RESEARCH ENTERPRISE STRATEGIC PLAN 2023-2030

Strategic Research
THEMES AND SUB-THEMES

Texas A&M University's Research Enterprise Strategic Plan for 2023-2030 identifies six strategic research themes and 21 sub-themes that leverage Texas A&M's strengths, capacity and capabilities across multiple disciplines. These themes and sub-themes provide opportunities for Texas A&M to i) strengthen its tripartite mission of research, teaching and outreach; ii) advance research excellence and scholarship through collaborations; iii) address state, national and global challenges; iv) deliver significant societal impact; and v) elevate Texas A&M's status and ranking as a global research leader.

In addition, the themes align with the national and global research-and-development agenda and priorities of key federal research-and-development funding agencies—including Department of Defense and its Defense Advanced Research Projects Agency, National Institutes of Health, Department of Energy and its National Laboratories, National Aeronautics and Space Administration, National Science Foundation, Department of Agriculture, Department of Commerce and Department of Education—and the Texas Legislature.

Strategic initiatives that center around the research themes/sub-themes will be defined and developed, in consultation with the research enterprise community and stakeholders.

COMMUNITY, CULTURE AND ECONOMIC RESILIENCE
- Arts Ecosystem and Culture
- Human Development and Social Dynamics
- Workforce and Future of Work

EMERGING TECHNOLOGIES AND INNOVATIONS
- Artificial Intelligence, Learning and Autonomy
- Biotechnology and Biomanufacturing
- Data, Visualization and Information Technologies
- Microelectronics and Semiconductors
- Quantum Science and Technology

HEALTH AND QUALIFY OF LIFE
- Diagnostics, Treatments, Intervention and Cures
- Disease Prevention and Health Promotion
- Health Disparities and Community Health

NATIONAL SECURITY
- Biodefense and Biosecurity
- Cybersecurity
- Nuclear Security
- Advanced National Security Technologies

SPACE EXPLORATION
- Human Space Flight
- Space Engineering and Construction
- Earth and Planetary Sciences

SUSTAINABILITY AND ENVIRONMENT
- Climate Resilience and Mitigation
- Energy Transition/Clean Energy
- Food-Energy-Water (FEW) Nexus

The Texas A&M University *research enterprise* encompasses all elements that come together to address critical research needs (basic, applied or translational) including all stakeholders, resources and infrastructure. Delivering outcomes and results that promote knowledge growth and solve or prevent challenges for the public good are the basis for the research enterprise strategic plan.

SUB-THEMES

▶ ARTS ECOSYSTEM AND CULTURE

Examples of Research Areas of Strength/Opportunity within Texas A&M
Impact of arts on health & wellbeing, education and economy, community transformation and healing, adaptation to social, economic and technological challenges, public humanities, cultural heritage, historic creative activity, civics education, creative production and performance, use of new media and technologies in arts, and tourism

Alignment with National and Texas Legislative Priorities
NEA, NEH, NSF, NIH

Texas A&M Capacity (Initial Mapping of Alignment with Colleges, Schools, Agencies and *Centers/Institutes/Core Facilities*)
CAS, SEHD, PVFA, SOA (*HRRC, CHUD, CHC*), BUSH, LAW, LIBRARY, *GCHR, CoDHR, CSFA, CMAC, RESI*

▶ HUMAN DEVELOPMENT AND SOCIAL DYNAMICS

Examples of Research Areas of Strength/Opportunity within Texas A&M
Human resource development, change management, resilience, leadership development, social dynamics, policy, human factors, bioethics, education disparities

Alignment with National and Texas Legislative Priorities
NSF, NIH, DOED, NEA, USAID, UN

Texas A&M Capacity (Initial Mapping of Alignment with Colleges, Schools, Agencies and *Centers/Institutes/Core Facilities*)
SEHD, CAS, MAYS, PVFA, TEES (COE), HSC (SPH, SoN, SoM, SoP), AGLR (COALS), LAW, BUSH, AGEX, TEEX, TTI, *IECE*

▶ WORKFORCE AND FUTURE OF WORK

Examples of Research Areas of Strength/Opportunity within Texas A&M
Workforce development, future of work, cultures of work, policy, inclusive workforce

Alignment with National and Texas Legislative Priorities
NSF, NIH, DOED, USDA, DOC, CHIPS ACT, NEH, MULTI-AGENCY R&D, NATIONAL SECURITY, USAID, UN, TX

Texas A&M Capacity (Initial Mapping of Alignment with Colleges, Schools, Agencies and *Centers/Institutes/Core Facilities*)
SEHD, CAS, MAYS, PVFA, TEES (COE), AGLR (COALS), LAW, BUSH, AGEX, TEEX, TTI, *ERGO, ARCHI*

RESEARCH ENTERPRISE STRATEGIC PLAN 2023-2030

Research Theme 2

EMERGING TECHNOLOGIES *and* INNOVATIONS

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SUB-THEMES

▶ **ARTIFICIAL INTELLIGENCE, LEARNING AND AUTONOMY**

Examples of Research Areas of Strength/Opportunity within Texas A&M
Machine learning, deep learning, human-machine interactions, sensors, robotics, computer vision, ethics/policy, technology adoption

Alignment with National and Texas Legislative Priorities
NSF, NIH, DOD, DARPA, DOED, CHIPS ACT, MULTI-AGENCY R&D, NATIONAL LABS, SBIR/STTR

Texas A&M Capacity (Initial Mapping of Alignment with Colleges, Schools, Agencies and *Centers/Institutes/Core Facilities*)
TEES (COE), CAS, SEHD, AGLR (COALS), PVFA, HSC (SoM, SoP), BUSH, TTI, TAMIDS, SOA, (*GeoSAT*)

▶ **BIOTECHNOLOGY AND BIOMANUFACTURING**

Examples of Research Areas of Strength/Opportunity within Texas A&M
Synthetic biology, genomics, gene editing, genetic medicines and RNA/DNA vaccines, biomanufacturing

Alignment with National and Texas Legislative Priorities
NSF, NIH, DOE, DOD, DOC, DARPA, CHIPS ACT, MULTI-AGENCY R&D, NATIONAL BIOTECH, SBIR/STTR

Texas A&M Capacity (Initial Mapping of Alignment with Colleges, Schools, Agencies and *Centers/Institutes/Core Facilities*)
CAS, AGLR (COALS, VMBS), HSC (SoM, SoP), TEES, SEHD, *CPT, MIC, TxGEN, AggieFab, MCF, NCTM, SI, CIADM*

▶ **DATA, VISUALIZATION, AND INFORMATION TECHNOLOGIES**

Examples of Research Areas of Strength/Opportunity within Texas A&M
Digital twins, computing platforms, visualization, AR/VR technology, LED production stages, communicating with the future, policy

Alignment with National and Texas Legislative Priorities
NSF, NIH, USDA, DOC, DARPA, NEH, SBIR/STTR MULTI-AGENCY R&D, NATIONAL SECURITY, TX

Texas A&M Capacity (Initial Mapping of Alignment with Colleges, Schools, Agencies and *Centers/Institutes/Core Facilities*)
CAS, PVFA, SOA, TEES (COE), AGLR (COALS), SEHD, MAYS, BUSH, HSC (SPH), TTI, *HPRC, TAMIDS, ARCHI*

TEXAS A&M UNIVERSITY
Division of Research

RESEARCH ENTERPRISE STRATEGIC PLAN 2023-2030

SUB-THEMES

▶ **MICROELECTRONICS AND SEMICONDUCTORS**

Examples of Research Areas of Strength/Opportunity within Texas A&M

Analog and mixed signal circuits, artificial intelligence hardware, biosensors, brain-inspired computing, integrated photonics, intelligent and cognitive EM sensors, MEMS sensors and actuators, memristors and emergent memory devices, metrology, molecular computing, neuromorphic materials, radiation-hardened electronics, secure edge computing, 5G/6G technology, workforce development

Alignment with National and Texas Legislative Priorities

NSF, NIH, DOE, DOD, DOC, DARPA, CHIPS ACT, MULTI-AGENCY R&D, SBIR/STTR, TX

Texas A&M Capacity (Initial Mapping of Alignment with Colleges, Schools, Agencies and *Centers/Institutes/Core Facilities*)

TEES (COE), CAS, MAYS, SEHD, AGLR (COALS), *AggieFab, CI, HPRC, IQSE, MCF, NESC, TAMIDS*

▶ **QUANTUM SCIENCE AND TECHNOLOGY**

Examples of Research Areas of Strength/Opportunity within Texas A&M

Quantum sensing, quantum biology, quantum communications, quantum computing

Alignment with National and Texas Legislative Priorities

NSF, DOD, DARPA, MULTI-AGENCY R&D

Texas A&M Capacity (Initial Mapping of Alignment with Colleges, Schools, Agencies and *Centers/Institutes/Core Facilities*)

CAS, TEES (COE), AGLR (COALS), *IQSE*

Research Theme 3
HEALTH *and* QUALIFY OF LIFE

The Texas A&M University *research enterprise* encompasses all elements that come together to address critical research needs (basic, applied or translational) including all stakeholders, resources and infrastructure. Delivering outcomes and results that promote knowledge growth and solve or prevent challenges for the public good are the basis for the research enterprise strategic plan.

SUB-THEMES

▶ ### DIAGNOSTICS, TREATMENTS, INTERVENTION AND CURES

Examples of Research Areas of Strength/Opportunity within Texas A&M
Biomedical devices, diagnostic technologies, precision medicine, genetics/genomics, toxicology/environmental health, neuroscience, infectious diseases, zoonotic/emerging diseases, digital health, telehealth, cancer therapeutics/vaccines, cardiovascular diseases, communication and adoption, clinical trials and governance

Alignment with National and Texas Legislative Priorities
NIH, DARPA, DVA, DHA, HRSA, ARPA-H, MULTI-AGENCY, MULTI-AGENCY R&D, NATIONAL BIODEFENSE, USAID, UN, TX

Texas A&M Capacity (Initial Mapping of Alignment with Colleges, Schools, Agencies and *Centers/Institutes/Core Facilities*)
HSC (SoD, SoM, SoN, SoP, SPH), CAS, TEES (COE), ENMED, AGLR (COALS, VMBS), TVMDL, PVFA, SEHD, *CVRI, GHRC, CMDD, CPT, CTCR, HCRF, TAMIN, IQSE*

▶ ### DISEASE PREVENTION AND HEALTH PROMOTION

Examples of Research Areas of Strength/Opportunity within Texas A&M
Risk and protective factors, food-nutrition-health link, prevention of chronic diseases, stress management, vaccine development, emissions-energy-health interactions, health communication, hospitality and recreation

Alignment with National and Texas Legislative Priorities
NIH, USDA, MA, CDC, DHA, HRSA, ARPA-H, NEH, SBIR/STTR, UN, TX

Texas A&M Capacity (Initial Mapping of Alignment with Colleges, Schools, Agencies and *Centers/Institutes/Core Facilities*)
HSC (SoM, SoN, SPH), SEHD, SOA (*CHSD, CHUD*), AGLR (COALS, VMBS), AGEX, TTI, TEES, *IAH, IBT, CCHD, HCDC, GHRC, IIAD, CARTEEH*

▶ ### HEALTH DISPARITIES AND COMMUNITY HEALTH

Examples of Research Areas of Strength/Opportunity within Texas A&M
Rural and community health, racial/ethnic/socioeconomic health disparities, women's health and gender differences, military and operational medicine, humanitarian assistance/disaster response, health resilience, global health security and governance

Alignment with National and Texas Legislative Priorities
NIH, DOED, USAID, VA, DHA, NSF, HRSA, ARPA-H, NEH, MULTI-AGENCY R&D, UN, TX

Texas A&M Capacity (Initial Mapping of Alignment with Colleges, Schools, Agencies and *Centers/Institutes/Core Facilities*)
HSC (SoD, SoM, SoN, SoP, SPH), SEHD, SOA (*CHSD, CHUD*), CAS, AGLR (COALS), BUSH, TEES, AGEX, *CDC, IECE, IAH, CHEER, SRHRC, CCHA, HST*

The Texas A&M University *research enterprise* encompasses all elements that come together to address critical research needs (basic, applied or translational) including all stakeholders, resources and infrastructure. Delivering outcomes and results that promote knowledge growth and solve or prevent challenges for the public good are the basis for the research enterprise strategic plan.

SUB-THEMES

▶ BIODEFENSE AND BIOSECURITY

Examples of Research Areas of Strength/Opportunity within Texas A&M
Detection/forecasting, rapid response/contamination, pandemic response, one health, rapid therapy/vaccine development, applied biosafety/bio-risk mitigation, environmental surveillance, manufacturing, supply chain

Alignment with National and Texas Legislative Priorities
NIH, DOE, NL, DARPA, DHS, CDC, MULTI-AGENCY R&D, NATIONAL BIODEFENSE, NATIONAL SECURITY, NATIONAL LABS, SBIR/STTR, USAID

Texas A&M Capacity (Initial Mapping of Alignment with Colleges, Schools, Agencies and *Centers/Institutes/Core Facilities*)
HSC (SoM, SoP, SPH), CAS, TEES (COE), AGLR (COALS, VMBS), TDEM, TVMDL, TEEX, BUSH, *GHRC, IIAD, CBTS, IQSE, NCTM, CIADM, TEMAG, TxGEN*

▶ CYBERSECURITY

Examples of Research Areas of Strength/Opportunity within Texas A&M
Cybersecurity assessment, human dimensions, cyber modeling, privacy versus security, governance

Alignment with National and Texas Legislative Priorities
NSF, DOD, DOC, DOE, DARPA, AFOSR, CHIPS ACT, MULTI-AGENCY R&D, NATIONAL SECURITY, SBIR/STTR, NATIONAL LABS

Texas A&M Capacity (Initial Mapping of Alignment with Colleges, Schools, Agencies and *Centers/Institutes/Core Facilities*)
CAS, TEES (COE), LAW, MAYS, SEHD, TEEX, *CC, GCRI, HPRC, BCDC, CI, TAMC2*

▶ NUCLEAR SECURITY

Examples of Research Areas of Strength/Opportunity within Texas A&M
Arms control, nuclear terrorism, risk analysis, nuclear forensics, nuclear nonproliferation, nuclear power, policy

Alignment with National and Texas Legislative Priorities
DOD, DOE, NASA, DARPA, NATIONAL SECURITY, SBIR/STTR MULTI-AGENCY R&D

Texas A&M Capacity (Initial Mapping of Alignment with Colleges, Schools, Agencies and *Centers/Institutes/Core Facilities*)
TEES (COE), CAS, LAW, BUSH, *NPI, NSC, CI*

▶ ADVANCED NATIONAL SECURITY TECHNOLOGIES

Examples of Research Areas of Strength/Opportunity within Texas A&M
Directed energy; hypersonic technology; ballistics; encryption; systems engineering; materials for extreme environments; policy

Alignment with National and Texas Legislative Priorities
DOD, DOE, NASA, DARPA, NATIONAL SECURITY, SBIR/STTR, MULTI-AGENCY R&D

Texas A&M Capacity (Initial Mapping of Alignment with Colleges, Schools, Agencies and *Centers/Institutes/Core Facilities*)
TEES (COE), CAS, LAW, BUSH, TTI, *BCDC*

Research Theme 5
SPACE EXPLORATION

The Texas A&M University *research enterprise* encompasses all elements that come together to address critical research needs (basic, applied or translational) including all stakeholders, resources and infrastructure. Delivering outcomes and results that promote knowledge growth and solve or prevent challenges for the public good are the basis for the research enterprise strategic plan.

SUB-THEMES

▶ **HUMAN SPACE FLIGHT**

Examples of Research Areas of Strength/Opportunity within Texas A&M
Human factors and behavioral performance, human health countermeasures, space radiation, exploration medical capability, research operations and integration, food/ nutrition, space humanities

Alignment with National and Texas Legislative Priorities
NASA, DOC, AFOSR, CHIPS ACTS, NATIONAL LABS

Texas A&M Capacity (Initial Mapping of Alignment with Colleges, Schools, Agencies and *Centers/Institutes/Core Facilities*)
HSC (SoM, SoN, SoP, SPH), TEES (COE), CAS, AGLR (COALS), SEHD, PVFA, BUSH

▶ **SPACE ENGINEERING AND CONSTRUCTION**

Examples of Research Areas of Strength/Opportunity within Texas A&M
Aerospace power and energy storage; robotics, sensors, and autonomous systems; robotics space flight; materials and manufacturing; space food systems

Alignment with National and Texas Legislative Priorities
DOD, NASA, DOE, DARPA, AFOSR, CHIPS ACT, SBIR/STTR, MULTI-AGENCY R&D

Texas A&M Capacity (Initial Mapping of Alignment with Colleges, Schools, Agencies and *Centers/Institutes/Core Facilities*)
TEES (COE), CAS, SOA, PVFA, AGLR (COALS), *CI*

▶ **EARTH AND PLANETARY SCIENCES**

Examples of Research Areas of Strength/Opportunity within Texas A&M
Earth science, astrophysics, astrobiology, planetary science, exoplanets, space domain awareness, remote communications, asteroid detection and deflection

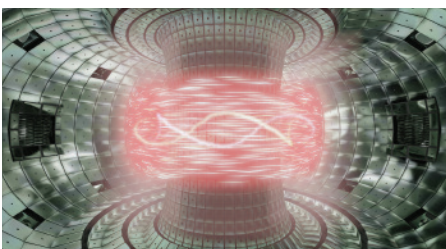**Alignment with National and Texas Legislative Priorities**
NASA, DOC, DOD, AFOSR, CHIPS ACT, NATIONAL SECURITY, NATIONAL LABS

Texas A&M Capacity (Initial Mapping of Alignment with Colleges, Schools, Agencies and *Centers/Institutes/Core Facilities*)
CAS, TEES (COE), LAW, IQSE, *CI*

TEXAS A&M UNIVERSITY

Research Theme 6
SUSTAINABILITY *and* ENVIRONMENT

The Texas A&M University *research enterprise* encompasses all elements that come together to address critical research needs (basic, applied or translational) including all stakeholders, resources and infrastructure. Delivering outcomes and results that promote knowledge growth and solve or prevent challenges for the public good are the basis for the research enterprise strategic plan.

SUB-THEMES

▶ **CLIMATE RESILIENCE AND MITIGATION**

Examples of Research Areas of Strength/Opportunity within Texas A&M
Climate resilience/mitigation, coastal resiliency, blue economy, carbon capture, environmental ethics/humanities and policy

Alignment with National and Texas Legislative Priorities
NSF, DOE, USDA, DOC, CHIPS ACT, NATIONAL SECURITY, NATIONAL LABS, NEH, MULTI-AGENCY R&D, USAID, UN

Texas A&M Capacity (Initial Mapping of Alignment with Colleges, Schools, Agencies and *Centers/Institutes/Core Facilities*)
CAS, AGLR (COALS, VMBS), TEES (COE), SOA, SEHD, BUSH, MAYS, HSC (SPH), Galveston, Qatar, TDEM, PVFA, TTI, *TSG, TIO, NRI, EI, TCCS, ISTPP, NBI, TWRI*

▶ **ENERGY TRANSITION/CLEAN ENERGY**

Examples of Research Areas of Strength/Opportunity within Texas A&M
Biomass/renewables, nuclear reactors, hydrogen economy, smart grid/infrastructure of the future, electrification, decarbonization, energy storage, critical materials, simulations of scenarios of energy of the future, response, training and policy

Alignment with National and Texas Legislative Priorities
NSF, DOE, USDA, DOC, DOT, AFOSR, CHIPS ACT, NATIONAL SECURITY, NATIONAL LABS, ARPA-E, SBIR/STTR, MULTI-AGENCY R&D, UN, TX

Texas A&M Capacity (Initial Mapping of Alignment with Colleges, Schools, Agencies and *Centers/Institutes/Core Facilities*)
TEES (COE), CAS, AGLR (COALS), MAYS, PVFA, SEHD, SOA, (CHUD, CHSD) BUSH, LAW, TEEX, TTI, Qatar, *EI, CIR, NCEBR, IQSE, CI*

▶ **FOOD-ENERGY-WATER (FEW) NEXUS**

Examples of Research Areas of Strength/Opportunity within Texas A&M
Development and application of integrated tools/platforms to inform the decision-making process for FEW resilience, assessment of the sustainability of FEW systems, water quality decision support system, FEW and health, food security, clean water, response, training and policy

Alignment with National and Texas Legislative Priorities
NSF, DOE, USDA, NIH, CHIPS ACT, NATIONAL LABS, NATIONAL SECURITY, USAID, UN, TX

Texas A&M Capacity (Initial Mapping of Alignment with Colleges, Schools, Agencies and *Centers/Institutes/Core Facilities*)
CAS, AGLR (COALS), TEES (COE), AGEX, SEHD, BUSH, SOA, MAYS, PVFA, HSC (SPH), TEEX, Galveston, *TSG, TWRI, EI, NBI*