NATIONAL MAGLAB

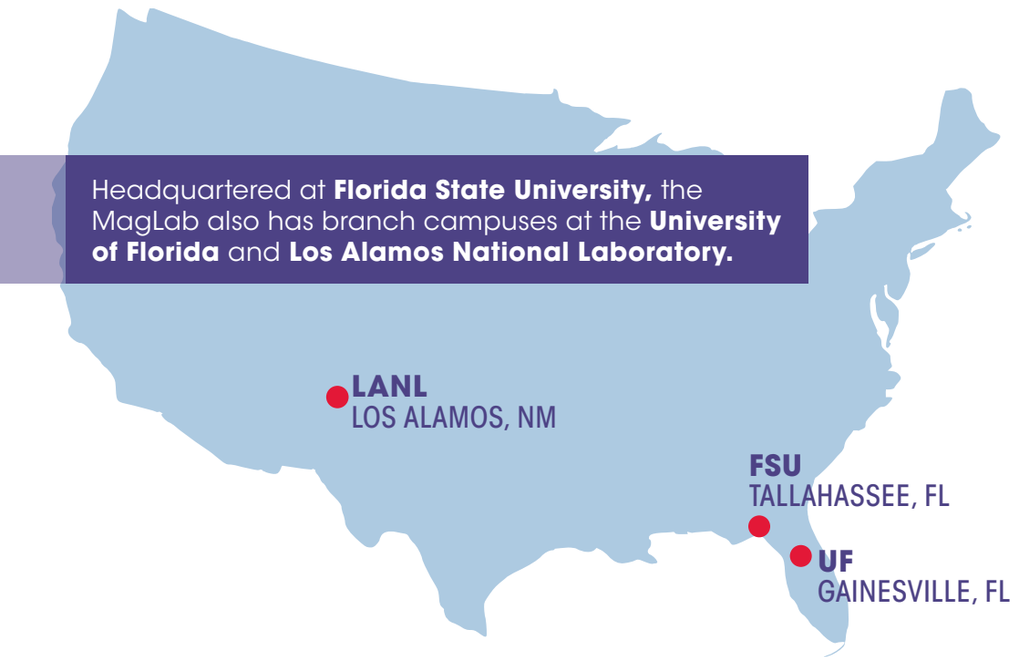
AT A GLANCE

Florida State University • University of Florida • Los Alamos National Laboratory

Supported by the National Science Foundation and the state of Florida

LEADING THE WORLD

The National High Magnetic Field Laboratory (National MagLab) is the largest and highest-powered magnet laboratory in the world. We are one lab across three sites representing the United States' investment in high magnetic field research.



By harnessing magnetic fields as important research tools, the National MagLab expands the boundaries of scientific knowledge and advances basic science, engineering and technology in the 21st century.

In 2018, more than 2,000 researchers from academia, national labs and industry conducted cutting-edge experiments using our fleet of world-record magnets. The National MagLab's powerful and unique magnets are designed and built in-house by the best magnet engineers on the planet to serve diverse scientists.

High magnetic field research is highly interdisciplinary, bringing together physics, chemistry, biology and engineering from both our international user community and talented in-house team to explore fundamental questions about materials, energy and life. This collaborative work leads to exciting discoveries that are shared in more than 400 peer-reviewed publications each year and at community and educational events to lay the foundation for the explorers of the future.

MATERIALS

Scientists use our magnets to explore semiconductors and superconductors, crystals and atomically thin materials — research that reveals the secret workings of materials and empowers us to develop new technologies.

- **Correlated Electrons**
- **Graphene**
- **Kondo/Heavy Fermion Systems**
- **Magnetism and Magnetic Materials**
- **Molecular Conductors**
- **Quantum Fluids and Solids**
- **Qubits & Quantum Entanglement**
- **Semiconductors**
- **Superconductors**
- **Topological Matter**

ENERGY

Scientists work to optimize petroleum refining, advance potential biofuels such as pine needles and algae and fundamentally change the way we store and deliver energy by developing better batteries.

- **Biofuels**
- **Catalysis**
- **Dissolved Organic Matter**
- **Environmental Analysis**
- **Fuel Cell Membranes**
- **Geochemistry**
- **Lithium Battery Imaging**
- **Petroleomics**
- **Superconductivity - Applied Research**

LIFE

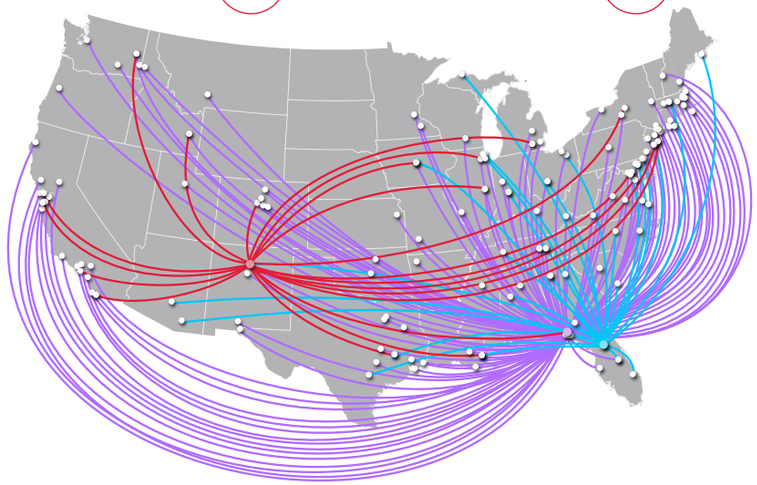
Scientists study the foundational science of protein and disease molecules that underlies the cells and creates life itself. This work could improve future treatment of AIDS, cancer, Alzheimer's and other diseases.

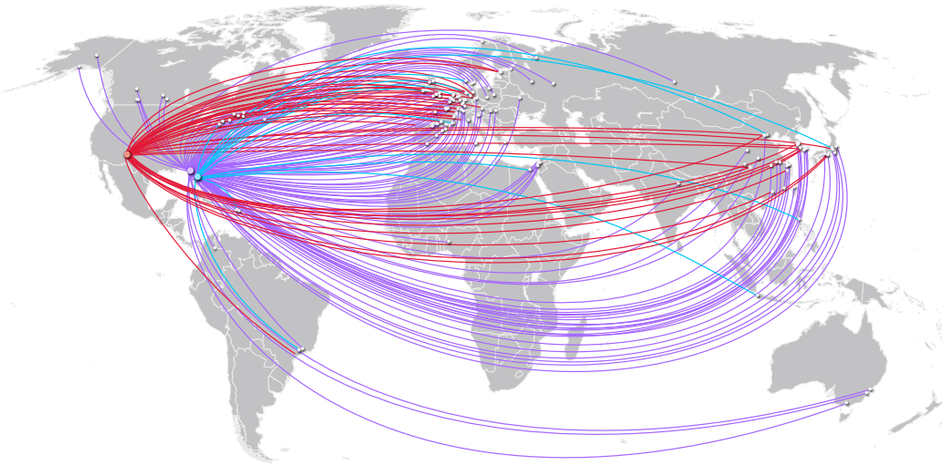
- **Biomarkers**
- **Dynamic Nuclear Polarization**
- **Membrane Proteins**
- **Metabolomics**
- **Natural Products**
- **Quadrupolar NMR**
- **Sodium MRI**

SCIENCE KNOWS NO BOUNDARIES

Seeking the most powerful magnetic fields on Earth, scientists and engineers from around the world conduct their experiments at the National MagLab. In 2018, our **2,077** users represented **321** universities, government labs and private companies worldwide.

76% UNIVERSITIES **15%** GOVERNMENT LABS **9%** INDUSTRY





2018 LAB STATS

USERS:
2,077

PERCENTAGE OF USERS WHO WERE NEW:
27%

ARTICLES PUBLISHED IN PEER-REVIEWED JOURNALS:
380

K-12 STUDENTS REACHED THROUGH TOURS AND LESSONS:
8,600

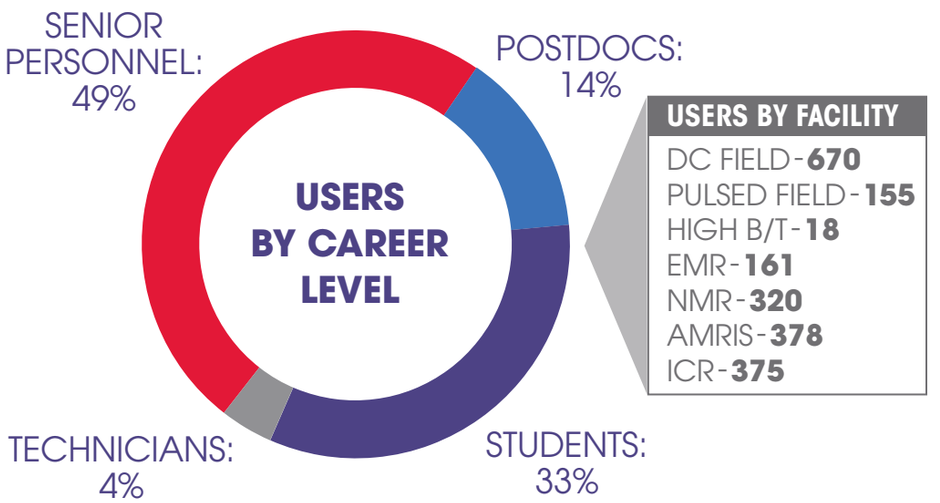
MAGLAB WORLD RECORDS:
16

TALKS, LECTURES AND PRESENTATIONS IN 19 COUNTRIES:
294

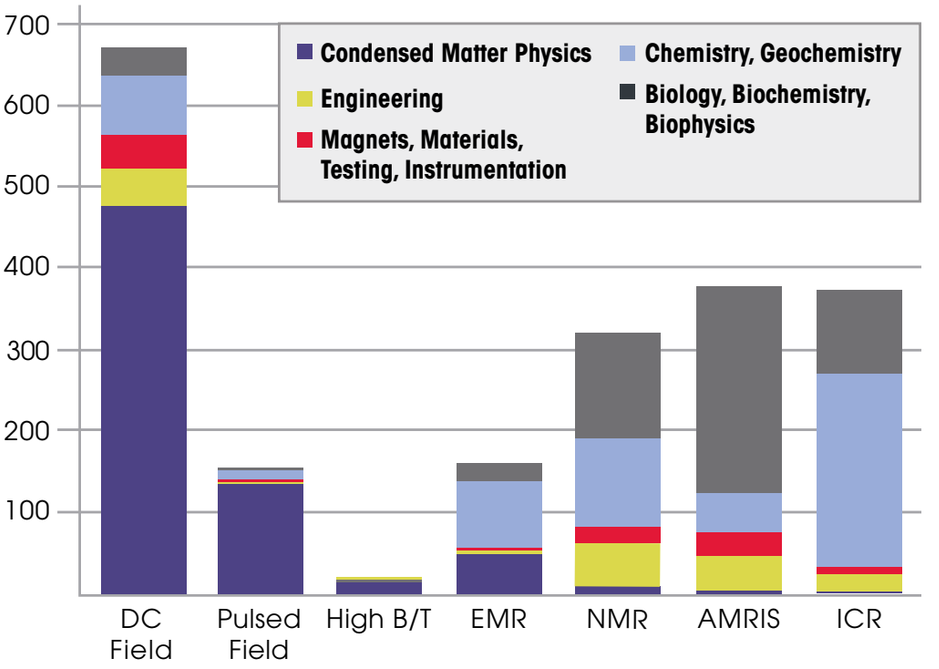
WHO OUR USERS ARE

High magnetic fields are a powerful research tool across many disciplines leading to groundbreaking discoveries that impact your life. The lab comprises 7 distinct user facilities that offer our researchers a wide range of research capabilities:

- **DC Field**
  Steady, continuous magnetic fields up to 45 T
- **Pulsed Field**
  Short, ultra-powerful magnetic fields up to 100 T
- **High B/T**
  Magnetic fields up to 15 T combined with ultra-cold temperatures of 0.4 mK
- **Electron Magnetic Resonance (EMR)**
  Magnetic resonance techniques associated with the electron
- **Nuclear Magnetic Resonance (NMR)**
  Solid & solution state NMR & animal imaging
- **Advanced Magnetic Resonance Imaging & Spectroscopy (AMRIS)**
  High-resolution solution and solid-state, NMR, animal imaging & human imaging
- **Ion Cyclotron Resonance (ICR)**
  Ultra-high resolution and high mass accuracy Fourier transform ion cyclotron resonance (FT-ICR) mass spectrometry



2018 USERS BY DISCIPLINE



31% OF STUDENT USERS ARE FEMALE. & **29%** OF POSTDOC USERS ARE FEMALE.

WHAT OUR USERS SAY

95% of users were satisfied with performance of the facilities and equipment.

94% of users were satisfied with the assistance provided by MagLab technical staff.

92% of users were satisfied with the proposal process.

Data reflects external users only. All users were surveyed anonymously.

"We performed a very difficult but a very successful experiment that opens a whole new world on optomagnetic polarization phase selective measurements using ultrafast pulses and very high magnetic field."

Kresimir Rupnik
Louisiana State University

"I received absolutely adequate support from staff scientists and also from students. They were very helpful, willing to stay at work long hours in order for me to get as much data as possible."

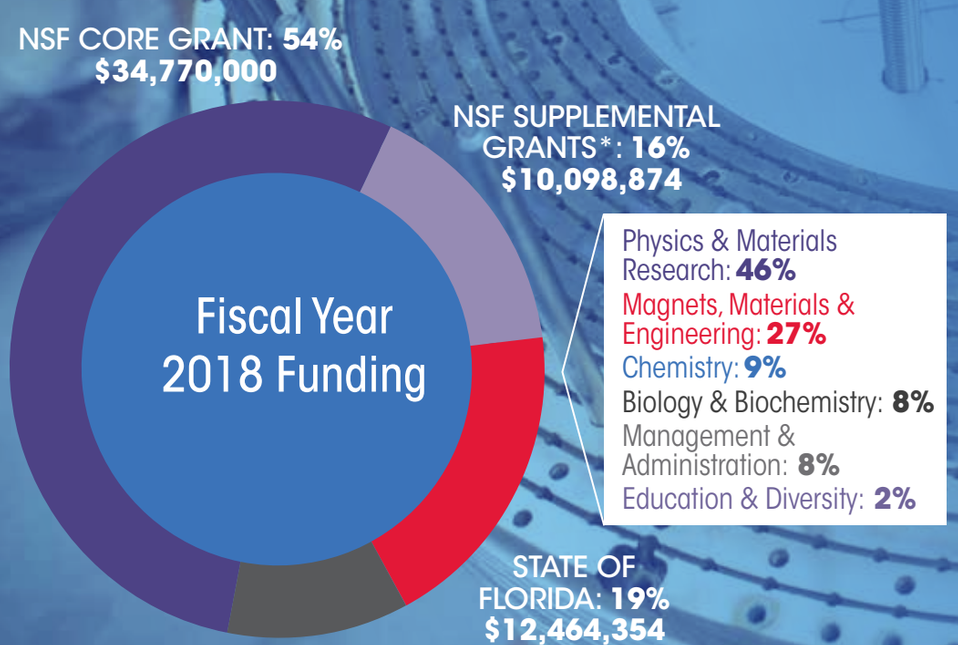
Stergios Piligkos
University of Copenhagen

INVESTING IN THE FUTURE

The National MagLab is funded by the National Science Foundation and the state of Florida, making you a stakeholder in our science. In return for your investment, we are positively impacting the nation's economy and making critical discoveries that will lead to the technologies of tomorrow.

BUDGET

TOTAL BUDGET: $64,247,788



*Funds provided in 2018 by the NSF primarily to update critical equipment at the MagLab and launch the development of a new 40-tesla all-superconducting magnet project.

**New 2018 awards from funding other than the NSF core grant and state of Florida.

ECONOMIC IMPACT

RETURN ON INVESTMENT

IN THE U.S., THE MAGLAB **ANNUALLY GENERATES**

$182 million in economic output

more than **1,560 jobs**

→

OVER THE NEXT 20 YEARS, **PROJECTED TO GENERATE**

$3.6 billion in economic output

more than **31,000 jobs**

$1 INVESTED BY THE STATE = **$6.57** ECONOMIC ACTIVITY IN FLORIDA

Source: Center for Economic Forecasting and Analysis at Florida State University 2013

CROSS-SECTOR PARTNERS

MagLab researchers and staff develop dynamic partnerships to help bring new technologies closer to the marketplace.

92 PARTNERSHIPS INCLUDING:

Siemens · Agilent Technologies · Bruker · SuperPower · Philips · Danfoss Turbocor

MAGLAB STAFF

The MagLab employs a diverse workforce that includes scientists, machinists, engineers, administrators, writers and even artists.

Total MagLab Staff: **788**

- Senior Personnel: **254**
- Other Professional: **88**
- Support Staff - Technical/ Managerial: **123**
- Support Staff - Clerical: **31**
- Postdoctoral: **55**
- Graduate Student: **168**
- Undergraduate Student: **69**

58% **of MagLab grad students are female.**

SPARKING CURIOSITY

Whether in a traditional classroom setting or on our website, within the walls of our lab or in universities around the globe, the National MagLab is committed to sharing our passion for science. We are growing the next generation of scientists and inspiring all individuals about the magic of discovery in high magnetic fields.

3 MILLION+

views to our **"See-Thru Science"** animations about electricity and magnetism on YouTube.

149

middle school students in long-term mentorship or camp programs, **82%** of whom were from underrepresented minority groups.

8,200+

visitors of all ages during our annual **5-hour** Open House event

1.3 MILLION+

website **pageviews**

85

scientists and staff reported conducting outreach to the community reaching **9,700+** people

Connect with us at **NationalMagLab.org** or by following us across social media.

Want to see our lab in person? Learn how at NationalMagLab.org/Visit