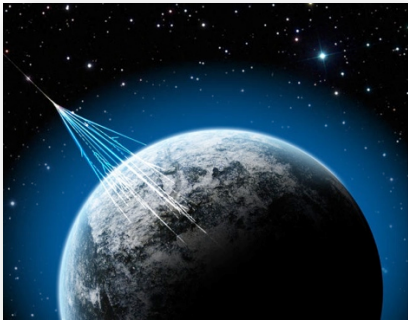
# Science at the Scales of the Universe



Images from Wikipedia Commons

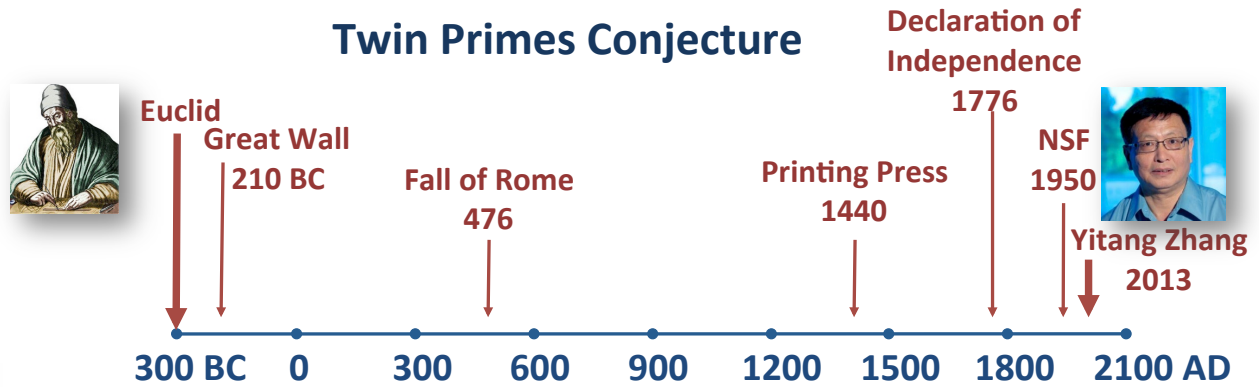


# Science Hors d'Oeuvres



**Ice Cube  
High Energy Neutrinos**

## Twin Primes Conjecture



## Ab Initio Prediction of Molecular Crystal Structures





# Science Hors d'Oeuvres

## How Round is the Electron ? Measuring the Electric Dipole Moment of the Electron



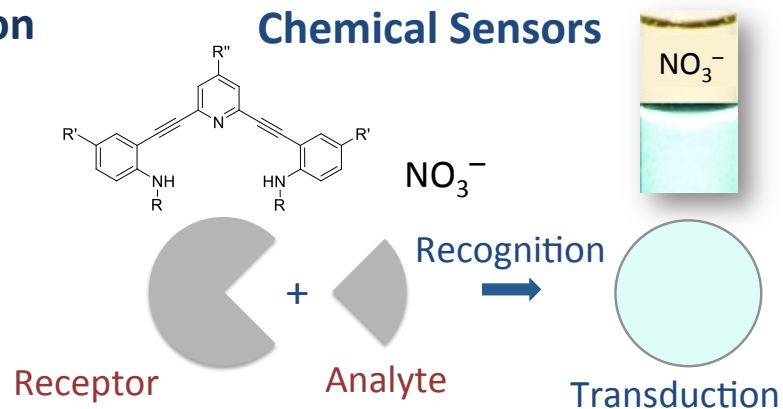
Advanced Cold Molecule EDM

**Order of Magnitude Smaller  
Limit on the Electric Dipole  
Moment of the Electron**

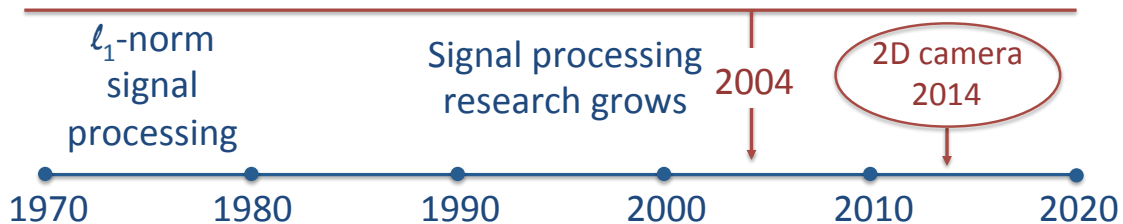
Science 343, 269 (2014)



## Supramolecules, Scaffolds, and Chemical Sensors

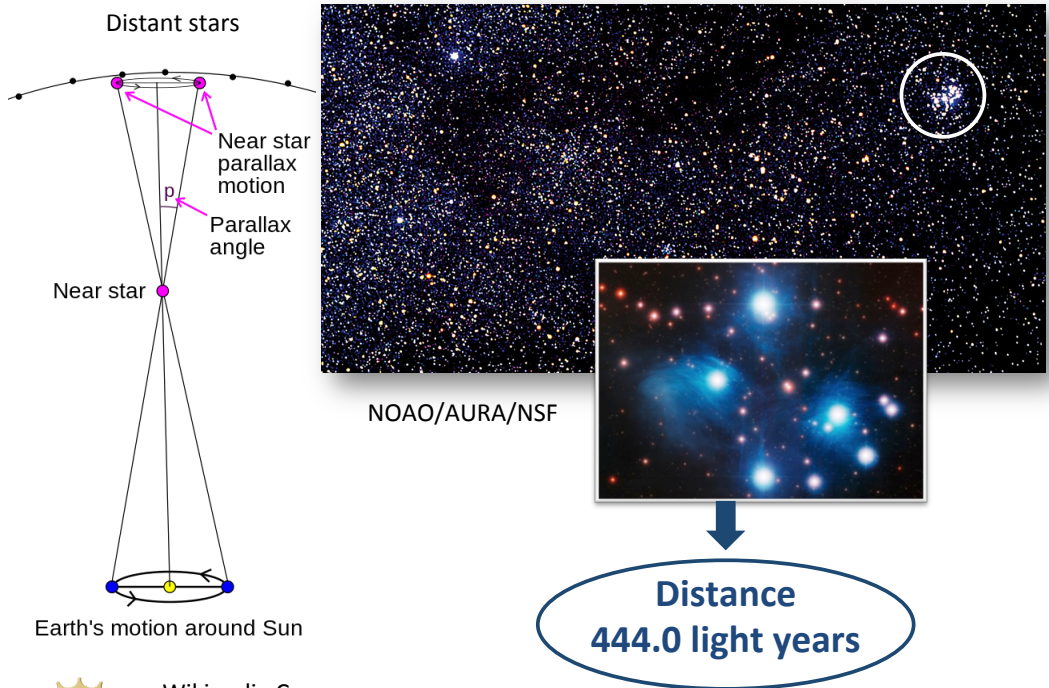


## Theory of Compressed Sensing World's Fastest 2-D Camera

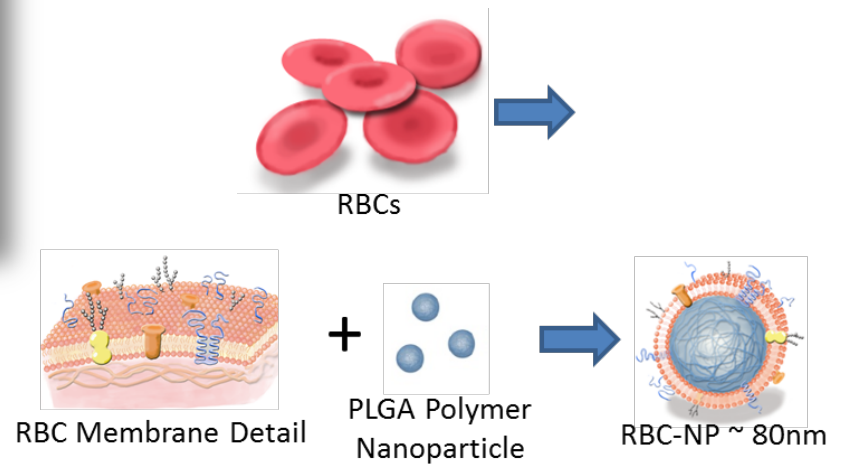


# Science Hors d'Oeuvres

## One Good Cosmic Measure: Radio Telescopes Resolve Pleiades Distance Debate

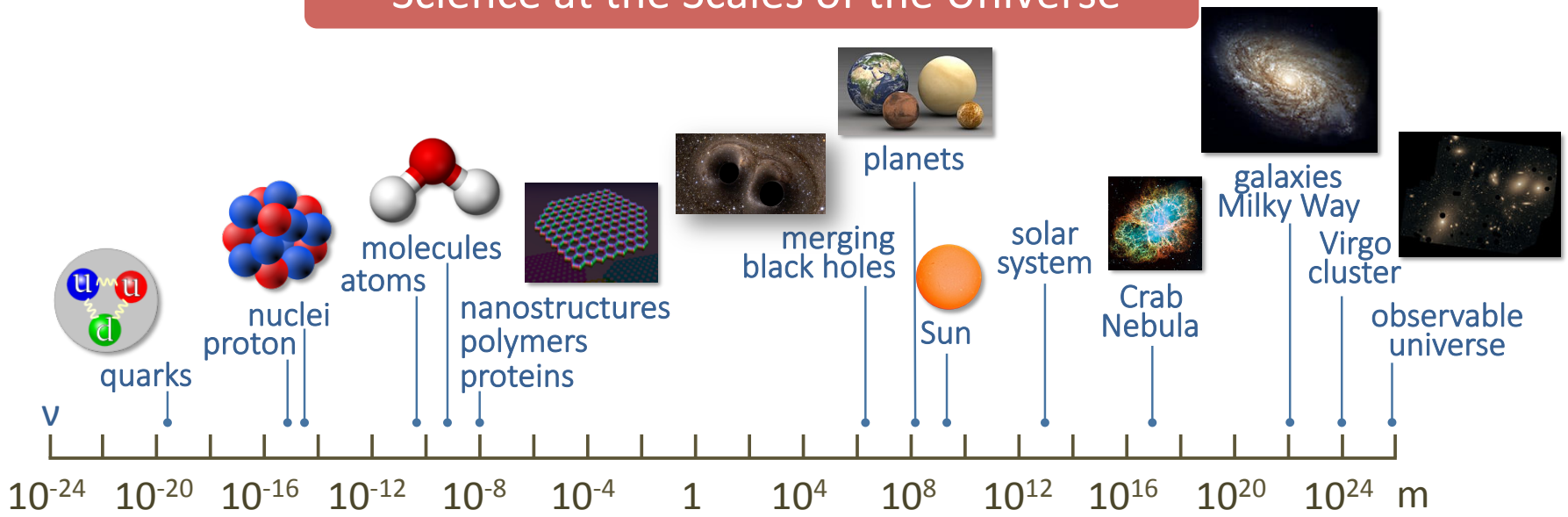


## Stealthy Nanomaterials for Biomedical Use



Wikipedia Commons

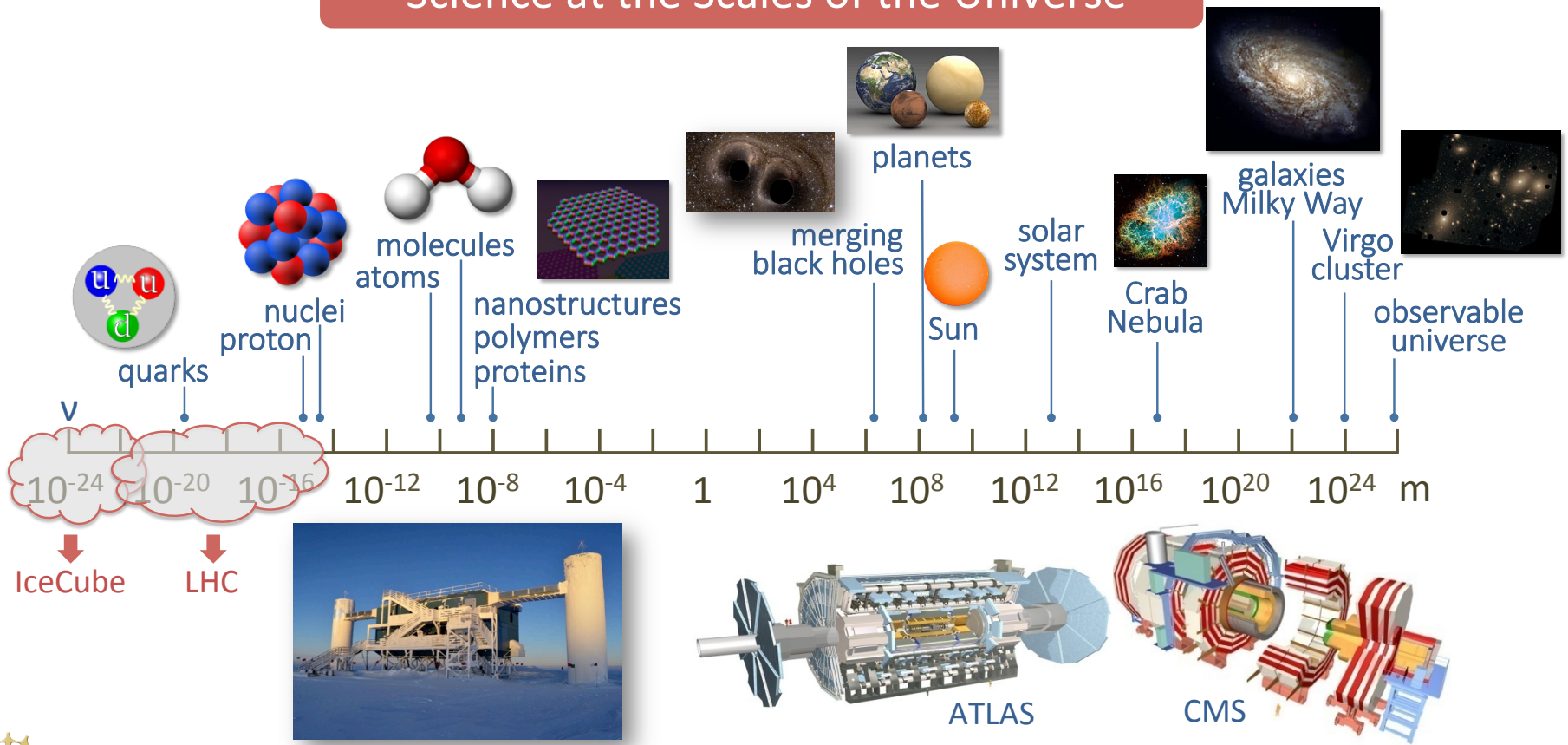
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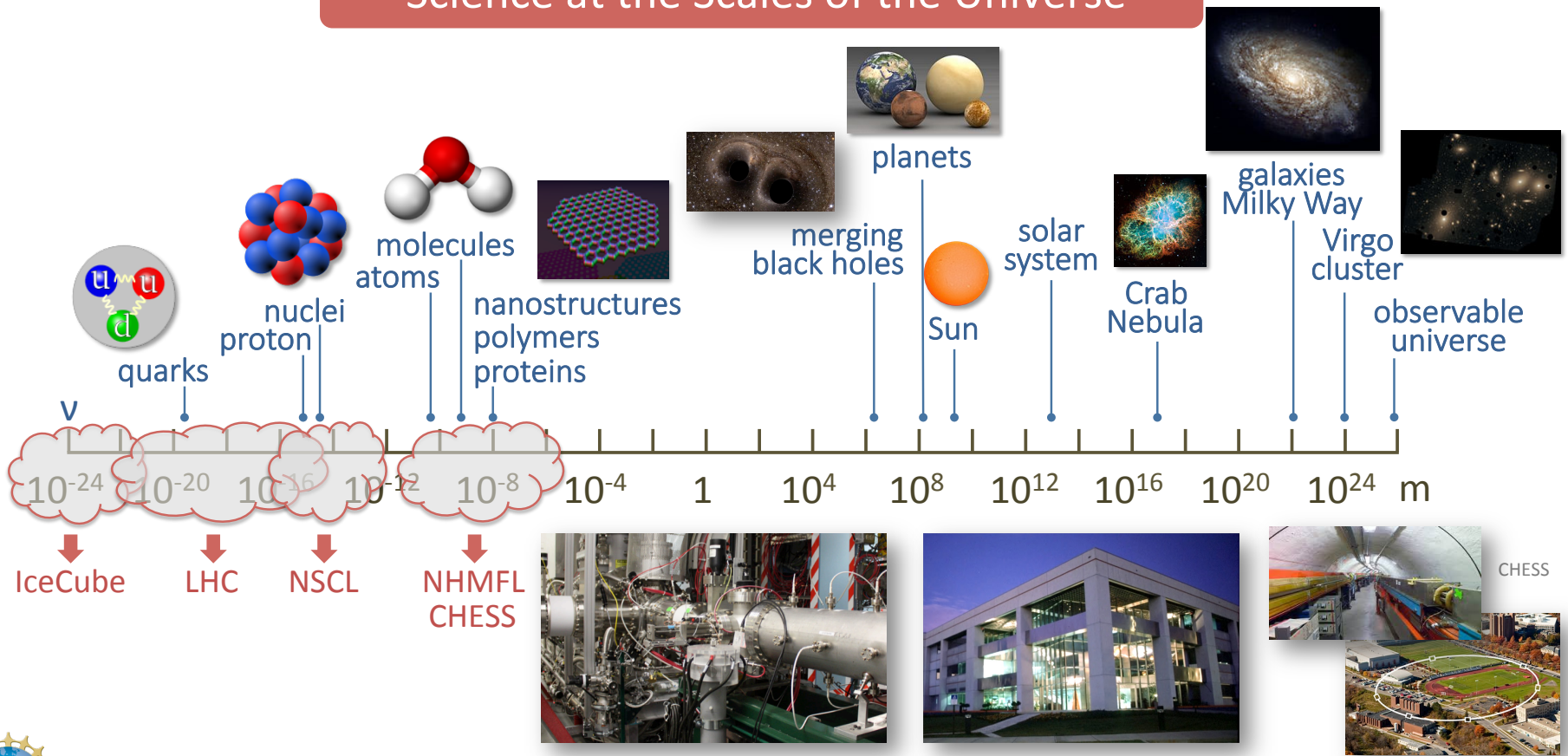
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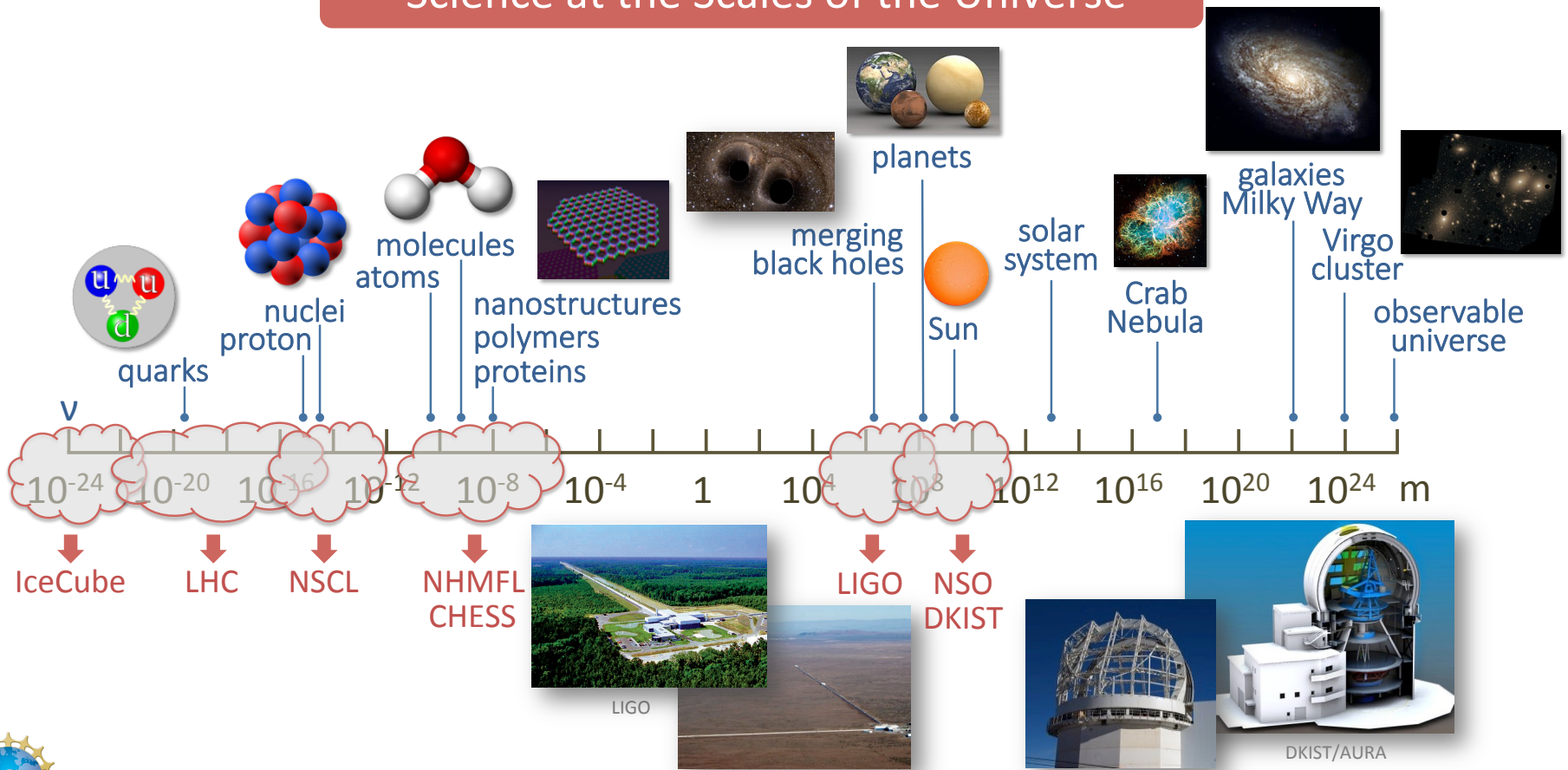
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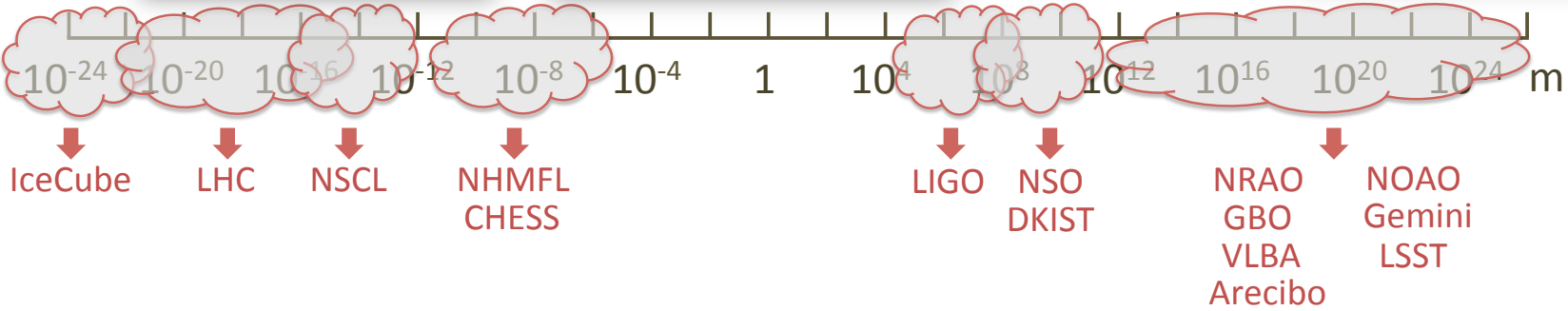
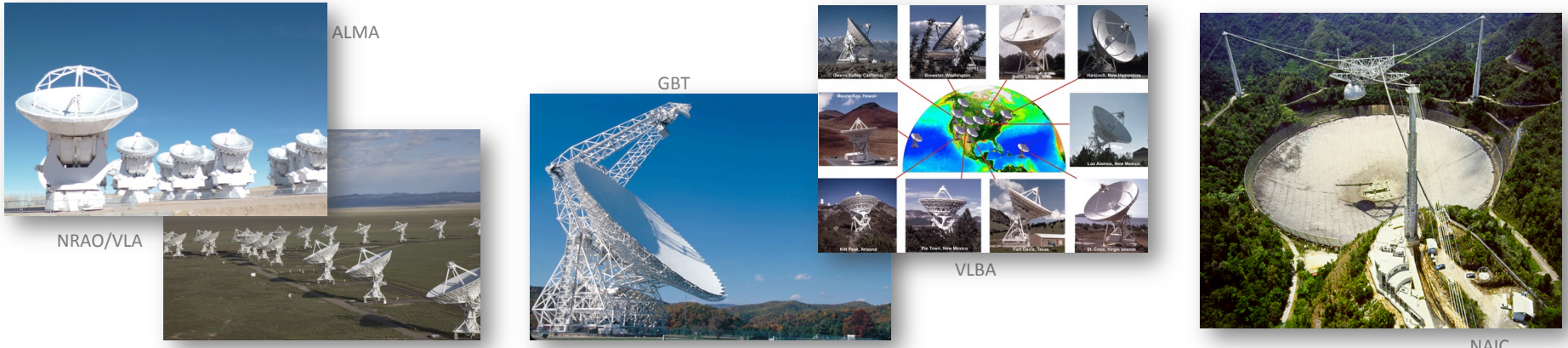
# Science at the Scales of the Universe



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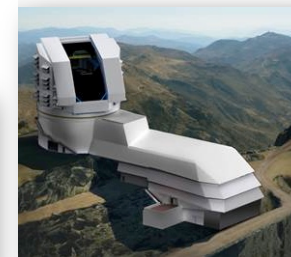
# Science at the Scales of the Universe



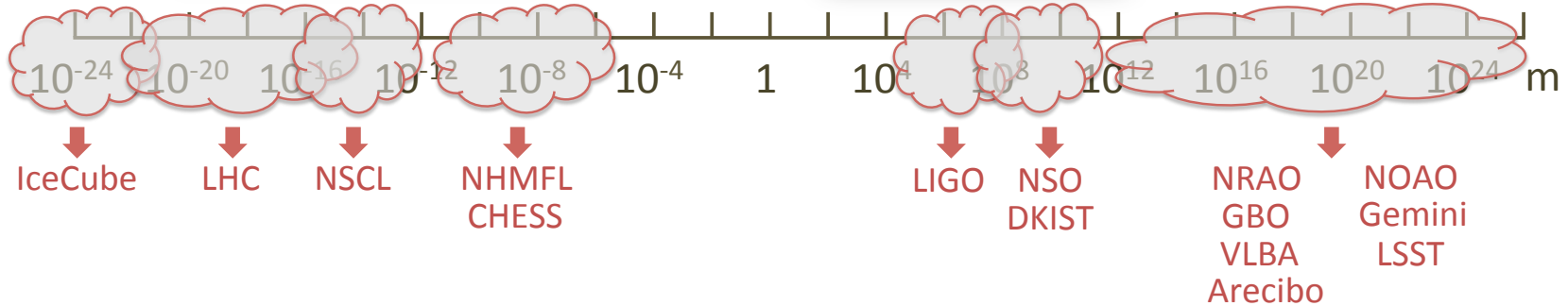
NOAO/AURA



Gemini/AURA

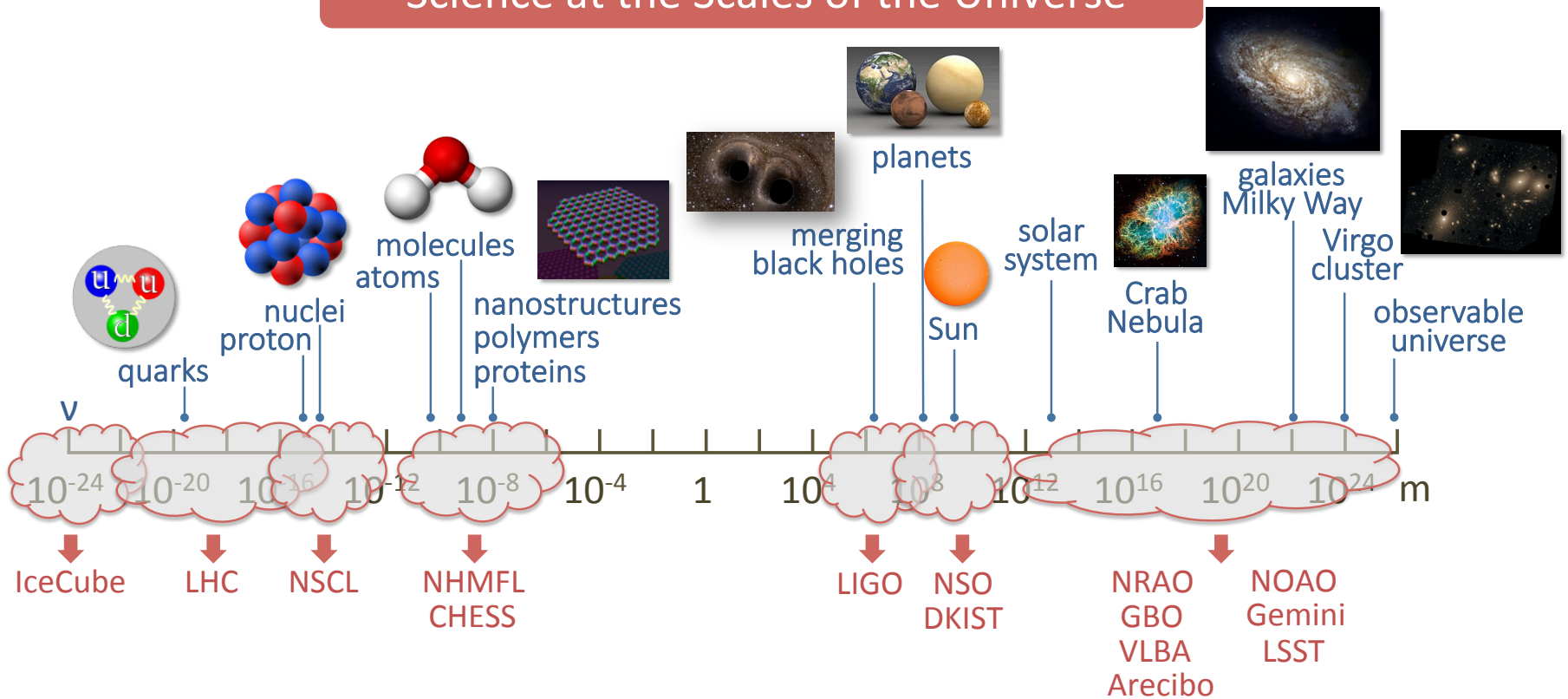


LSST/AURA





# Science at the Scales of the Universe



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Mathematical and Physical Sciences



Supporting basic research  
to create knowledge that  
transforms our future



Drives the economy  
Enhances our security  
Sustains global leadership