

MPS Portfolio

Anne L. Kinney
Assistant Director



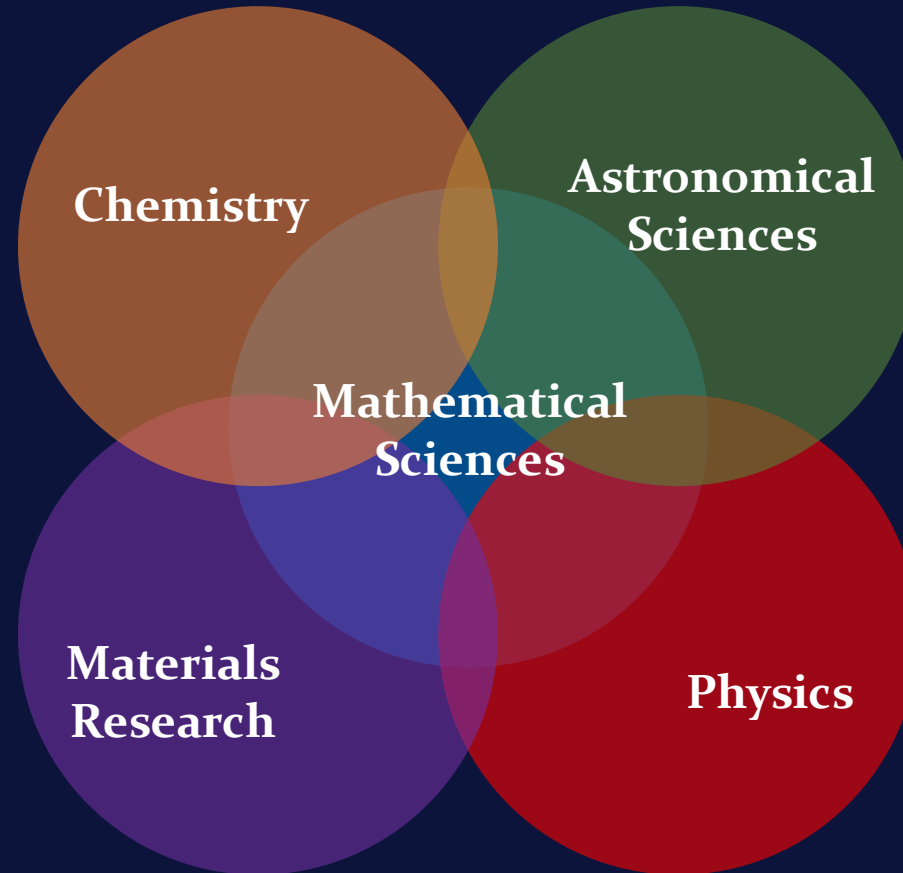


To understand the Universe, you must understand the language in which it is written. That language is mathematics.

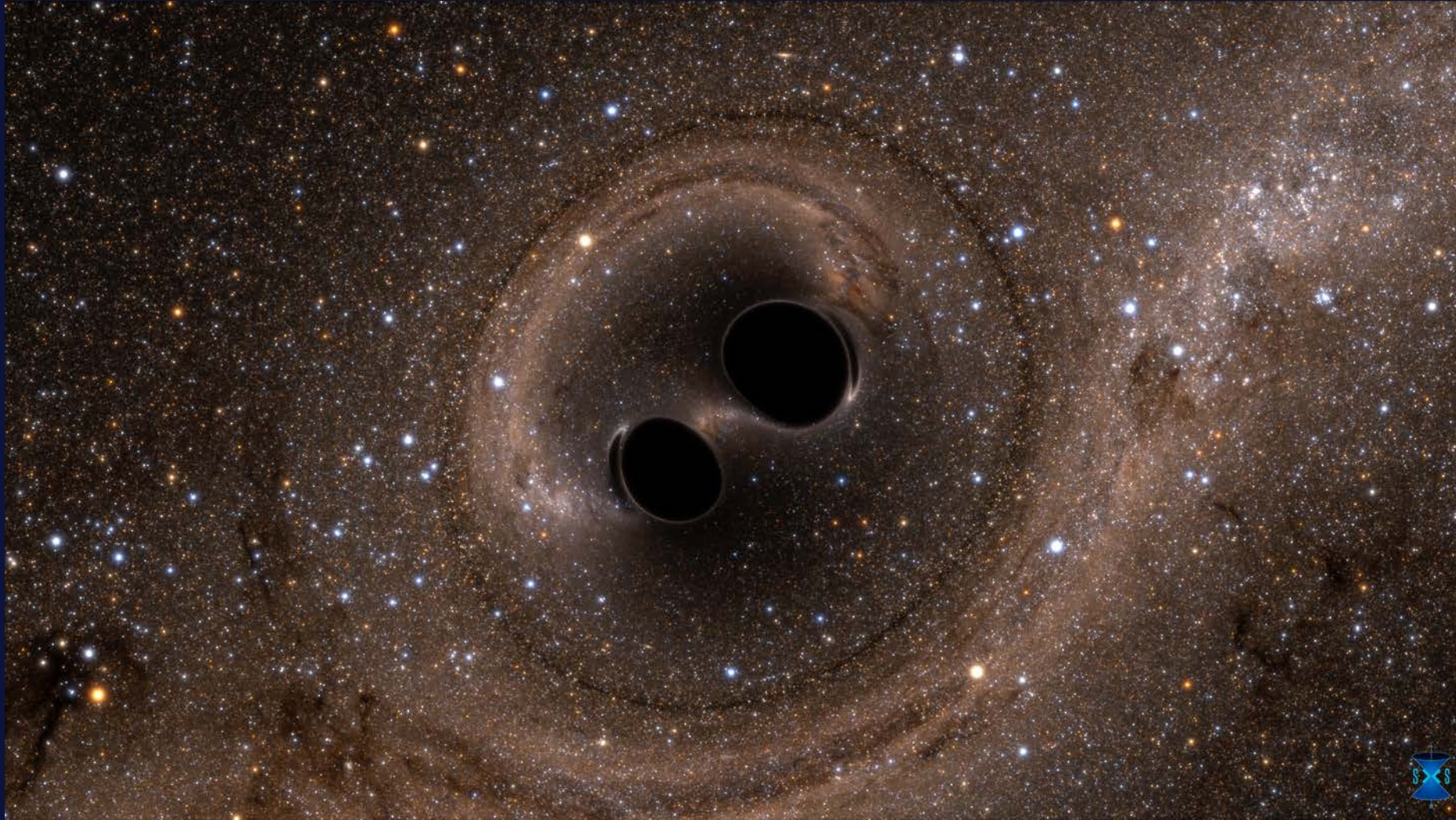
Galileo Galilei



Fundamental Connections



Fundamental Connections

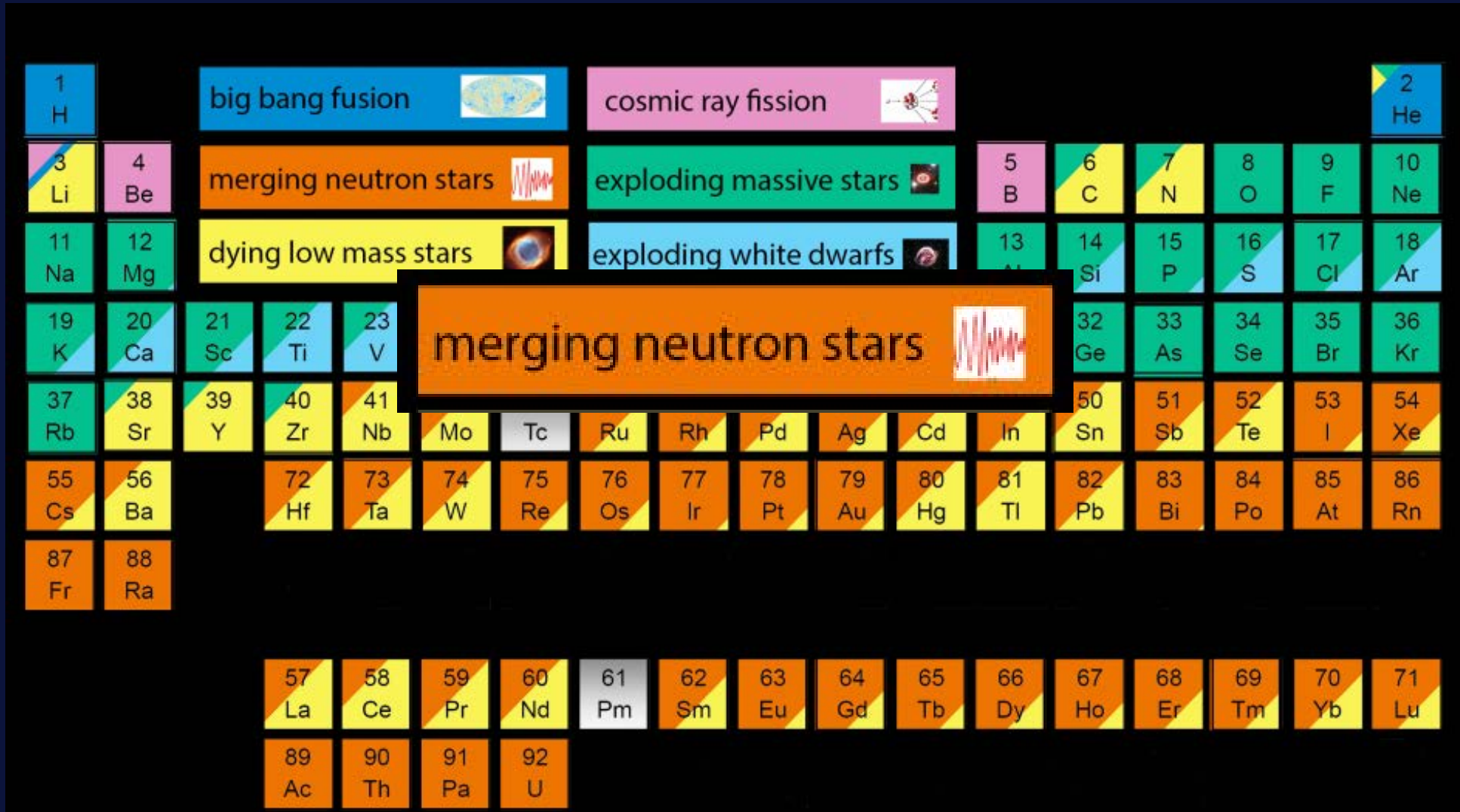


Fundamental Connections

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



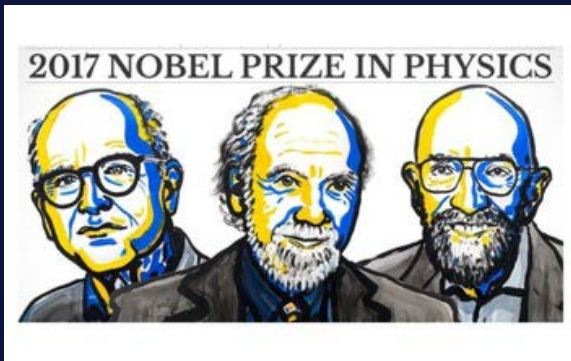
MPS Scientific Leadership



Chemistry



Astronomical Sciences



Rainer Weiss,
Kip Thorne and
Barry Barish
2017



Akshay Venkatesh
2018



Maryam Mirzakhani
2014

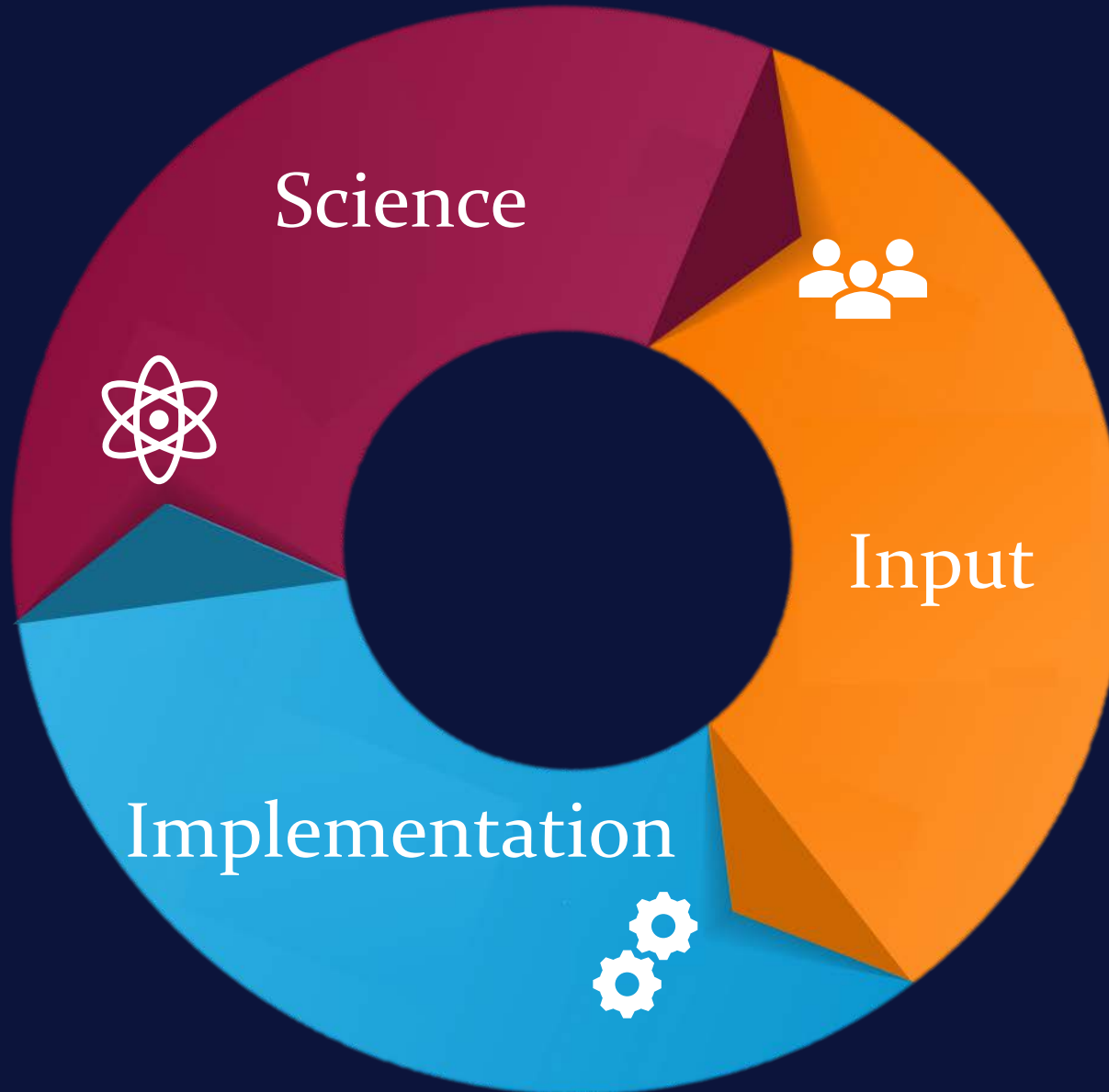


Allan Sly
2018



Danielle Bassett
2014

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. Lynn H. Gibson, Georgia Institute of Technology
 Dr. Andrew Millis, Columbia University/Simons Foundation
 Dr. ... University of California, Los Angeles



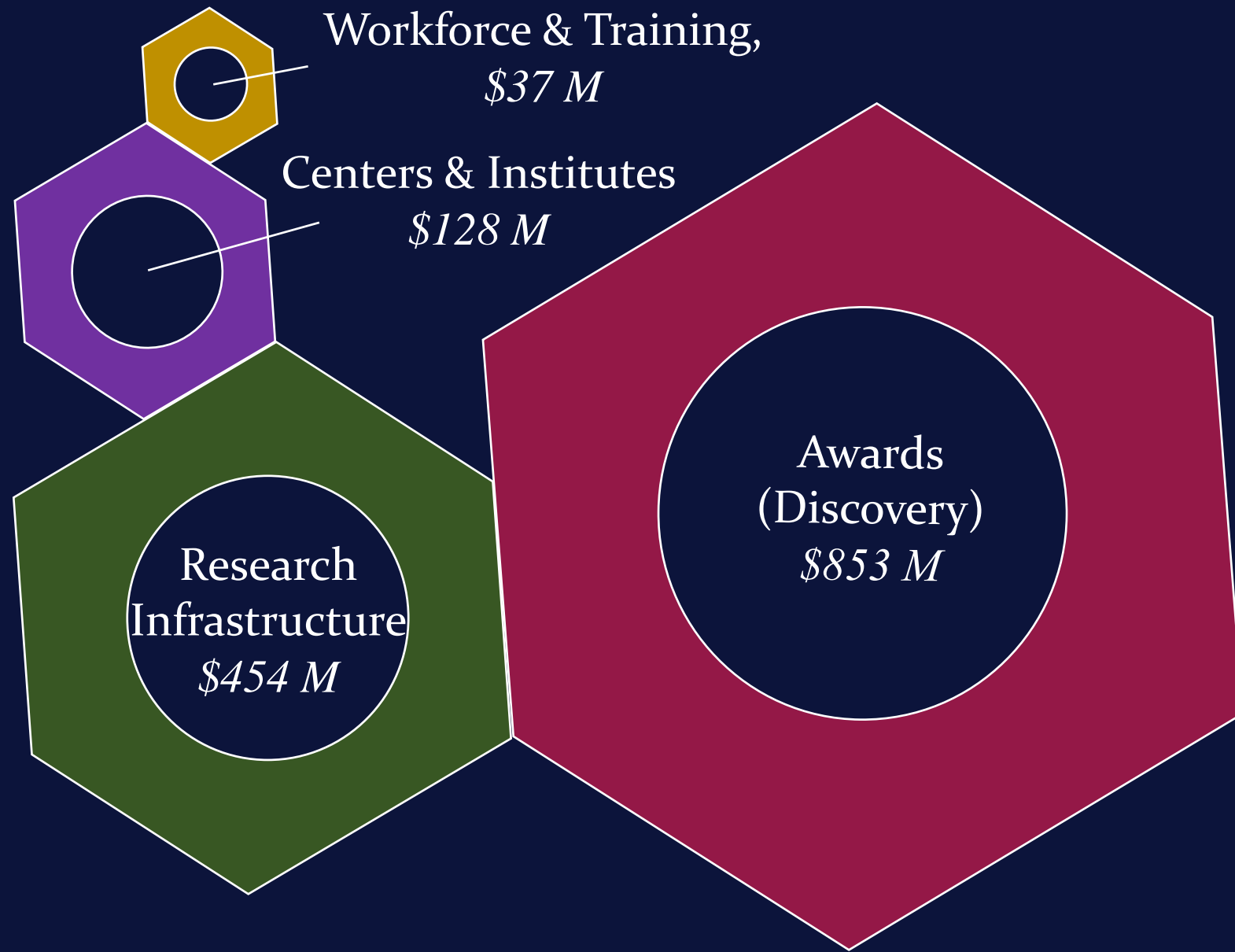
Key Materials Inputs



physics



Mechanisms for Implementation





Awards
(Discovery)
\$853 M





Research
Infrastructure
\$454 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

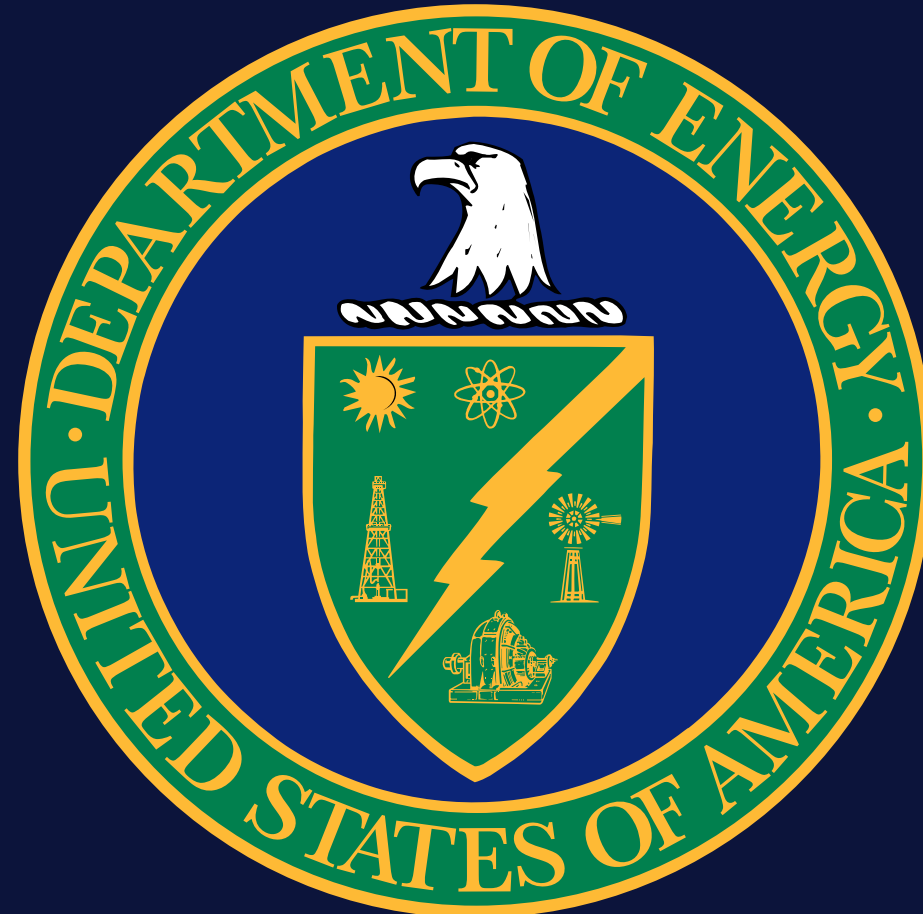
Public

International



Private

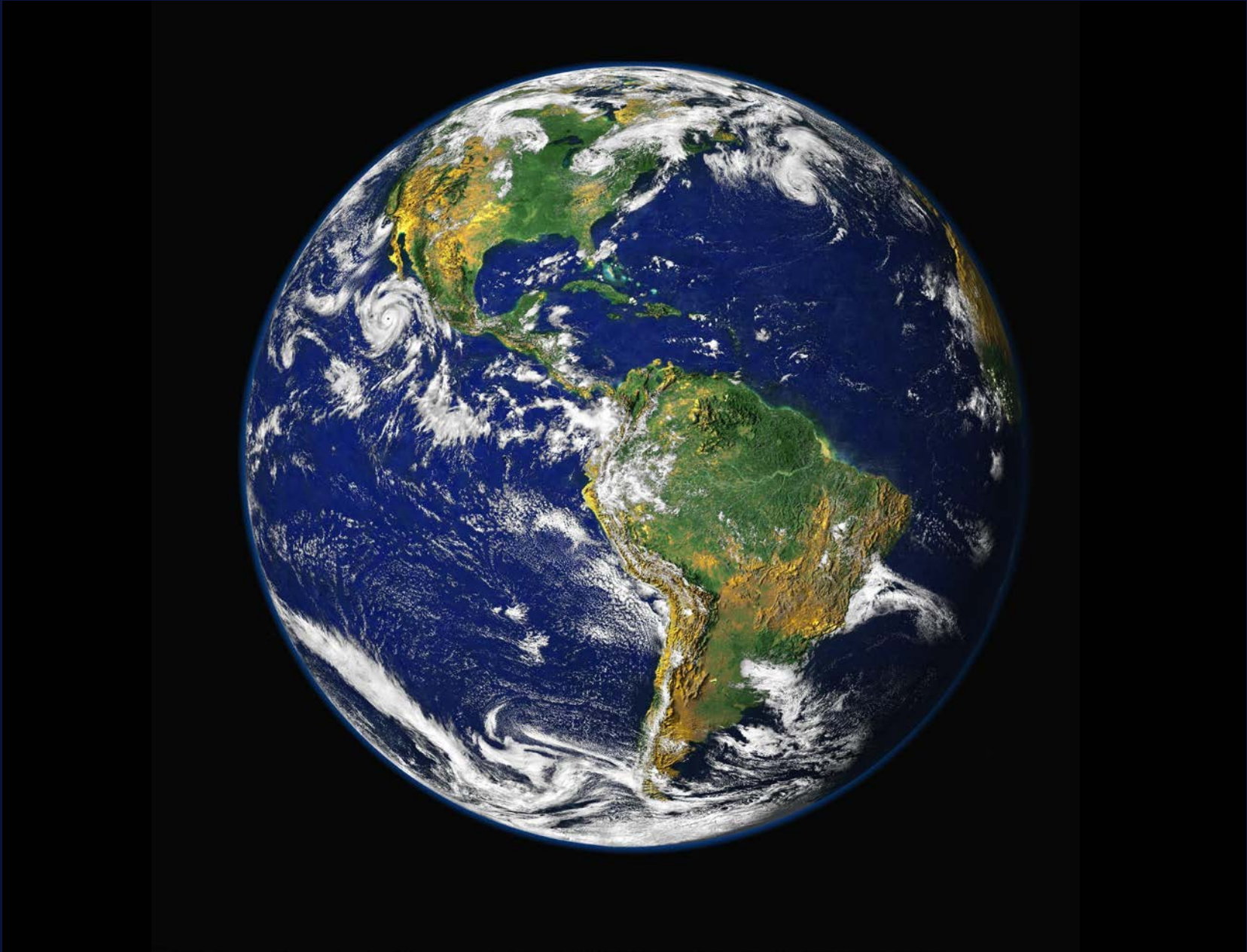




The background features the NASA logo, which consists of a blue circle containing a white orbital path, a red swoosh, and several white stars.

SIMONS FOUNDATION **STAND UP TO CANCER™**





NSF'S 10 BIG IDEAS



MPS & Quantum Leap



MPS & Quantum Leap



- Outline
- What is MBE and what is it good for?
Greatest hits of MBE
 - How to grow your favorite oxide quantum material by MBE?
Nuts and bolts of oxide MBE
 - Oxide MBE growth of quantum materials
Case studies—including Sr_2RuO_4
 - How can I gain access to an oxide MBE if I don't have one?
Use PARADIM's oxide MBE (+ ARPES + ...)



at Cornell University

Kyle Shen, Cornell University

Next Generation Science

15
Prime factors: 3×5

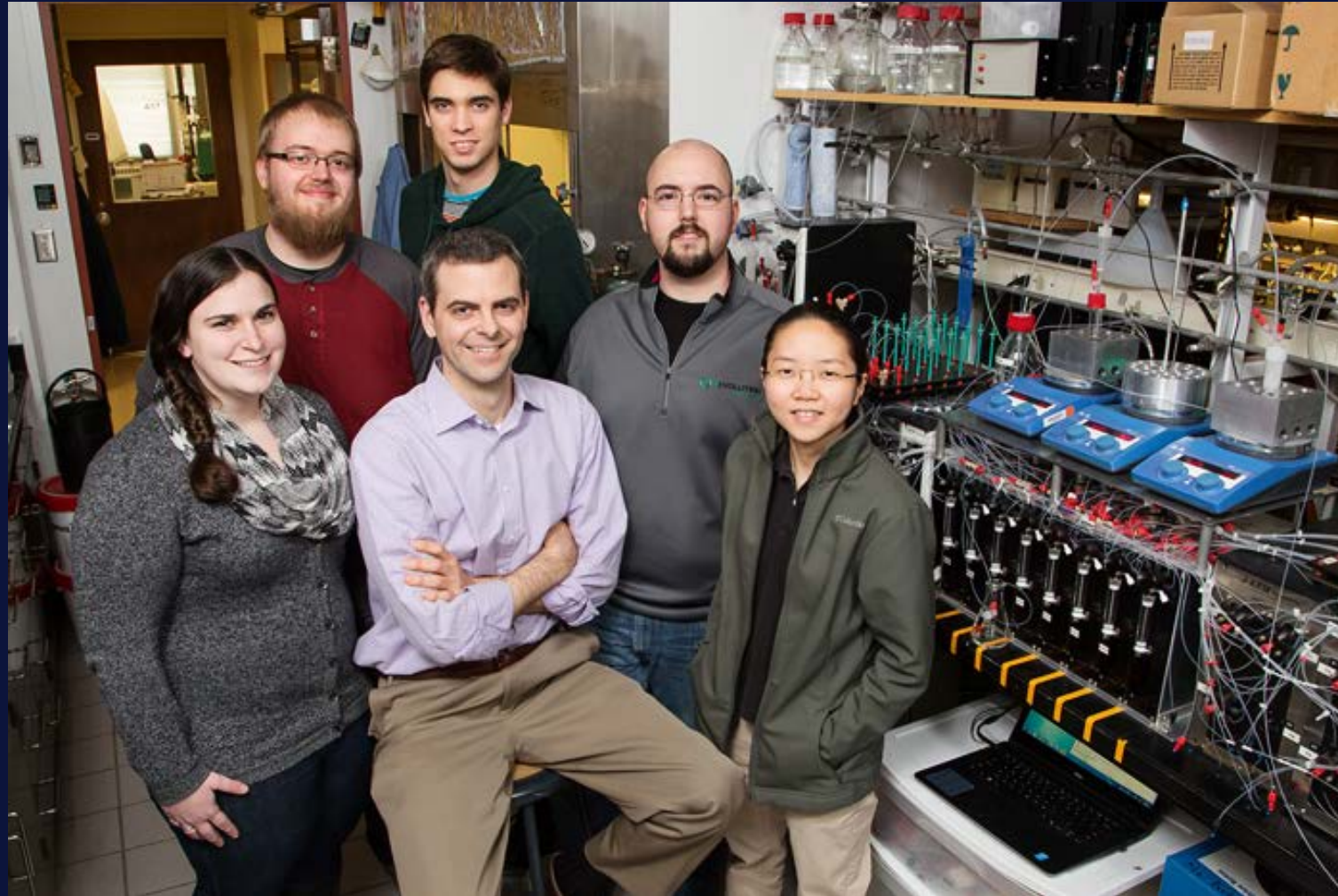
91
Prime factors: 7×13

103958915
0853266275273
0923570670283740823750871785
82405702837592830185764821742857183848584792737483
23807630734872729748804672727A78730276074837207607202976520200502057273626375611375617584918575628373650
Prime factors: $???? \times ????$



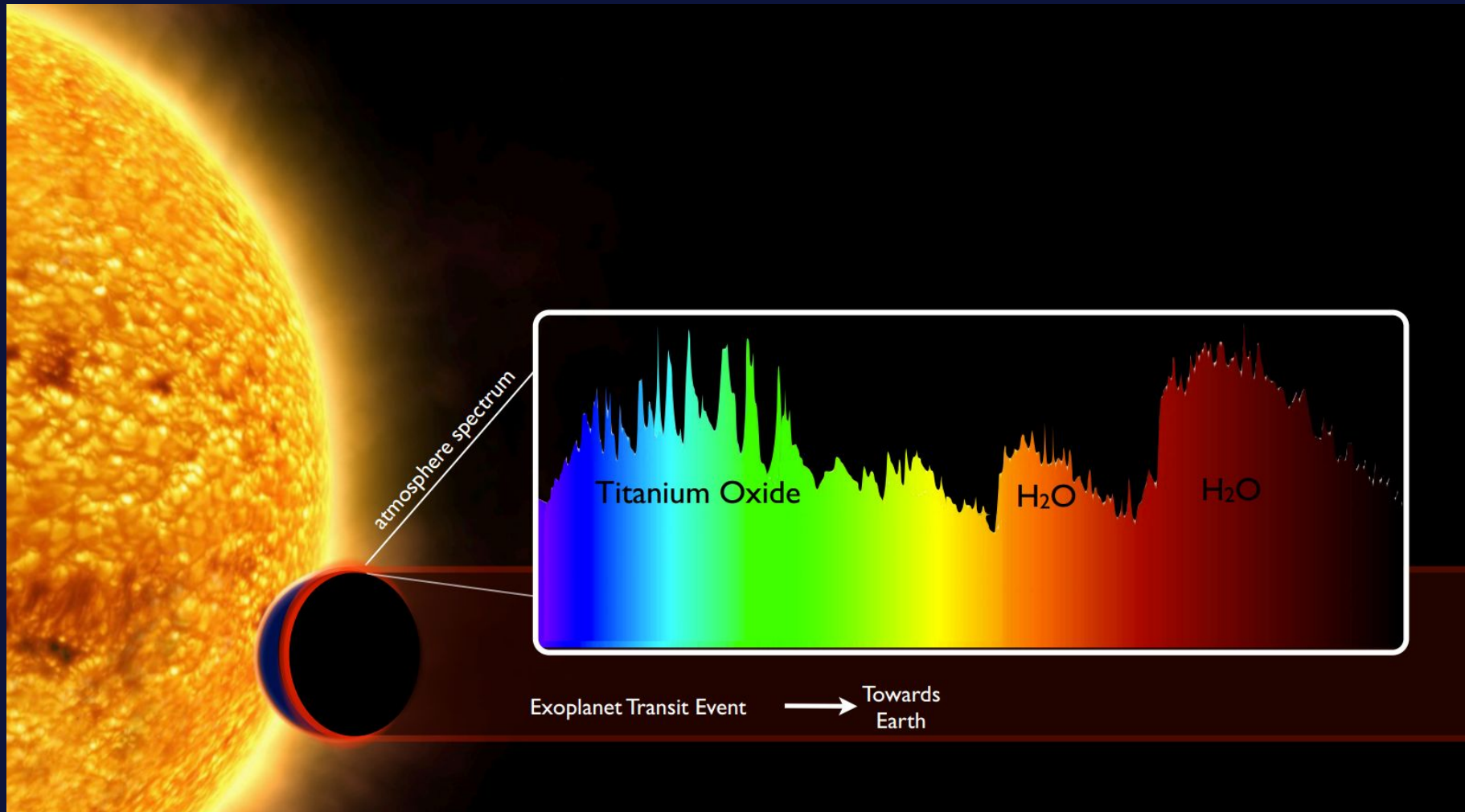
Post-Quantum Cryptography

Next Generation Science



Chemical and Material Discovery with Data Mining and Artificial Intelligence

Next Generation Science



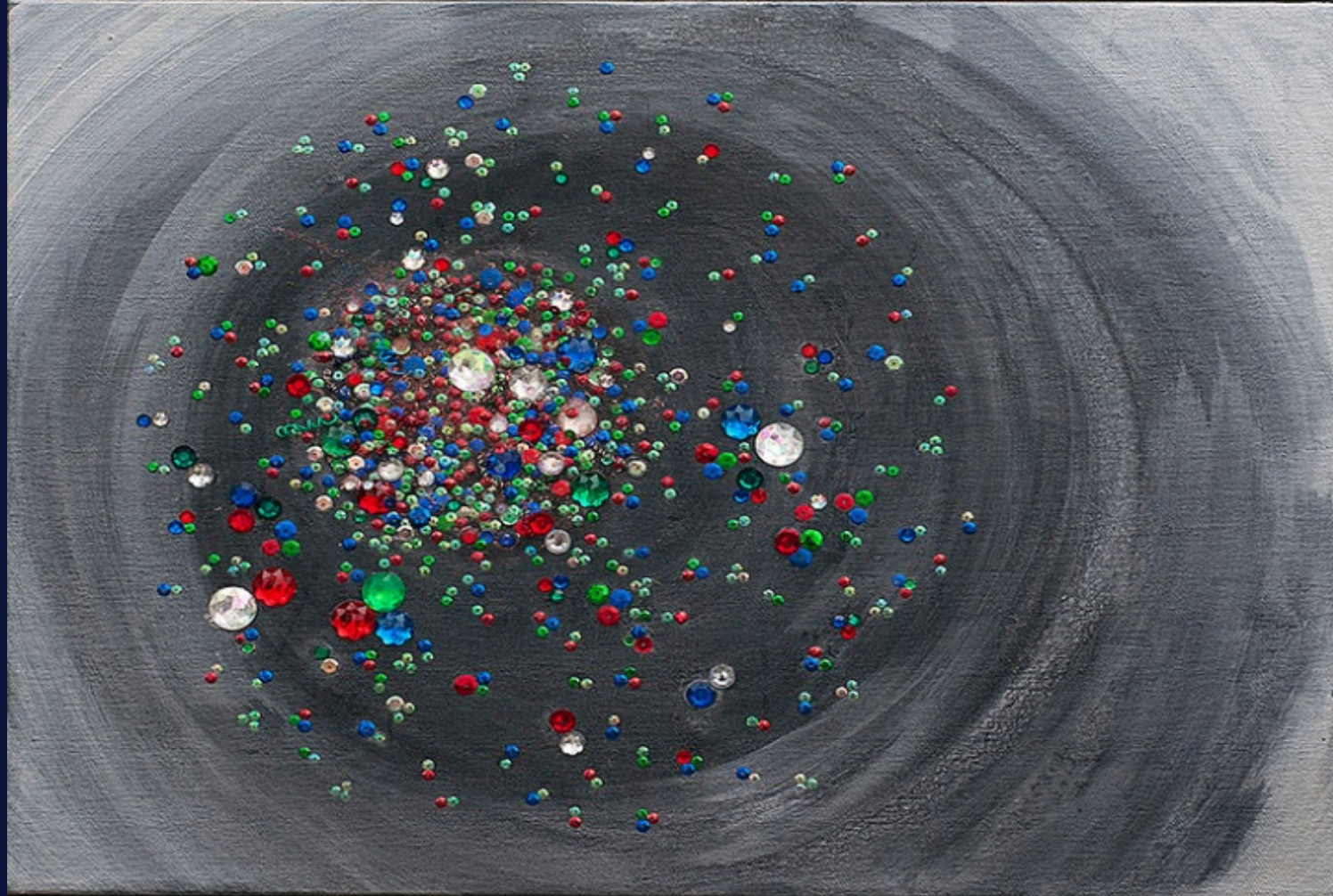
Exoplanet Atmospheres

Next Generation Science



Synthetic Materials Biology

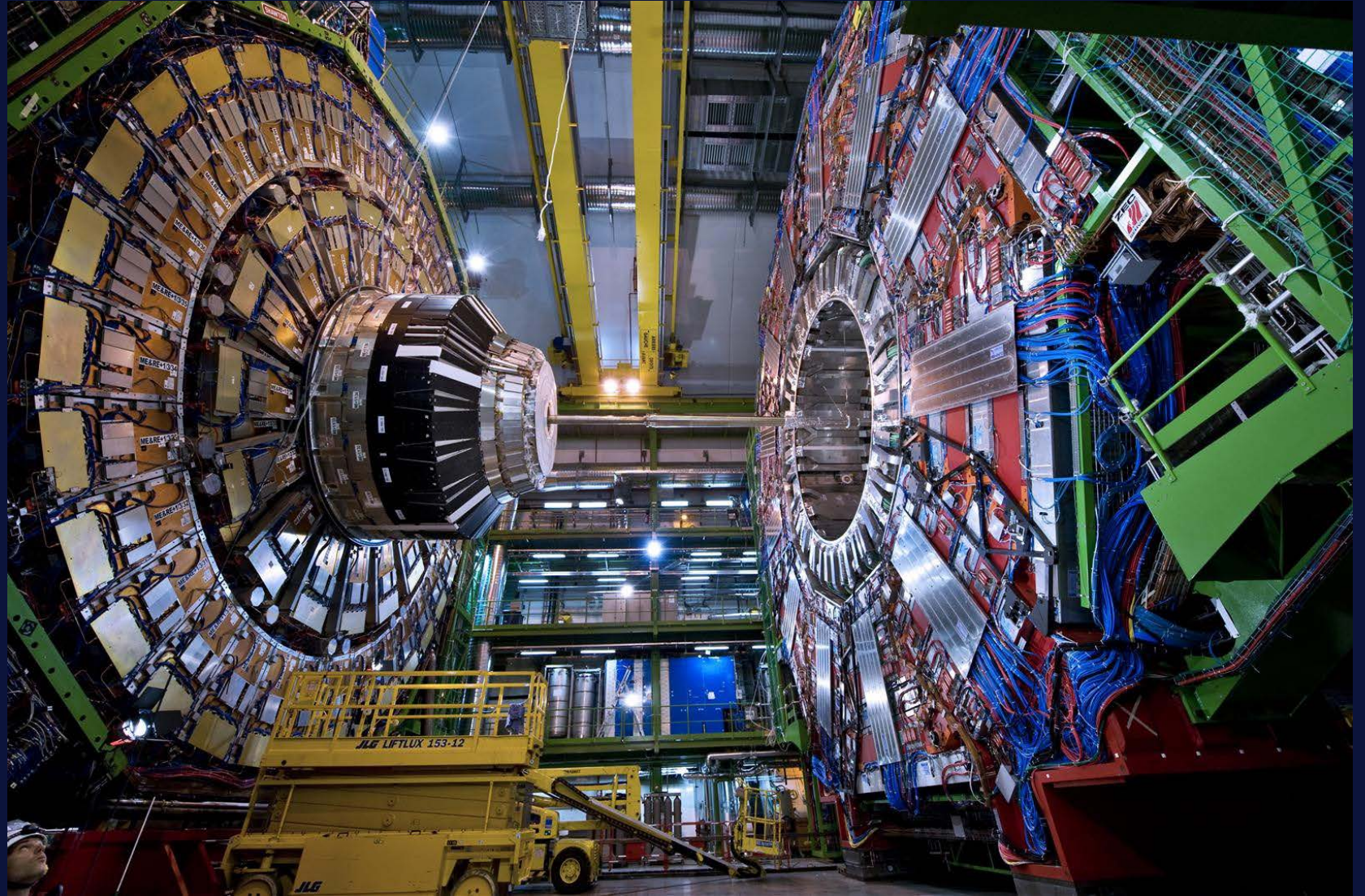
Next Generation Science



Quark-Gluon Plasma

NSF-Supported Research Infrastructure

High Luminosity Large
Hadron Collider (HL-LHC)
Upgrades



NSF-Supported Research Infrastructure

Pending Community Prioritization:

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



