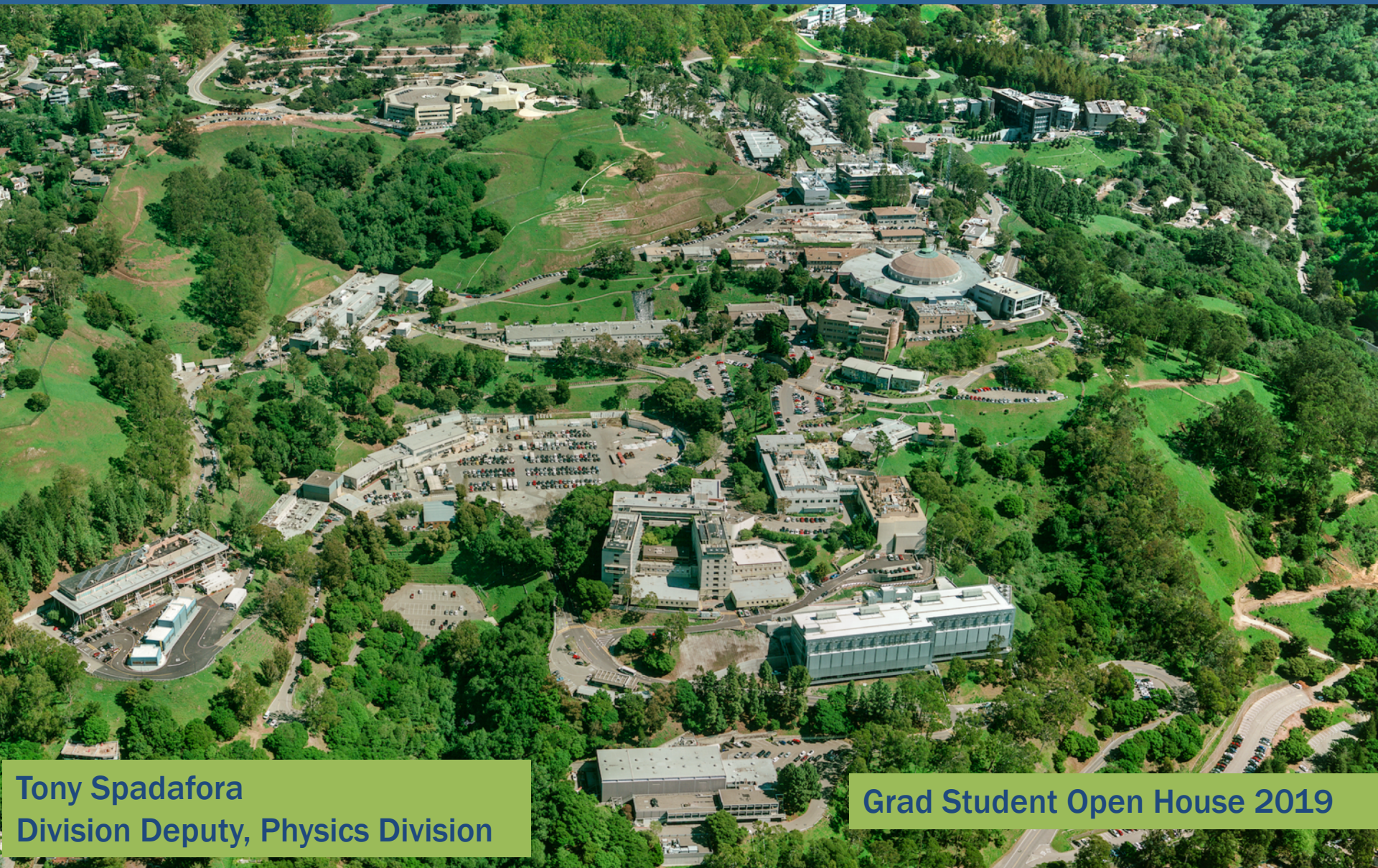
Welcome to Berkeley Lab! (Aka LBL, LBNL)



Tony Spadafora
Division Deputy, Physics Division

Grad Student Open House 2019

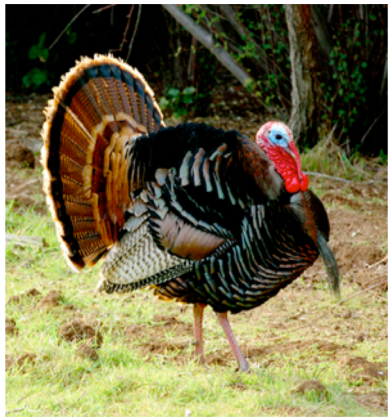
VISITOR SAFETY AT THE LAWRENCE BERKELEY NATIONAL LABORATORY

BERKELEY LAB

Safety at LBNL

US DOE Facility

- Obey all posted signs



Pedestrian Safety

- Use sidewalk and crosswalks
- Watch your step!
- Do not interact with wild animals

Traffic Safety

- Speed limit is 15 mph on most of site due to construction
- Follow traffic, parking and pedestrian signs and markings

Smoking

- In designated areas only

Earthquake Response

Drop down on the floor

Cover under a sturdy desk, table or other furniture

Hold onto it and be prepared to move with the furniture

Evacuate to assembly area (usually in parking lot). Take personal items.

Follow Directions from the Building Emergency Team

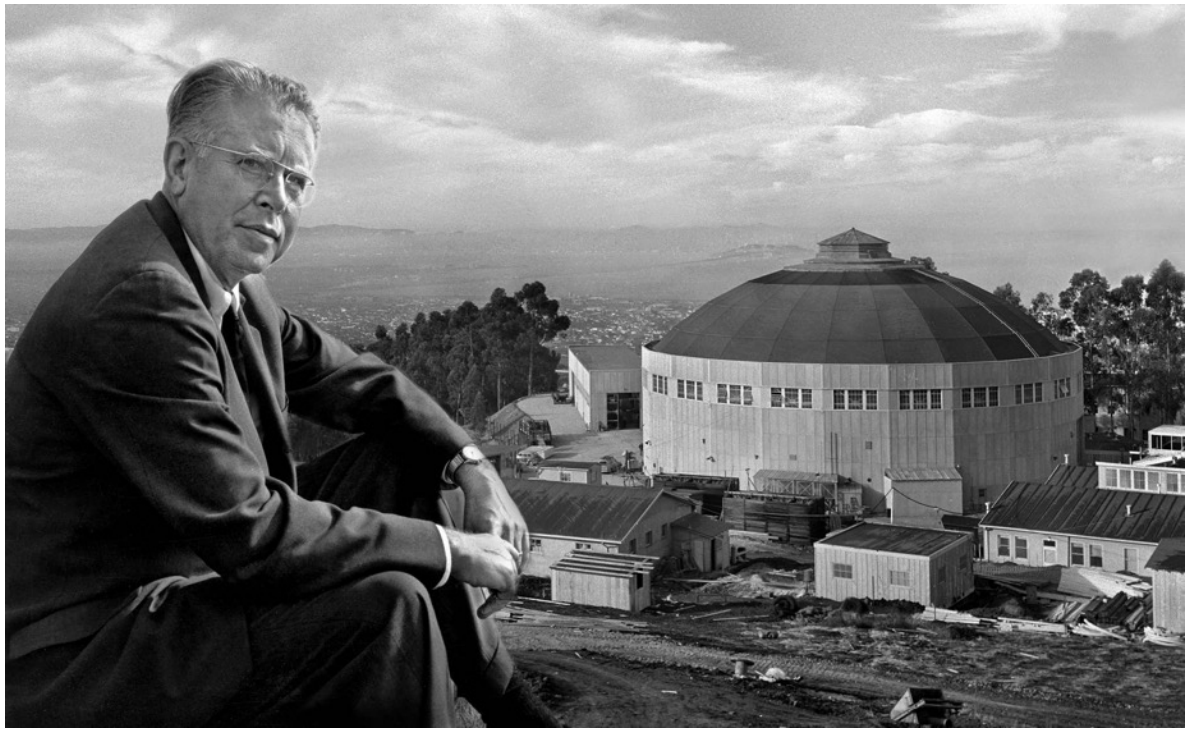
Reporting Emergencies

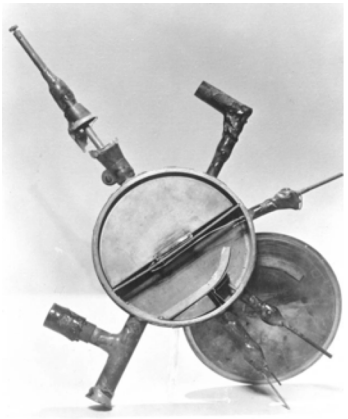
- Dial **911** for life threatening emergencies

- Dial **6999** for non-life threatening events

LBNL was established established in 1931

E. O Lawrence and the 184” cyclotron (circa 1940).

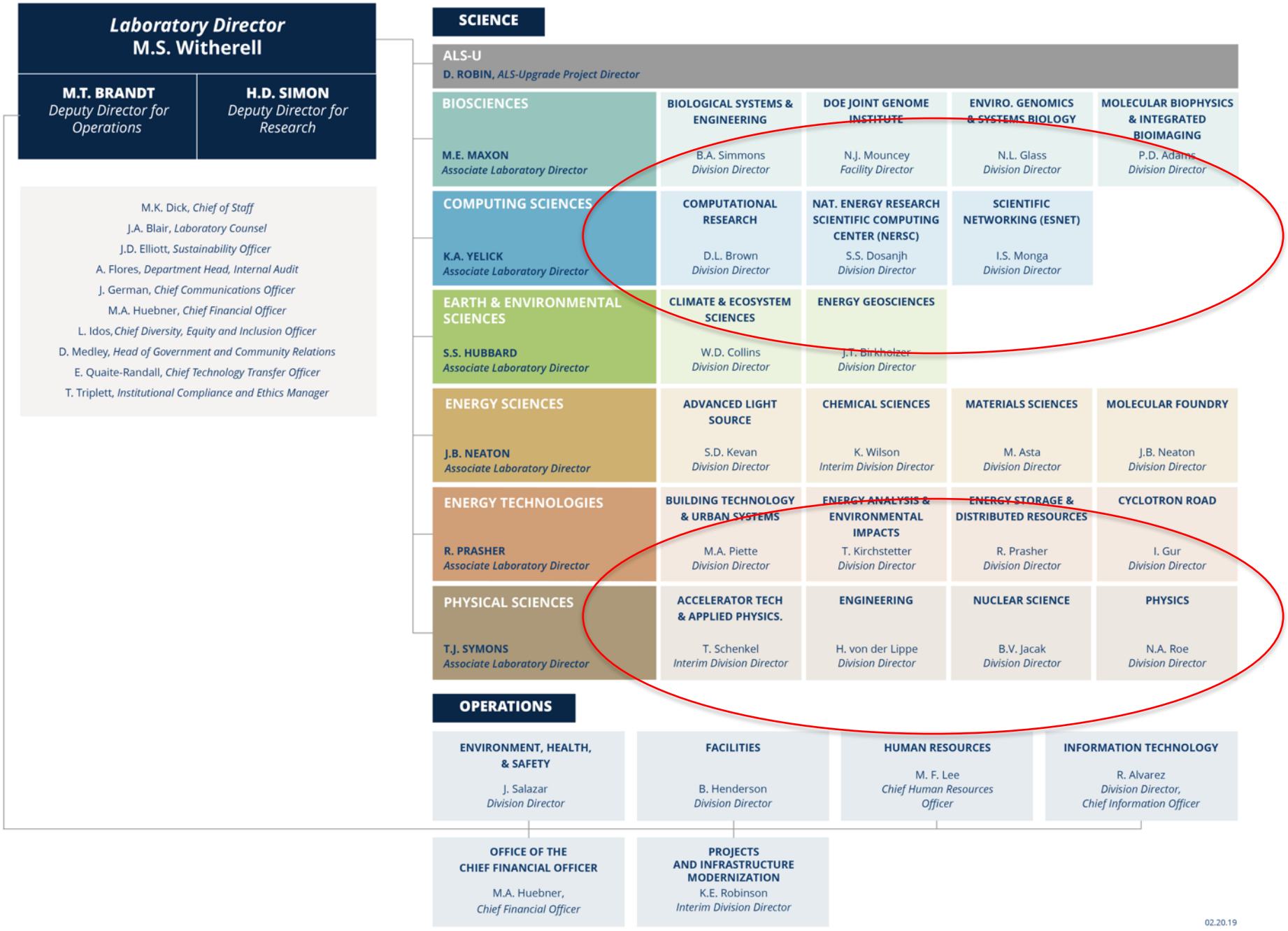




The small seed from which Big Science grew.

Berkeley Lab Today

- Today Berkeley Lab has 21 scientific divisions organized in 6 areas:
  - Physical Sciences, Computing Sciences, BioSciences, Energy Sciences, Energy Technologies, Earth and Environmental Sciences
- 3,200 Employees
  - 1,500 Scientists and Engineers
  - 450 postdocs
- 1,900 visiting scientists
- Connection to UC Berkeley
  - 240 Joint faculty, 320 grad students, 100 u/grads
- Budget ~ $1.1B in FY18)
- 202 acres, 96 buildings, 24 trailers


Laboratory Director
M.S. Witherell
M.T. BRANDT
Deputy Director for Operations
H.D. SIMON
Deputy Director for Research
M.K. Dick, Chief of Staff
J.A. Blair, Laboratory Counsel
J.D. Elliott, Sustainability Officer
A. Flores, Department Head, Internal Audit
J. German, Chief Communications Officer
M.A. Huebner, Chief Financial Officer
L. Idos, Chief Diversity, Equity and Inclusion Officer
D. Medley, Head of Government and Community Relations
E. Quaite-Randall, Chief Technology Transfer Officer
T. Triplett, Institutional Compliance and Ethics Manager
SCIENCE
ALS-U
D. ROBIN, ALS-Upgrade Project Director
BIOSCIENCES
M.E. MAXON
Associate Laboratory Director
BIOLOGICAL SYSTEMS & ENGINEERING
B.A. Simmons
Division Director
DOE JOINT GENOME INSTITUTE
N.J. Mouncey
Facility Director
ENVIRO. GENOMICS & SYSTEMS BIOLOGY
N.L. Glass
Division Director
MOLECULAR BIOPHYSICS & INTEGRATED BIOIMAGING
P.D. Adams
Division Director
COMPUTING SCIENCES
K.A. YELICK
Associate Laboratory Director
COMPUTATIONAL RESEARCH
D.L. Brown
Division Director
NAT. ENERGY RESEARCH SCIENTIFIC COMPUTING CENTER (NERSC)
S.S. Dosanjh
Division Director
SCIENTIFIC NETWORKING (ESNET)
I.S. Monga
Division Director
EARTH & ENVIRONMENTAL SCIENCES
S.S. HUBBARD
Associate Laboratory Director
CLIMATE & ECOSYSTEM SCIENCES
W.D. Collins
Division Director
ENERGY GEOSCIENCES
J.T. Birkholzer
Division Director
ENERGY SCIENCES
J.B. NEATON
Associate Laboratory Director
ADVANCED LIGHT SOURCE
S.D. Kevan
Division Director
CHEMICAL SCIENCES
K. Wilson
Interim Division Director
MATERIALS SCIENCES
M. Asta
Division Director
MOLECULAR FOUNDRY
J.B. Neaton
Division Director
ENERGY TECHNOLOGIES
R. PRASHER
Associate Laboratory Director
BUILDING TECHNOLOGY & URBAN SYSTEMS
M.A. Piette
Division Director
ENERGY ANALYSIS & ENVIRONMENTAL IMPACTS
T. Kirchstetter
Division Director
ENERGY STORAGE & DISTRIBUTED RESOURCES
R. Prasher
Division Director
CYCLOTRON ROAD
I. Gur
Division Director
PHYSICAL SCIENCES
T.J. SYMONS
Associate Laboratory Director
ACCELERATOR TECH & APPLIED PHYSICS.
T. Schenkel
Interim Division Director
ENGINEERING
H. von der Lippe
Division Director
NUCLEAR SCIENCE
B.V. Jacak
Division Director
PHYSICS
N.A. Roe
Division Director
OPERATIONS
ENVIRONMENT, HEALTH, & SAFETY
J. Salazar
Division Director
FACILITIES
B. Henderson
Division Director
HUMAN RESOURCES
M. F. Lee
Chief Human Resources Officer
INFORMATION TECHNOLOGY
R. Alvarez
Division Director, Chief Information Officer
OFFICE OF THE CHIEF FINANCIAL OFFICER
M.A. Huebner,
Chief Financial Officer
PROJECTS AND INFRASTRUCTURE MODERNIZATION
K.E. Robinson
Interim Division Director
02.20.19

Thirteen Nobel Laureates

Luis W. Alvarez

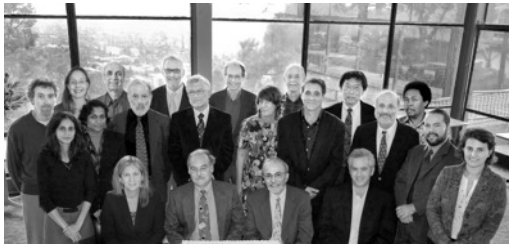
Melvin Calvin

Owen Chamberlain

Steven Chu

Donald A. Glaser

Ernest Orlando Lawrence

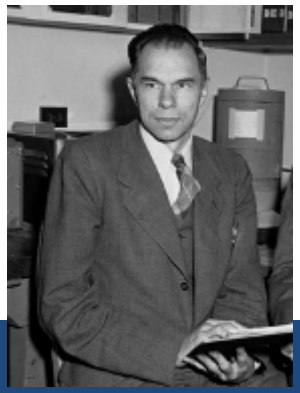


Intergovernmental Panel on Climate Change (IPCC)

Yuan T. Lee

Edwin M. McMillan

Saul Perlmutter



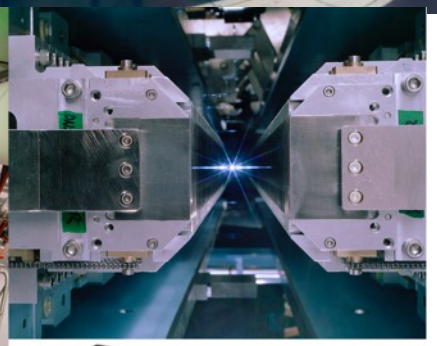
Glenn T. Seaborg

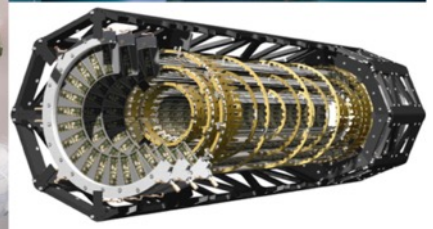
Emilio G. Segrè

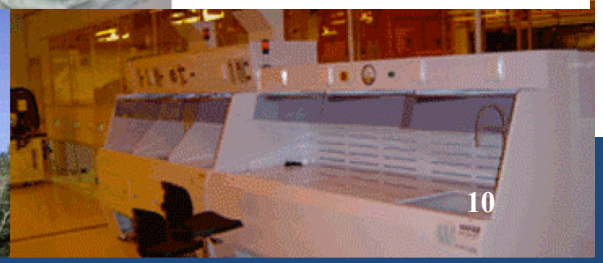
George F. Smoot

World-Class Facilities at Berkeley Lab

- NERSC computation facility
  - World-top class user facility.
  - Support/collaboration with computer scientists & engineers
- Engineering division – Enabling "big science"
- MicroSystems Lab and Molecular Foundry
- Scientists in these areas
  - Postdocs and graduate students
  - "Team science"







Physics Division Research Program

- Areas
  - Hadron Collider Physics — ATLAS
  - Lepton Flavor/Neutrino Physics — Mu2e, Daya Bay, DUNE
  - Dark Matter — LZ, low-mass DM R&D
  - Cosmology — DESI, CMB, SNe
  - Theory
  - Advanced Detector R&D

  and new activities in QIS, Machine Learning for science, etc.

- Scientific Staff
  - 52 Total Staff: 34 Career Scientific Staff and 18 UCB Faculty
  - 58 Postdocs (including visiting/fellowship postdocs)
  - 41 Grad students (including visiting students)
  - 10 Technical staff

Timeline of Physics Division Projects

Projects	2016	2017	2018	2019	2020	2021	2022	2023	2024
BOSS	Analysis								
LUX	Operations	Analysis							
eBOSS	Operations/Analysis			Analysis					
Daya Bay	Operations/Analysis			Analysis					
DESI		Construction				Operations/Analysis			
LZ		Construction				Operations/Analysis			
Mu2e		Construction					Commissioning/Operations/Analysis		
ATLAS Upgrades	R&D				Construction				Operations
CMB S4		R&D				CD1/3a	Construction		
DUNE			R&D				Construction		
LEAD LAB									
LEADING ROLE									
SUPPORTING ROLE									

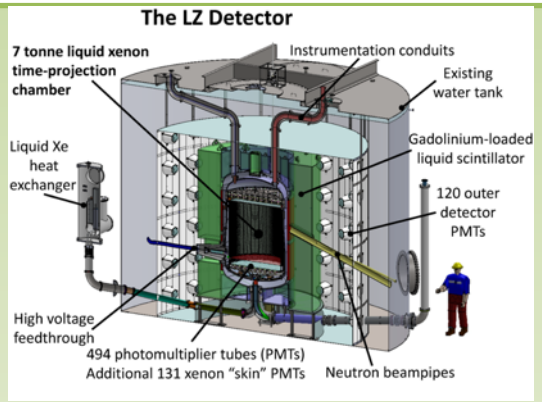
Two New Experiments about to Start Operations

10x increased sensitivity to dark atter

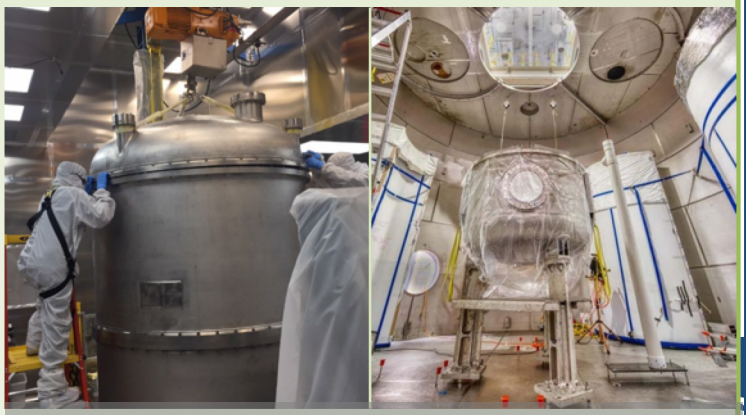
CD3: 2017

Start first science run: 2020

LDRD on cryogenic HV techn-ologies



TPC Field shaping rings stacked at SURF



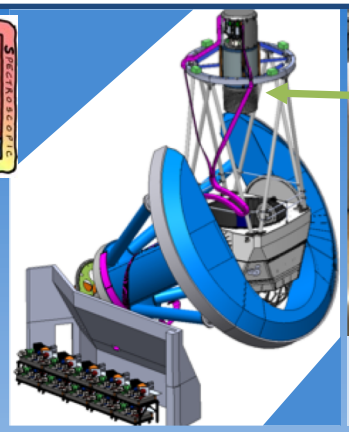
Outer Cryostat tested at SURF and being installed

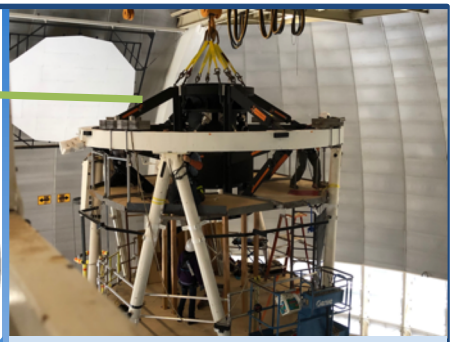
x10 increased precision in dark energy

CD3: 2016

Commission-ing complete: Jan. 2020

Seeded with LDRD on CCDs, fibers and positioners





12-ton corrector installed Nov '18

SN1 Spectrograph Inspection at Kitt Peak

Final production petal, loaded with fiber positioners

C2 Lens after coating with production team

Plan for today

Presentations from Research Groups

9:30 Welcome to Berkeley Lab - Tony Spadafora

9:40 Collider Physics with ATLAS at the LHC - Simone Pagan Griso

9:50 Heavy Ion Physics with ALICE at the LHC - Nikki Apadula

10:00 Neutrino Physics - Alan Poon

10:10 Dark Matter - Peter Sorensen

10:20 Dark Energy - David Schlegel

10:30 Quantum Computing in HEP - Christian Bauer

(slides are available at https://indico.physics.lbl.gov/indico/event/868/

10:45 – 12:20: Lab tours or Quantum Computing/Machine Learning discussion

Students can choose 2 from:

ATLAS Silicon detector labs

Cosmology labs (DESI, CMB, Dark Matter)

Discussion Group on Quantum Computing and Machine Learning

Please indicate your choice on the sign-up sheet

12:25 Bus departs for campus

Plan for today

10:45 - 11:15	ATLAS Labs	QC/ML Discussion
11:15 - 12:15	Cosmology Labs	QC/ML Discussion

- ATLAS labs
  - ATLAS silicon strips detector lab: 50B-6238 - Carl Haber
  - ATLAS silicon pixel detector lab: 50-6007: - Aleksandra Dimitrievska

- Cosmology labs
  - DESI: 50-6040 - Claire Poppett
  - CMB: 50-6003 - Charlie Hill
  - Dark Matter- Liquid Xenon: 70A-2633 - Scott Kravitz

- Discussion Group:
  - Quantum Computing and Machine Learning 50A-5132
    - Christian Bauer, Ben Nachman