



# MPS Portfolio

Anne L. Kinney  
Assistant Director





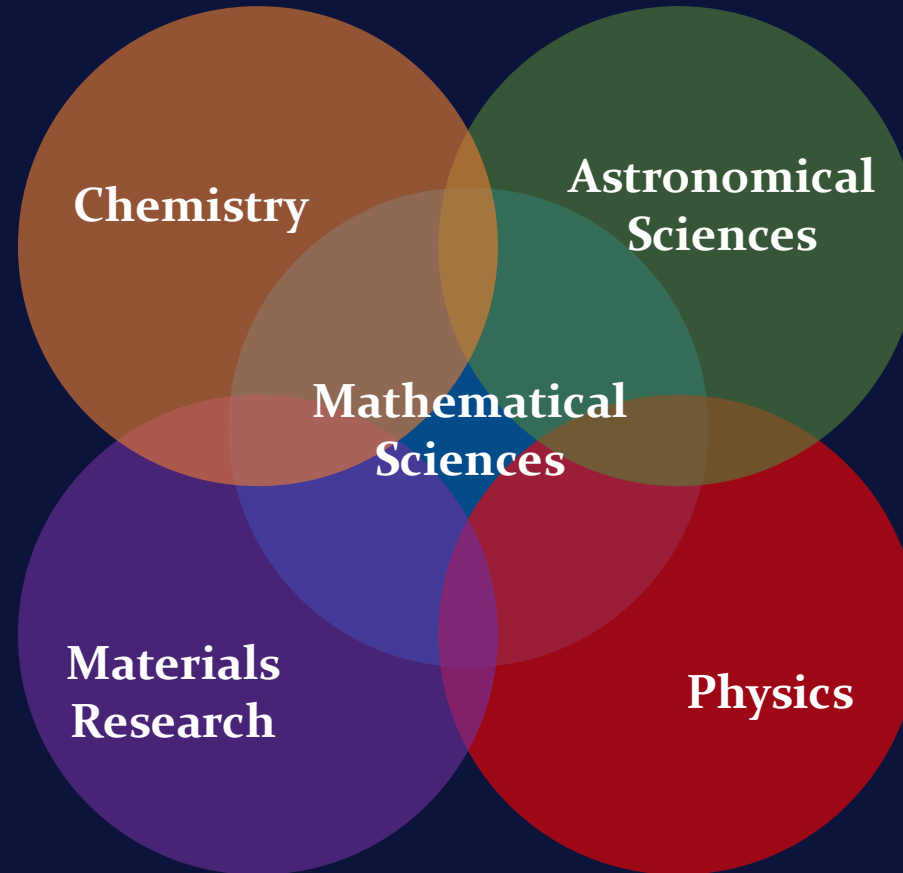


To understand the Universe, you must understand the language in which it is written. That language is mathematics.

Galileo Galilei

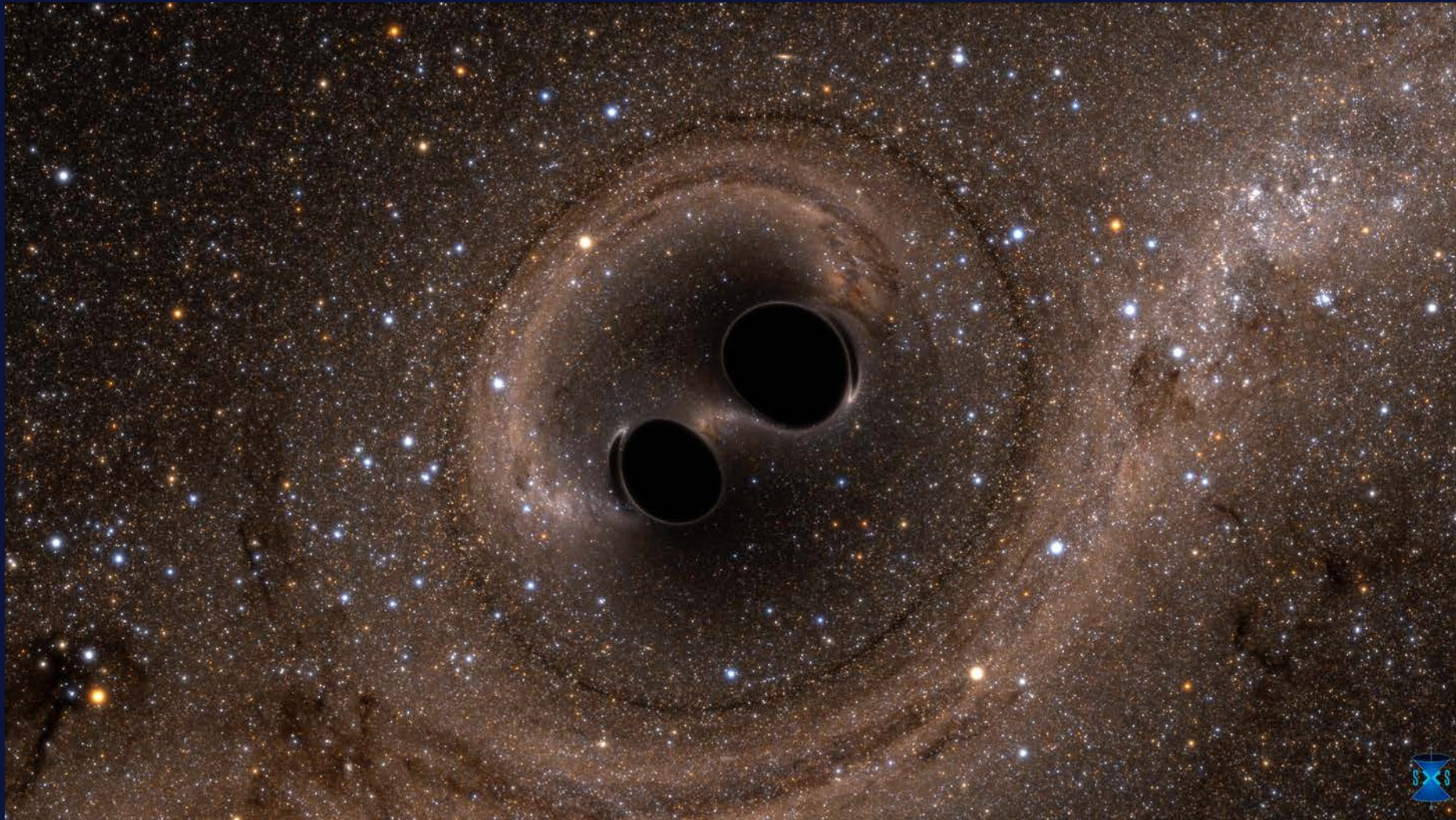


# Fundamental Connections





# Fundamental Connections

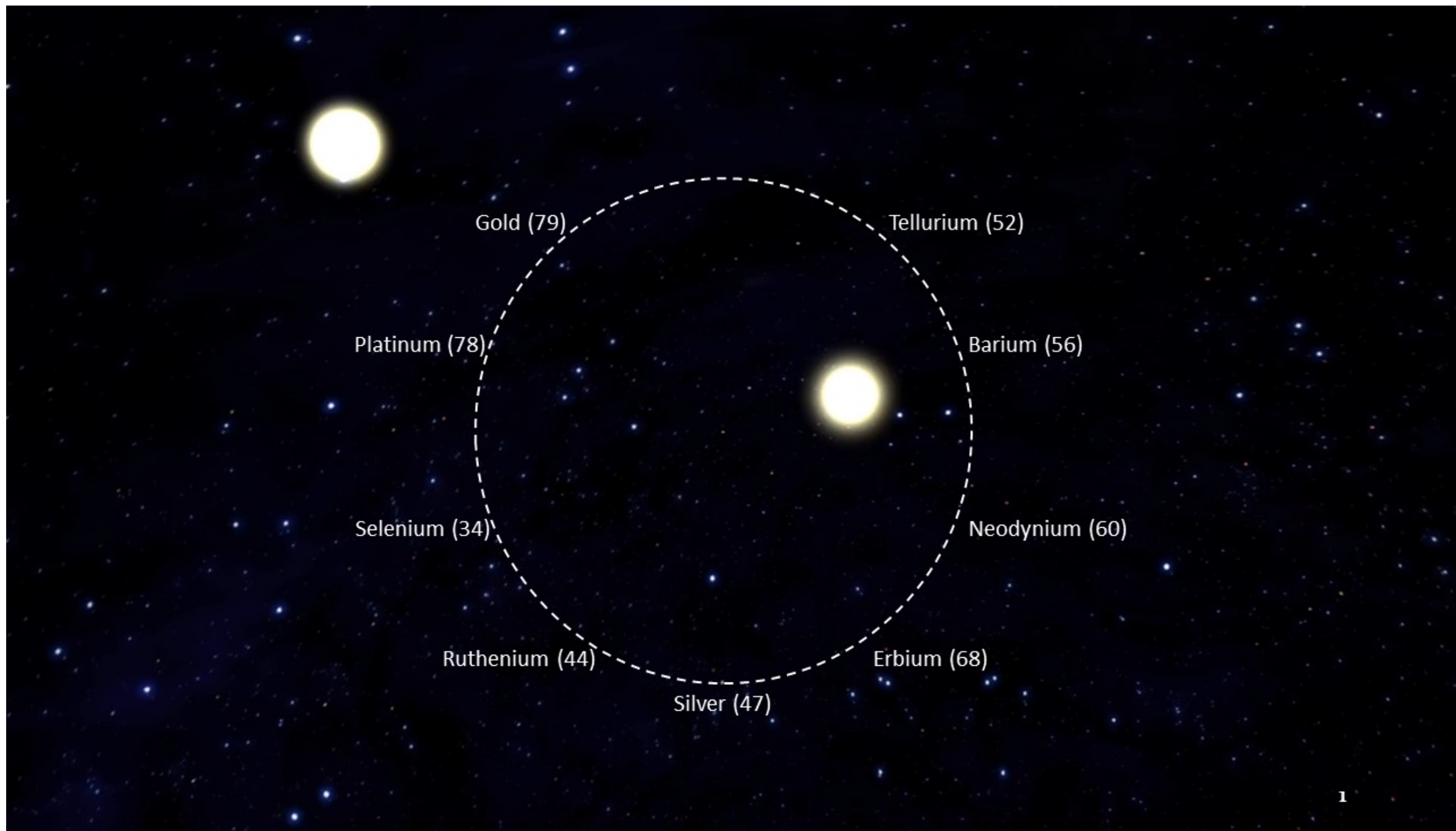


# Fundamental Connections

1 H																	2 He
3 Li	4 Be											5 B	6 C	7 N	8 O	9 F	10 Ne
11 Na	12 Mg											13 Al	14 Si	15 P	16 S	17 Cl	18 Ar
19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr
37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe
55 Cs	56 Ba		72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn
87 Fr	88 Ra		104 Rf	105 Db	106 Sg	107 Bh	108 Hs	109 Mt	110 Ds	111 Rg	112 Cn	113 Nh	114 Fl	115 Mc	116 Lv	117 Ts	118 Og
Lanthanides			57 La	58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb	71 Lu
Actinides			89 Ac	90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No	103 Lr
















# Fundamental Connections

1 H	big bang fusion 				cosmic ray fission 				2 He								
3 Li	4 Be	merging neutron stars 				exploding massive stars 				5 B	6 C	7 N	8 O	9 F	10 Ne		
11 Na	12 Mg	dying low mass stars 				exploding white dwarfs 				13 Al	14 Si	15 P	16 S	17 Cl	18 Ar		
19 K	20 Ca	21 Sc	22 Ti	23 V	merging neutron stars 								32 Ge	33 As	34 Se	35 Br	36 Kr
37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe
55 Cs	56 Ba		72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn
87 Fr	88 Ra																
		57 La	58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb	71 Lu	
		89 Ac	90 Th	91 Pa	92 U												



# MPS Scientific Leadership



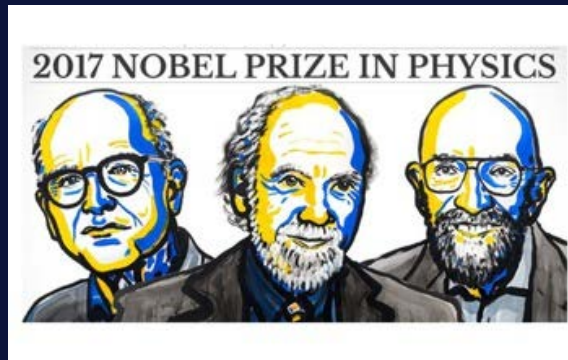
Chemis



onomical  
sciences

Mathematical

ic



Rainer Weiss,  
Kip Thorne and  
Barry Barish  
2017



Akshay Venkatesh  
2018



Maryam Mirzakhani  
2014



Allan Sly  
2018

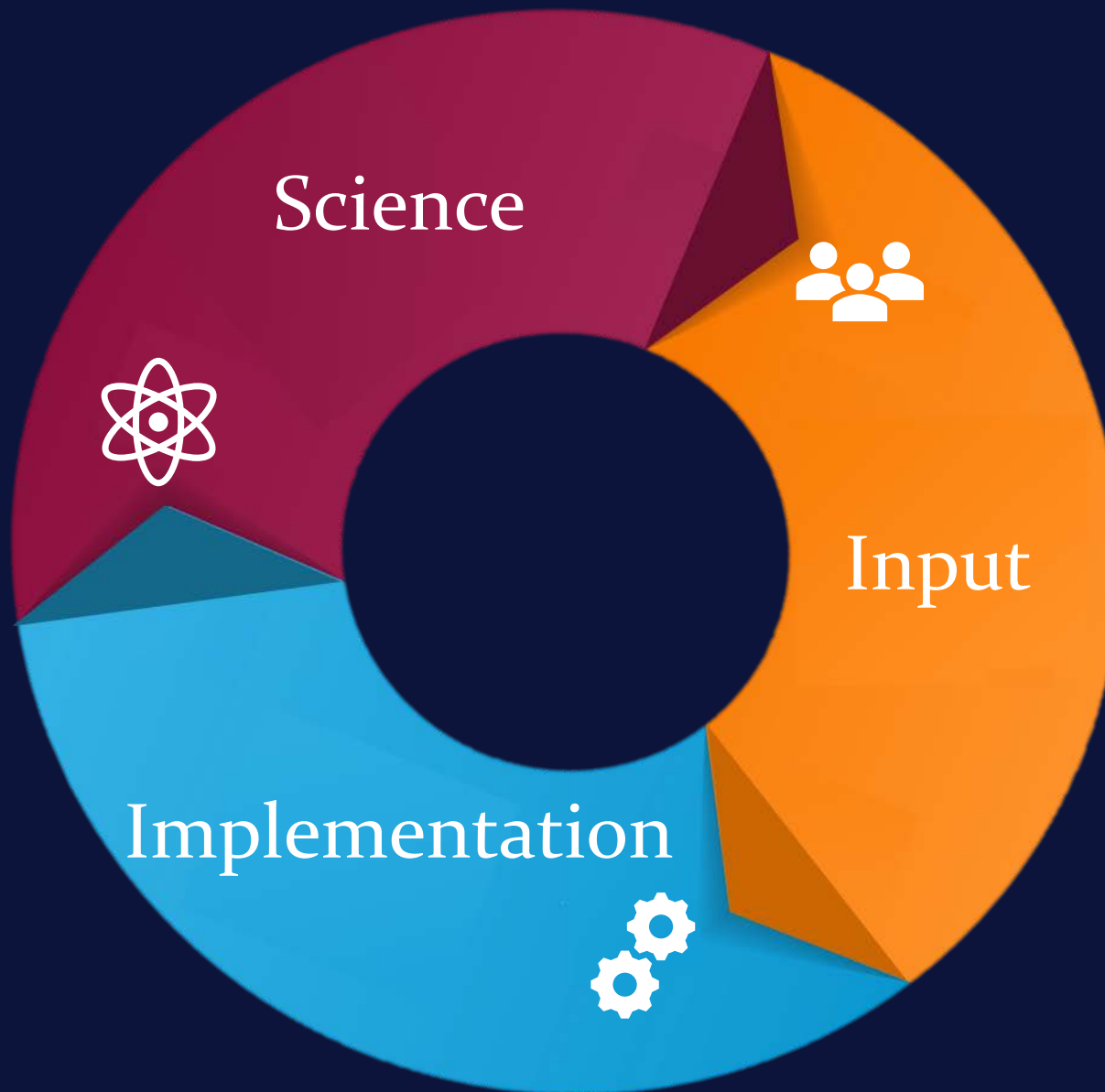


Danielle Bassett  
2014

MacArthur  
Foundation



# Our Cyclical Approach







ACS  
Chemistry for Life®

AMERICAN CHEMICAL SOCIETY

**Maintaining Competitiveness  
in the Age of Materials**

Dr. Catherine Pilachowski, Indiana University  
 Dr. Susanne Brenner, Louisiana State University  
 Dr. John H. Hecht, Massachusetts Institute of Technology  
 Dr. ... University/Simon's Foundation  
 Dr. ... University of California, Los Angeles



# Key Materials Inputs

NSB

National Academies

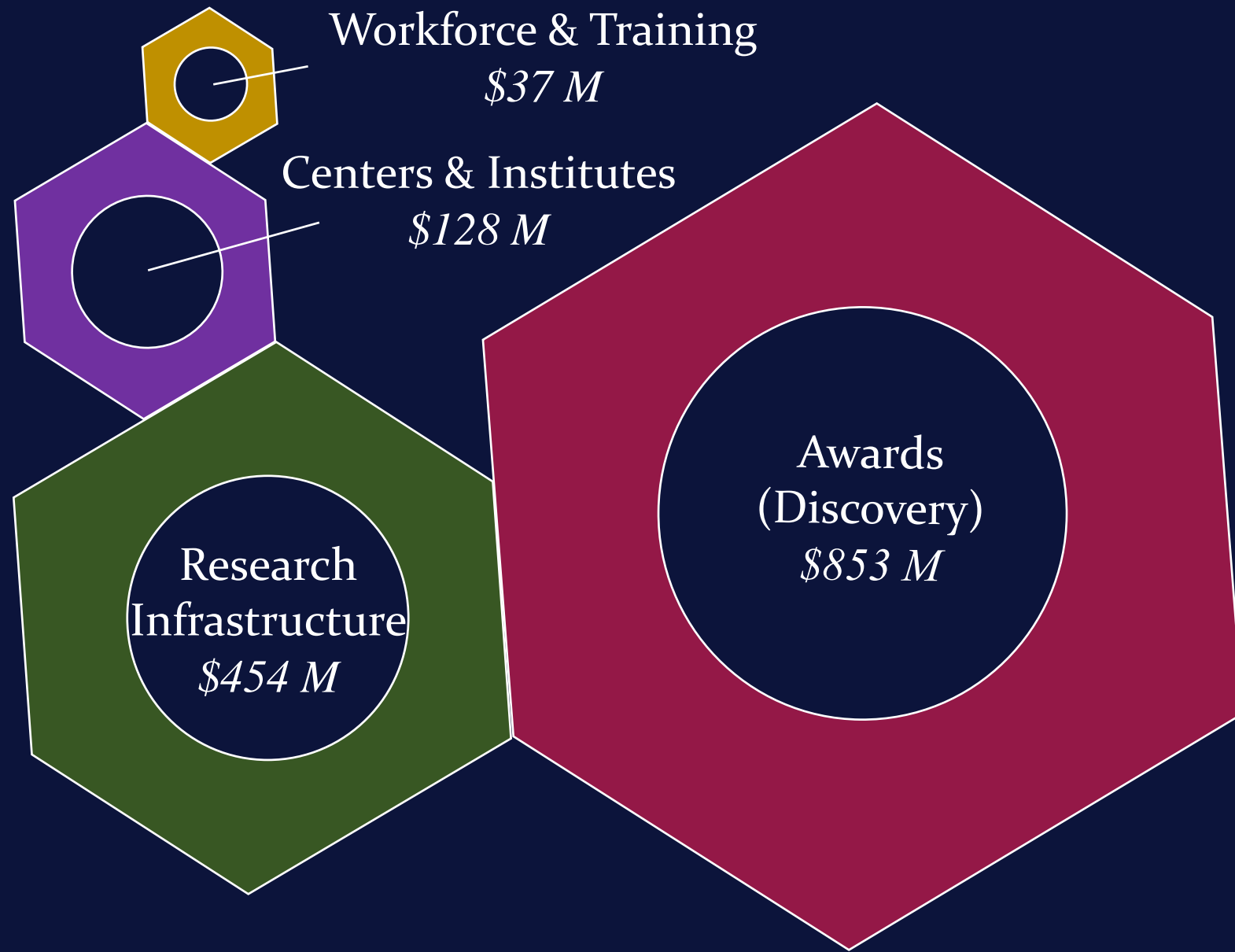
Federal Advisory Committee Act  
(FACA) Committees

Independent Science Organizations

Community Members and Panelists



# Mechanisms for Implementation





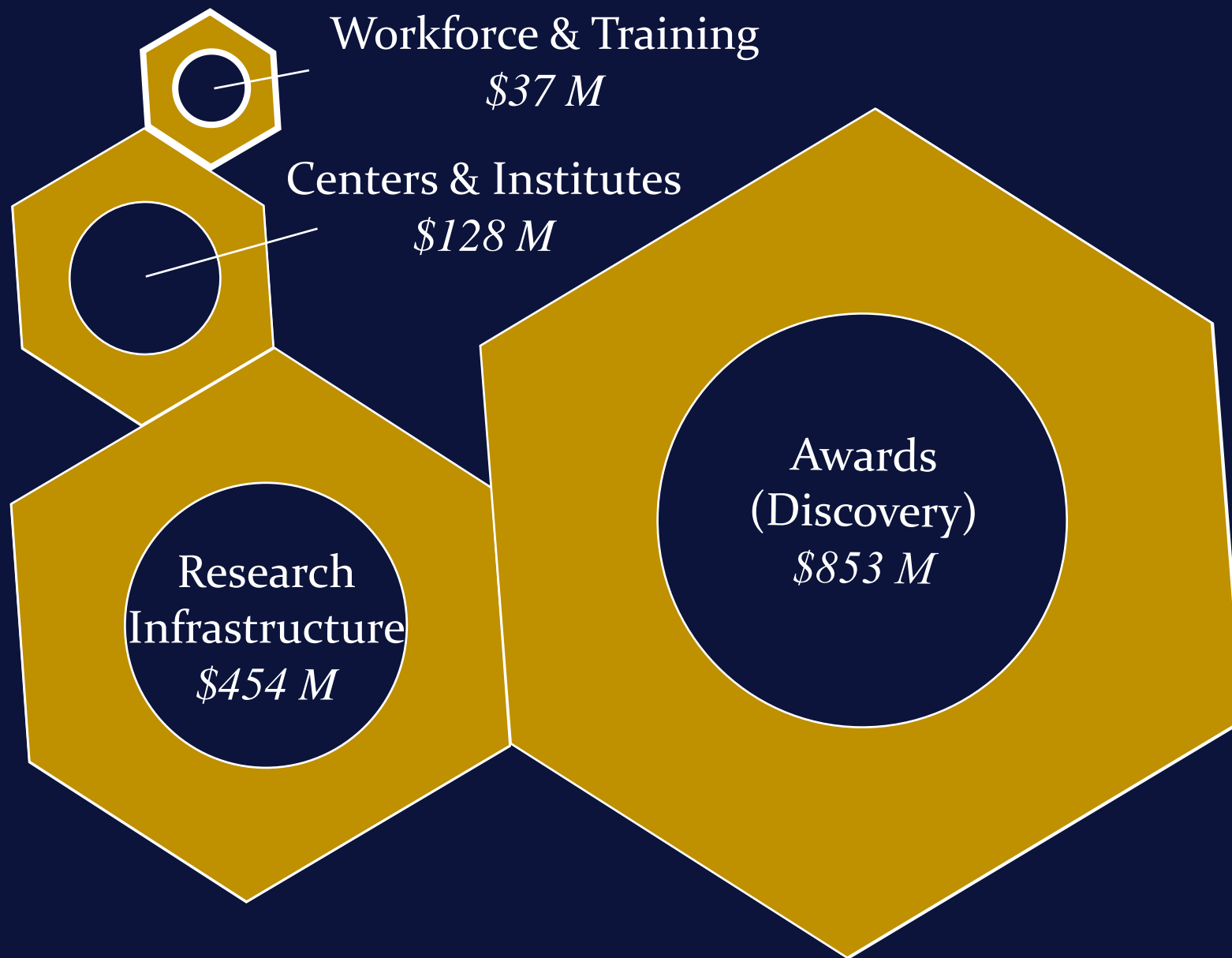
Awards  
(Discovery)  
\$853 M







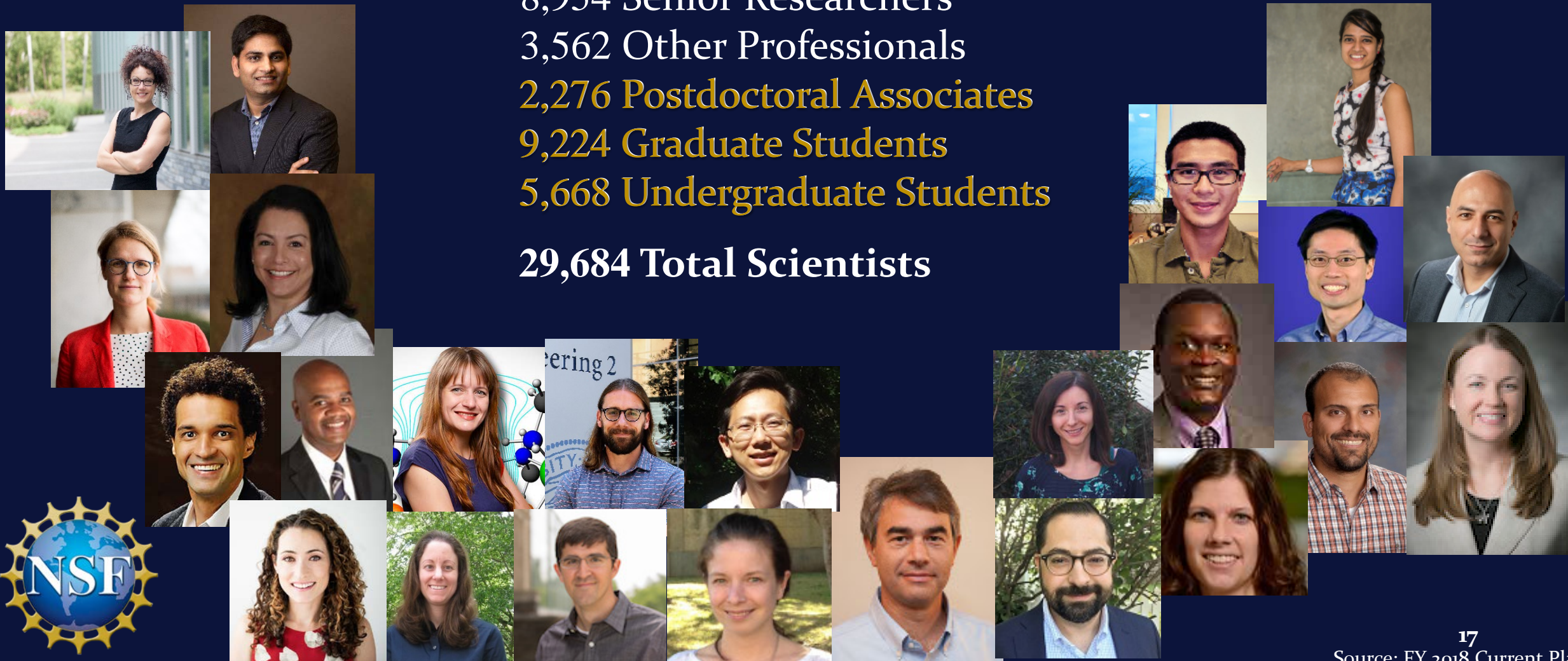






# Workforce & Training

8,954 Senior Researchers  
3,562 Other Professionals  
2,276 Postdoctoral Associates  
9,224 Graduate Students  
5,668 Undergraduate Students  
29,684 Total Scientists



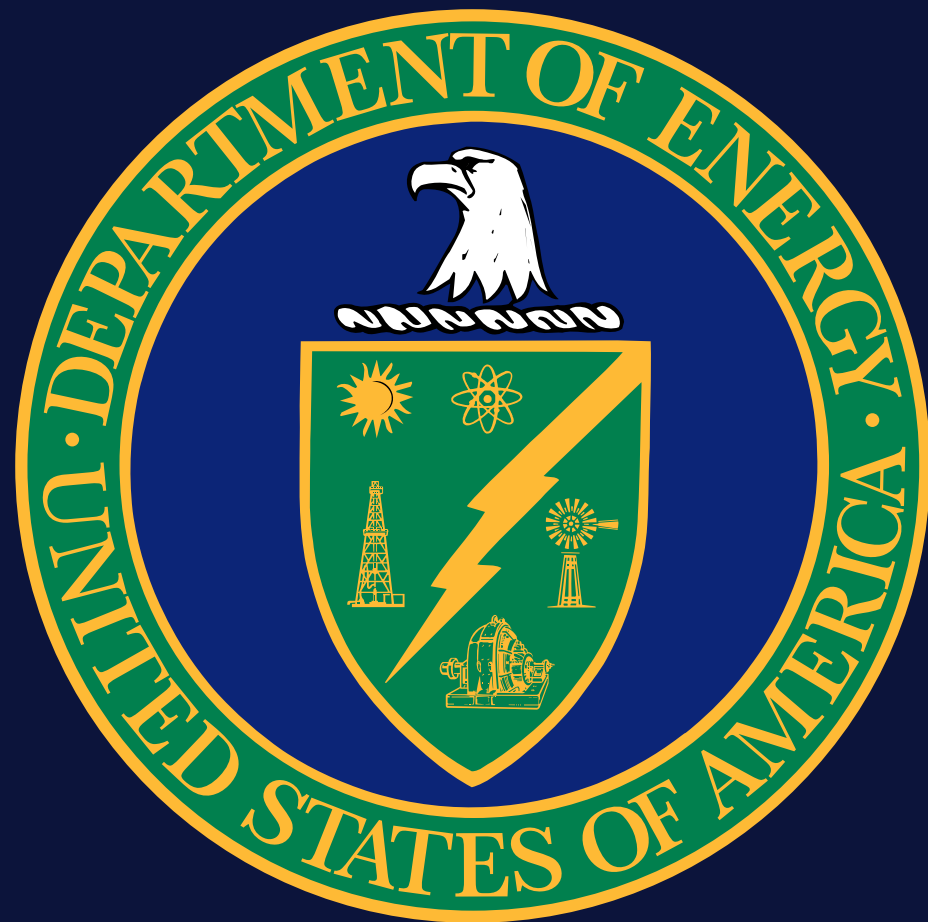
# Partnerships

Public

International



Private

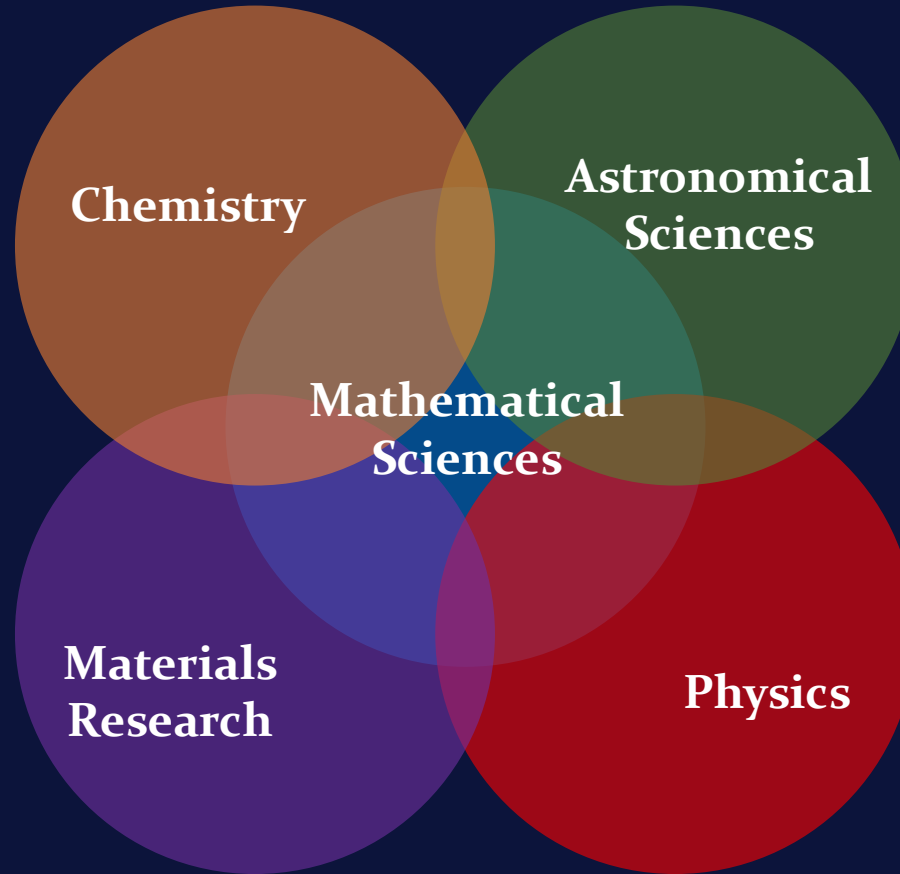








Directorate for Computer  
& Information Science &  
Engineering:  
**TRIPODS**



Directorate for  
Geosciences:  
**IceCube Neutrino  
Observatory**

Directorate for  
Biological Sciences:  
**4 divisional  
programs at MPS-  
BIO interface**

Directorate for  
Engineering:  
**Q-AMASE-i**





# NSF'S 10 BIG IDEAS





# MPS & Quantum Leap

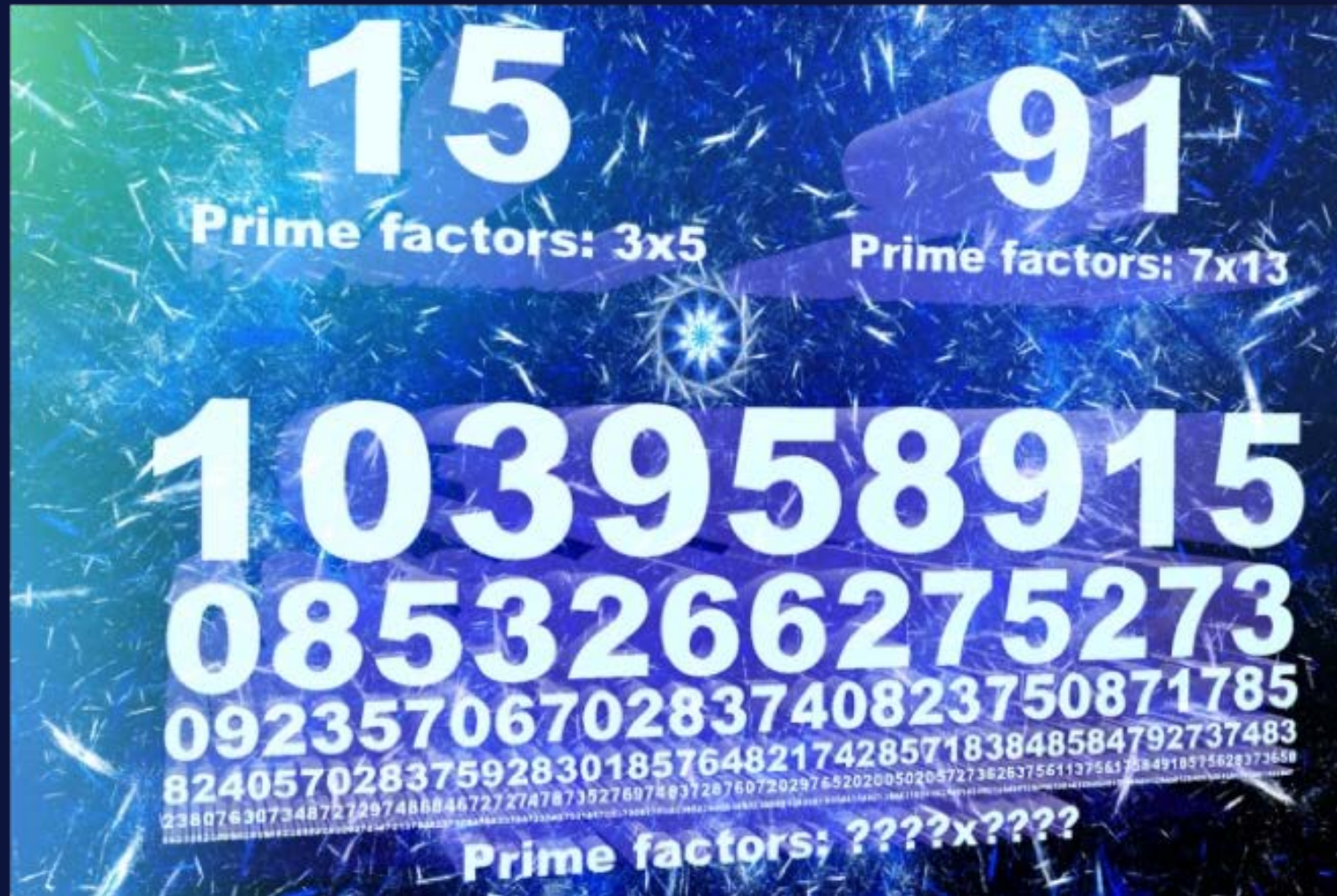


at Cornell University

Kyle Shen, Cornell University



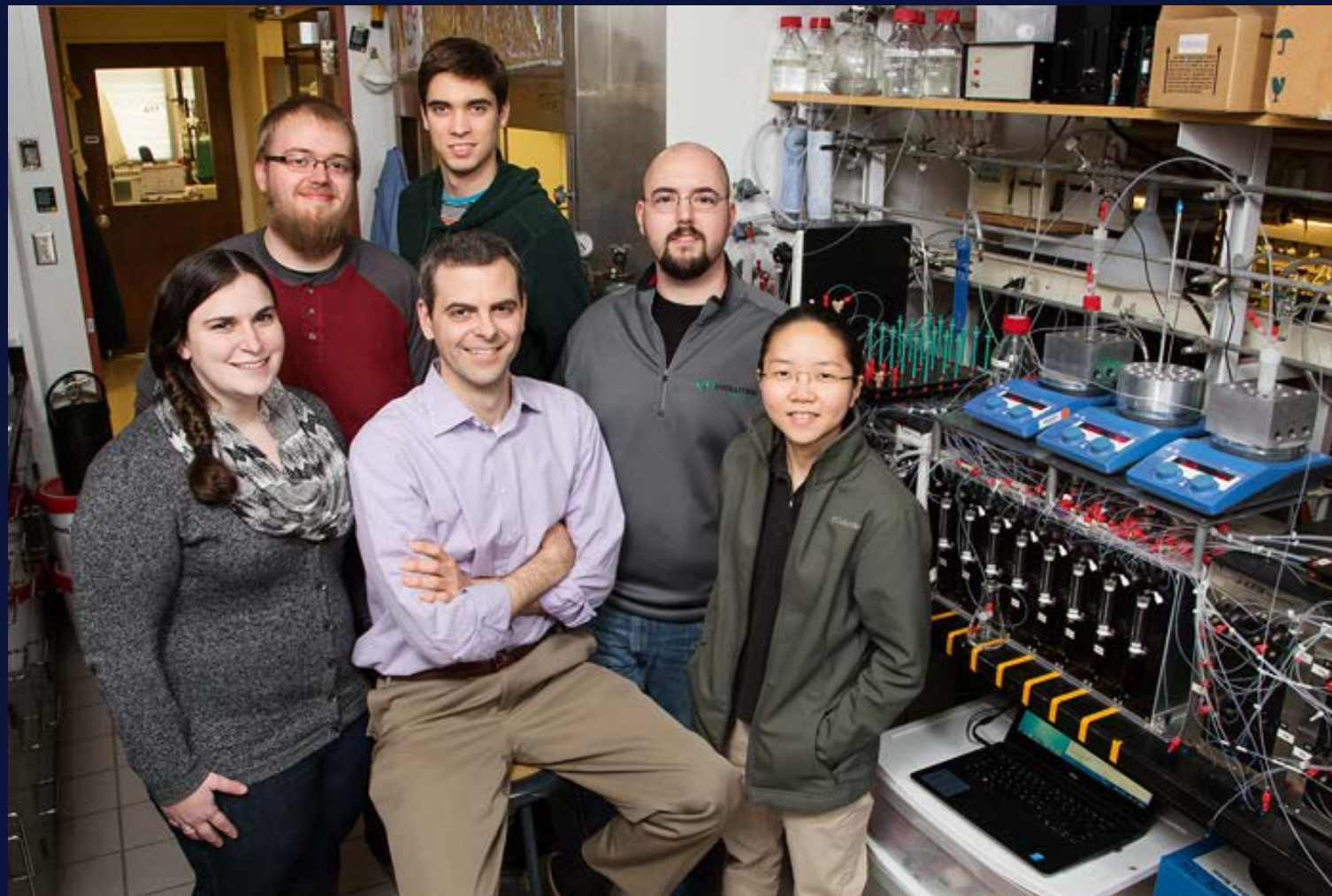
# Next Generation Science



Post-Quantum Cryptography

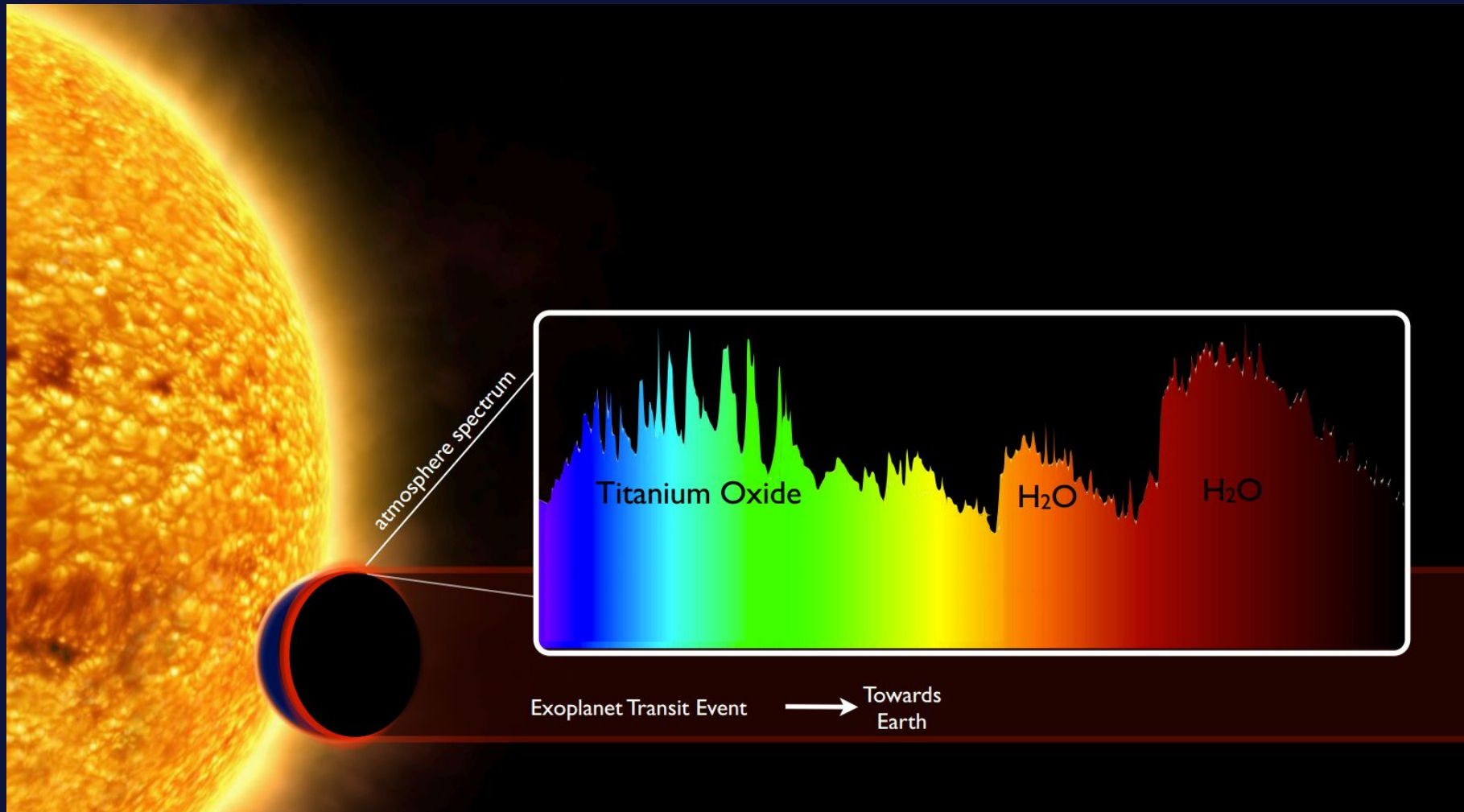


# Next Generation Science



Chemical Discovery with Data Mining and Artificial Intelligence

# Next Generation Science



Exoplanet Atmospheres

# Next Generation Science



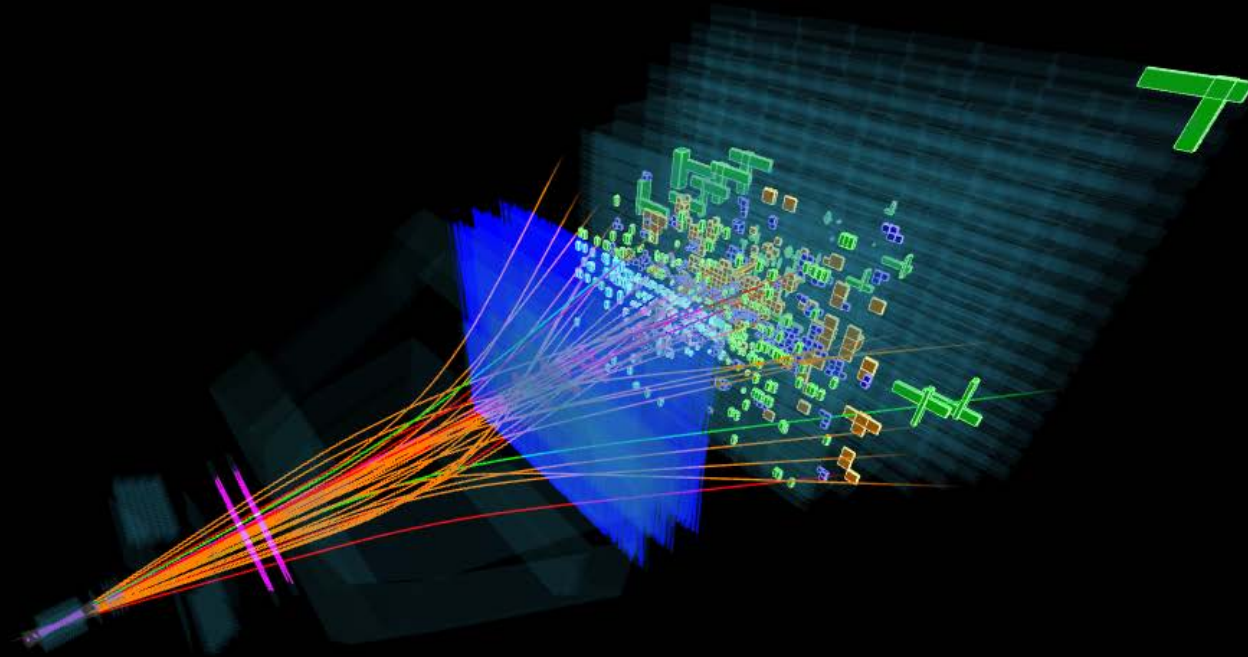
Synthetic Materials Biology



# Next Generation Science



Event 158826354  
Run 206854  
Sat, 28 Apr 2018 21:48:17



Resolving the Asymmetry of Matter/Anti-matter

# NSF-Supported Research Infrastructure

## Pending Community Prioritization:

High Luminosity Large  
Hadron Collider (HL-LHC)  
Upgrades

- U.S. Extremely Large Telescope
- Cosmic Microwave Background – Stage 4
- Next Generation Very Large Array (VLA)
- 60-Tesla superconducting magnet
- IceCube upgrade
- SuperLIGO









