Exhibit R-2, RDT&E Budget Item Justification: PB 2024 Air Force											Date: March 2023	
Appropriation/Budget Activity 3600: *Research, Development, Test & Evaluation, Air Force* / BA 1: *Basic Research*					R-1 Program Element (Number/Name) PE 0601102F / *Defense Research Sciences*							
COST ($ in Millions)	**Prior Years**	**FY 2022**	**FY 2023**	**FY 2024 Base**	**FY 2024 OCO**	**FY 2024 Total**	**FY 2025**	**FY 2026**	**FY 2027**	**FY 2028**	**Cost To Complete**	**Total Cost**
Total Program Element	0.000	331.118	406.125	401.486	0.000	401.486	382.183	399.768	407.209	433.283	Continuing	Continuing
613001: *Physics and Electronics*	0.000	70.930	118.359	117.740	0.000	117.740	111.853	114.611	116.067	122.242	Continuing	Continuing
613002: *Aerospace, Chemical and Material Sciences*	0.000	76.461	123.618	117.926	0.000	117.926	106.418	109.926	115.385	120.411	Continuing	Continuing
613003: *Mathematics, Information and Life Sciences*	0.000	69.387	124.835	118.511	0.000	118.511	113.258	116.009	117.709	123.734	Continuing	Continuing
613004: *Education and Outreach*	0.000	114.340	39.313	38.911	0.000	38.911	39.734	47.088	46.525	54.129	Continuing	Continuing
613005: *STEM Pipeline Development*	0.000	0.000	0.000	8.398	0.000	8.398	10.920	12.134	11.523	12.767	Continuing	Continuing

A. Mission Description and Budget Item Justification

Defense Research Sciences consists of extramural research activities in academia and industry along with in-house research performed in the Air Force Research Laboratory. This program supports basic broad-based scientific and engineering research in areas critical to Department of the Air Force weapon, sensor, and support systems. All research areas are subject to long-range planning and technical review by both Department of the Air Force and tri-Service scientific planning groups. Efforts in this program have been coordinated through the Department of Defense (DoD) Science and Technology (S&T) Executive Committee process to harmonize efforts and eliminate duplication.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver science & technology capabilities. The use of program funds in this program element would be in addition to the civilian pay expenses budgeted in program elements 0602102F, 0602201F, 0602202F, 0602203F, 0602204F, 0602602F, 0602605F, 0602788F, 0602298F, and 1206601SF.

This program element may include necessary expenses to support the operation and maintenance of facilities to manage, execute, and deliver science and technology capabilities.

Funds in this program element may be used to investigate specified science advancements in air, space and/or cyber domains.

This program is in Budget Activity 1, Basic Research because this budget activity includes scientific study and experimentation directed toward increasing fundamental knowledge and understanding in those fields of the physical, engineering, environmental, and life sciences related to long-term national security needs.

Exhibit R-2, RDT&E Budget Item Justification: PB 2024 Air Force	Date: March 2023
Appropriation/Budget Activity 3600: *Research, Development, Test & Evaluation, Air Force* / BA 1: *Basic Research*	**R-1 Program Element (Number/Name)** PE 0601102F / *Defense Research Sciences*

B. Program Change Summary ($ in Millions)	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total
Previous President's Budget	353.303	375.325	376.916	0.000	376.916
Current President's Budget	331.118	406.125	401.486	0.000	401.486
Total Adjustments	-22.185	30.800	24.570	0.000	24.570
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	30.800			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	-9.053	0.000			
• Other Adjustments	-13.132	0.000	24.570	0.000	24.570

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2022	FY 2023
Project: 613001: *Physics and Electronics*		
Congressional Add: *Program Increase - basic research*	0.000	8.000
Congressional Add Subtotals for Project: 613001	0.000	8.000
Project: 613002: *Aerospace, Chemical and Material Sciences*		
Congressional Add: *Program Increase - basic research*	0.000	8.000
Congressional Add Subtotals for Project: 613002	0.000	8.000
Project: 613003: *Mathematics, Information and Life Sciences*		
Congressional Add: *Program Increase - basic research*	0.000	8.000
Congressional Add: *Program increase - Space Force human performance optimization research*	-	5.800
Congressional Add Subtotals for Project: 613003	0.000	13.800
Project: 613004: *Education and Outreach*		
Congressional Add: *Program increase: basic research*	24.359	1.000
Congressional Add Subtotals for Project: 613004	24.359	1.000
Congressional Add Totals for all Projects	24.359	30.800

Exhibit R-2A, RDT&E Project Justification: PB 2024 Air Force			Date: March 2023
Appropriation/Budget Activity 3600 / 1	R-1 Program Element (Number/Name) PE 0601102F / *Defense Research Sciences*	Project (Number/Name) 613001 / *Physics and Electronics*	

COST ($ in Millions)	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
613001: *Physics and Electronics*	0.000	70.930	118.359	117.740	0.000	117.740	111.853	114.611	116.067	122.242	Continuing	Continuing

A. Mission Description and Budget Item Justification

Basic research in the Physics and Electronics Project seeks to enable revolutionary advances and expand the fundamental knowledge supporting technologies critical to the future of the Department of the Air Force. Research prioritizes high-risk, high-reward, game-changing capability breakthroughs essential for future leaps in warfighter system performance, functionality, reliability, and survivability while simultaneously reducing component and system power, size, mass, and life cycle costs. Major areas being investigated in this project are complex electronics and fundamental quantum processes; plasma physics and high energy density non-equilibrium processes; and lasers and optics, electromagnetics, communication, and signal processing. While the following specific efforts are the focus of the project, there is interest in exploring novel ideas that may bridge these major efforts as well as those in the other projects within this program.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Title: Complex Electronics and Fundamental Quantum Processes	28.372	44.144	47.096
Description: Scientific focus areas are atomic and molecular physics, photonics, quantum electronic solids, gigahertz-terahertz electronics and material, semiconductor and electromagnetic materials, and optoelectronics.			
FY 2023 Plans: Explore a wide range of complex materials and devices, including non-linear optical materials, photonics, optoelectronics, metamaterials, cathodes, dielectric and magnetic materials, memristive systems, new classes of high-temperature superconductors, quantum dots, quantum wells and graphene. Includes generating and controlling quantum states, such as superposition and entanglement, in photonic systems, quantum dots and defects in solids, and ultracold atoms and molecules.			
FY 2024 Plans: Continue exploring a wide range of complex materials and devices, including non-linear optical materials, photonics, optoelectronics, metamaterials, cathodes, dielectric and magnetic materials, memristive systems, new classes of high-temperature superconductors, quantum dots, quantum wells and graphene. Includes generating and controlling quantum states, such as superposition and entanglement, in photonic systems, quantum dots and defects in solids, and ultracold atoms and molecules.			
FY 2023 to FY 2024 Increase/Decrease Statement: FY 2024 increased compared to FY 2023 by $2.952 million. Funding increased due to added emphasis in quantum information sciences and GHz-THz Electronics.			
Title: Plasma Physics and High Energy Density Non-Equilibrium Processes	14.186	23.175	24.725
Description: Scientific focus areas are plasma, electro-energetic physics and space sciences.			
FY 2023 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2024 Air Force		Date: March 2023
Appropriation/Budget Activity 3600 / 1	**R-1 Program Element (Number/Name)** PE 0601102F / *Defense Research Sciences*	**Project (Number/Name)** 613001 / *Physics and Electronics*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Explore a wide range of activities characterized by processes sufficiently energetic to require understanding and managing plasma phenomenology and the non-linear response of materials to high electric and magnetic fields. Includes space weather, plasma discharges, radio frequency propagation, radio frequency-plasma interaction, and high-power, beam-driven microwave devices. ***FY 2024 Plans:*** Continue exploring a wide range of activities characterized by processes sufficiently energetic to require understanding and managing plasma phenomenology and the non-linear response of materials to high electric and magnetic fields. Includes space weather, plasma discharges, radio frequency propagation, radio frequency-plasma interaction, and high-power, beam-driven microwave devices. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** FY 2024 increased compared to FY 2023 by $1.550 million. Funding increased due to added emphasis in high energy radiation-matter interactions research.			
Title: Lasers and Optics, Electromagnetics, Communication and Signal Processing ***Description:*** Scientific focus areas are physical mathematics and applied analysis, novel computational methods, electromagnetics and wave propagation in complex media, ultra-fast dynamics, for revolutionary approaches to remote sensing and imaging physics, and surveillance and navigation, including both air and the space environment from near Earth to cis-lunar trajectories. ***FY 2023 Plans:*** Explore all aspects of producing and receiving electromagnetic and electro-optical signals, as well as their propagation through complex media, including adaptive optics and optical imaging. Continue to investigate aspects of the phenomenology of lasers including high energy lasers, non-linear optics, and ultra-short pulse laser science. Includes the development of sophisticated mathematics and algorithm development for extracting information from complex and/or sparse signals as well as calculating astrodynamical spacecraft orbits. ***FY 2024 Plans:*** Continue exploring all aspects of producing and receiving electromagnetic and electro-optical signals, as well as their propagation through complex media, including adaptive optics and optical imaging. Continue to investigate aspects of the phenomenology of lasers including high energy lasers, non-linear optics, and ultra-short pulse laser science. Includes the development of sophisticated mathematics and algorithm development for extracting information from complex and/or sparse signals as well as calculating astrodynamical spacecraft orbits. ***FY 2023 to FY 2024 Increase/Decrease Statement:***	28.372	43.040	45.919

Exhibit R-2A, RDT&E Project Justification: PB 2024 Air Force		Date: March 2023
Appropriation/Budget Activity 3600 / 1	**R-1 Program Element (Number/Name)** PE 0601102F / *Defense Research Sciences*	**Project (Number/Name)** 613001 / *Physics and Electronics*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
FY 2024 increased compared to FY 2023 by $2.879 million. Funding increased due to added emphasis in astrodynamics.			
Accomplishments/Planned Programs Subtotals	70.930	110.359	117.740

	FY 2022	FY 2023
Congressional Add: Program Increase - basic research	0.000	8.000
FY 2022 Accomplishments: Not Applicable		
FY 2023 Plans: Conducted Congressionally directed effort.		
Congressional Adds Subtotals	0.000	8.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Not Applicable

Exhibit R-2A, RDT&E Project Justification: PB 2024 Air Force			Date: March 2023
Appropriation/Budget Activity 3600 / 1	R-1 Program Element (Number/Name) PE 0601102F / *Defense Research Sciences*	Project (Number/Name) 613002 / *Aerospace, Chemical and Material Sciences*	

COST ($ in Millions)	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
613002: *Aerospace, Chemical and Material Sciences*	0.000	76.461	123.618	117.926	0.000	117.926	106.418	109.926	115.385	120.411	Continuing	Continuing

A. Mission Description and Budget Item Justification

Mission Description and Budget Item Justification Basic research in the Aerospace, Chemical, and Materials Sciences Project seeks to enable revolutionary advances and expand the fundamental knowledge supporting technologies critical to the future of the Department of the Air Force. Research stresses high-risk, high-reward, game-changing capability breakthroughs essential for future leaps in warfighter system performance, functionality, reliability, and survivability while simultaneously reducing component and system power, size, mass, and life cycle costs. Research topics include: aero-structure interactions and control; energy, power, and propulsion; complex materials and structures; and cross-disciplinary research reflecting the highly integrated nature of future weapon systems.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Title: Aero-Structure Interactions and Control	22.938	34.685	35.378
Description: Scientific focus areas are high temperature aerospace materials, non-equilibrium aerothermodynamics and chemistry, unsteady, compressible flow turbulence, multiscale fluid-material interactions, and flow control. ***FY 2023 Plans:*** Investigate the characterization, modeling, and exploitation of interactions between the unsteady aerodynamic flow field and the dynamic air vehicle structure to enable enhanced performance in next generation Department of the Air Force systems. Explore the synergy gained from an interdisciplinary look at multiple technologies and the integration of core disciplines of fluid mechanics, high-performance structures, and thermodynamics. ***FY 2024 Plans:*** Continue investigating the characterization, modeling, and exploitation of interactions between the unsteady aerodynamic flow field and the dynamic air vehicle structure to enable enhanced performance in next generation Department of the Air Force systems. Continue to explore the synergy gained from an interdisciplinary look at multiple technologies and the integration of core disciplines of fluid mechanics, high-performance structures, and thermodynamics. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** FY 2024 increased compared to FY 2023 by $0.693 million. Funds increased as described in above plans.			
Title: Energy, Power, and Propulsion	22.939	35.842	36.557
Description: Scientific focus areas are thermal control, theoretical chemistry, molecular dynamics, power and propulsion, and combustion and diagnostics.			

Exhibit R-2A, RDT&E Project Justification: PB 2024 Air Force		Date: March 2023
Appropriation/Budget Activity 3600 / 1	**R-1 Program Element (Number/Name)** PE 0601102F / *Defense Research Sciences*	**Project (Number/Name)** 613002 / *Aerospace, Chemical and Material Sciences*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
FY 2023 Plans: Exploit technological innovations and develop potentially revolutionary technologies by integrating core disciplines of combustion, plasma dynamics, chemistry, hydrodynamics, structural dynamics, and multi-fidelity simulations. Investigate processes associated with the generation, storage, and utilization of energy, specifically for Department of the Air Force systems including developing novel energetic materials as well as understanding optimizing and controlling combustion processes. ***FY 2024 Plans:*** Continue developing potentially revolutionary scientific advances by integrating core disciplines of combustion, plasma dynamics, chemistry, hydrodynamics, structural dynamics, and multi-fidelity simulations. Continue to investigate processes associated with the generation, storage, and utilization of energy, specifically for Department of the Air Force systems including developing novel energetic materials as well as understanding optimizing and controlling combustion processes. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** FY 2024 increased compared to FY 2023 by $0.715 million. Funds increased as described in above plans.			
Title: Complex Materials and Structures ***Description:*** Scientific focus areas are design, manufacturing, and dynamics and control of multifunctional materials and microsystems, multi-scale mechanics, diagnostics and prognosis, and physio-chemistry of novel organic materials. ***FY 2023 Plans:*** Investigate multifunctional materials and structures composed of different classes of materials, both organic and inorganic, that can adapt to environmental constraints or mission requirements. Explore complex materials, microsystems, and structures that incorporate hierarchical design and functionality from the nano-scale through the mesoscale, ultimately leading to controlled, well understood material or structural behavior capable of dynamic functionality and/or performance characteristics to enhance mission versatility. ***FY 2024 Plans:*** Continue investigating multifunctional materials and structures composed of different classes of materials, both organic and inorganic, that can adapt to environmental constraints or mission requirements. Continue to explore complex materials, microsystems, and structures that incorporate hierarchical design and functionality from the nano-scale through the mesoscale, ultimately leading to controlled, well-understood material or structural behavior capable of dynamic functionality and/or performance characteristics to enhance mission versatility. ***FY 2023 to FY 2024 Increase/Decrease Statement:***	30.584	45.091	45.991

Exhibit R-2A, RDT&E Project Justification: PB 2024 Air Force		Date: March 2023
Appropriation/Budget Activity 3600 / 1	**R-1 Program Element (Number/Name)** PE 0601102F / *Defense Research Sciences*	**Project (Number/Name)** 613002 / *Aerospace, Chemical and Material Sciences*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
FY 2024 increased compared to FY 2023 by $0.900 million. Funds increased as described in above plans.			
Accomplishments/Planned Programs Subtotals	76.461	115.618	117.926

	FY 2022	FY 2023
Congressional Add: Program Increase - basic research	0.000	8.000
FY 2022 Accomplishments: Not Applicable		
FY 2023 Plans: Conduct Congressionally directed effort.		
Congressional Adds Subtotals	0.000	8.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Not Applicable

Exhibit R-2A, RDT&E Project Justification: PB 2024 Air Force			Date: March 2023
Appropriation/Budget Activity 3600 / 1	R-1 Program Element (Number/Name) PE 0601102F / *Defense Research Sciences*	Project (Number/Name) 613003 / *Mathematics, Information and Life Sciences*	

COST ($ in Millions)	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
613003: *Mathematics, Information and Life Sciences*	0.000	69.387	124.835	118.511	0.000	118.511	113.258	116.009	117.709	123.734	Continuing	Continuing

A. Mission Description and Budget Item Justification

Mission Description and Budget Item Justification Basic research in the Mathematics, Information Sciences, and Life Sciences Project seeks to expand fundamental knowledge and enable revolutionary advances and supporting technologies critical to the future of the Department of the Air Force. Major areas being investigated in this project are data fusion, machine learning and artificial intelligence, information and complex networks, cyber-security, autonomous decision making, dynamical systems, optimization and control, and natural materials and systems. While the following are specific sub-areas within this project, there is a continuing interest to explore novel ideas to bridge disciplines within this program.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Title: Information and Complex Networks	17.347	27.759	29.628
Description: Scientific focus areas are information operations and security, data and information fusion, advanced computing, artificial intelligence and complex networks. ***FY 2023 Plans:*** Design and analyze techniques to enable reliable and secure exchange of information and predictable operation of networks and systems, including hardware and software interactions. Investigate traditional aspects of information assurance with an emphasis on the underlying mathematics of secure-by-design architectures of networked communications and neural information processing. Analyze, optimize and design multi-scale networks with resilient features against noise and corruption from difficult environments and adversarial operations, using rigorous mathematical models of information exchange, physical operations, and human-machine interactions. Develop new computing approaches and algorithms for network-of-network information processing at the speed of warfare and new mathematical approaches for predictive, multi-scale and multi-physics simulations of Department of the Air Force systems and systems-of-systems in realistic environments. ***FY 2024 Plans:*** Continue designing and analyzing techniques to enable reliable and secure exchange of information and predictable operation of networks and systems, including hardware and software interactions. Investigate traditional aspects of information assurance with an emphasis on the underlying mathematics of secure-by-design architectures of networked communications and neural information processing. Analyze, optimize and design multi-scale networks with resilient features against noise and corruption from difficult environments and adversarial operations, using rigorous mathematical models of information exchange, physical operations, and human-machine interactions. Develop new computing approaches and algorithms for network-of-network			

Exhibit R-2A, RDT&E Project Justification: PB 2024 Air Force		Date: March 2023
Appropriation/Budget Activity 3600 / 1	**R-1 Program Element (Number/Name)** PE 0601102F / *Defense Research Sciences*	**Project (Number/Name)** 613003 / *Mathematics, Information and Life Sciences*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
information processing at the speed of warfare and new mathematical approaches for predictive, multi-scale and multi-physics simulations of Department of the Air Force systems and systems-of-systems in realistic environments. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** FY 2024 increased compared to FY 2023 by $1.869 million. Funding increased due to added emphasis in information assurance and cybersecurity research.			
Title: Decision Making ***Description:*** Scientific focus areas are mathematical modeling of cognition and decision making, development and testing of advanced representations and processes for higher-level artificial intelligence, trust between humans and autonomous agents, mixed human-machine decision making, and computational social science for asymmetric threat detection and predictive largescale influence. ***FY 2023 Plans:*** Investigate new mathematical laws, scientific principles, and robust algorithms that underlie intelligent, mixed human-machine decision-making to achieve accurate real-time integration of human expertise and knowledge into a machine-based battlespace network. Develop new mathematical models for information capture; object, scene and relation identification; and multi-level reasoning and meta-learning. Advance the critical knowledge base in modeling of individual and group cognitive processing and decision making, and construct advanced methodologies for predictive, verifiable simulations of large-scale socio-cultural and human-machine hybrid networks. ***FY 2024 Plans:*** Continue investigating new mathematical laws, scientific principles, and robust algorithms that underlie intelligent, mixed human-machine decision-making to achieve accurate real-time integration of human expertise and knowledge into a machine based battlespace network. Continue to develop new mathematical models for information capture; object, scene and relation identification; and multi-level reasoning and meta-learning. Continue to advance the critical knowledge base in modeling of individual and group cognitive processing and decision making, and construct advanced methodologies for predictive, verifiable simulations of large-scale socio-cultural and human-machine hybrid networks. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** FY 2024 increased compared to FY 2023 by $1.495 million. Funding increased due to added emphasis in artificial intelligence and human-machine teaming research.	13.877	22.207	23.702
Title: Dynamical Systems, Optimization, and Control ***Description:*** Scientific focus areas are computer models of dynamical data and communication networks, data-fusion, dynamics and control theory for multi-scale and complex networks, and mathematics of distributed optimization in uncertain, variable,	17.347	28.869	30.813

Exhibit R-2A, RDT&E Project Justification: PB 2024 Air Force		Date: March 2023
Appropriation/Budget Activity 3600 / 1	**R-1 Program Element (Number/Name)** PE 0601102F / *Defense Research Sciences*	**Project (Number/Name)** 613003 / *Mathematics, Information and Life Sciences*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
continuous and discrete networked systems. Includes the development of advanced computing architectures for solving optimization and data-fusion problems in real time and by embedded processors in autonomous or semi-autonomous platforms. ***FY 2023 Plans:*** Develop new scientific concepts supported by rigorous analysis for advancing the science of autonomy and promoting the understanding necessary to analyze and design complex multi-scale systems as well as provide guaranteed levels of performance. Develop novel adaptive control strategies for coordinating heterogeneous, autonomous, or semi-autonomous aerospace vehicles in uncertain, information rich, dynamically changing, adversarial, and networked environments. ***FY 2024 Plans:*** Continue developing new scientific concepts supported by rigorous analysis for advancing the science of autonomy and promoting the understanding necessary to analyze and design complex multi-scale systems as well as provide guaranteed levels of performance. Continue to develop novel adaptive control strategies for coordinating heterogeneous, autonomous, or semiautonomous aerospace vehicles in uncertain, information rich, dynamically changing, adversarial, and networked environments. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** FY 2024 increased compared to FY 2023 by $1.944 million. Funding increased due to added emphasis in machine learning and computational mathematics.			
Title: Natural Materials and Systems ***Description:*** Scientific focus areas are natural materials and nature inspired systems, human performance and biosystems, cognitive neuroscience and biophysics. ***FY 2023 Plans:*** Investigate multi-disciplinary approaches for studying, using, mimicking, synthesizing and adapting to the ways natural systems are built, assembled and organized, and functioning to accomplish their objectives. Develop a fundamental understanding of biochemical mechanisms and control procedures for the production and manufacture of natural materials, and develop reverse engineering approaches to optimize the bio-chemical functionality. Develop approaches to adapt, blend and mimic existing natural sensory systems and neural systems of varying complexity, to add existing capabilities to these organisms and design in-silico replicas with similar or advanced capabilities. ***FY 2024 Plans:*** Continue investigating multi-disciplinary approaches for studying, using, mimicking, synthesizing and adapting to the ways natural systems are built, assembled and organized, and functioning to accomplish their objectives. Continue to develop a fundamental understanding of bio-chemical mechanisms and control procedures for the production and manufacture of natural materials and	20.816	32.200	34.368

Exhibit R-2A, RDT&E Project Justification: PB 2024 Air Force		Date: March 2023
Appropriation/Budget Activity 3600 / 1	**R-1 Program Element (Number/Name)** PE 0601102F / *Defense Research Sciences*	**Project (Number/Name)** 613003 / *Mathematics, Information and Life Sciences*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
develop reverse-engineering approaches to optimize the bio-chemical functionality. Continue to develop approaches to adapt, blend and mimic existing natural sensory systems and neural systems of varying complexity, to add existing capabilities to these organisms and design in-silico replicas with similar or advanced capabilities. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** FY 2024 increased compared to FY 2023 by $2.168 million. Funding increased due to added emphasis in human performance and bio-systems research.			
Accomplishments/Planned Programs Subtotals	69.387	111.035	118.511

	FY 2022	FY 2023
Congressional Add: Program Increase - basic research ***FY 2022 Accomplishments:*** Not Applicable ***FY 2023 Plans:*** Conduct Congressionally directed effort.	0.000	8.000
Congressional Add: Program increase - Space Force human performance optimization research ***FY 2023 Plans:*** Conduct Congressionally directed effort.	-	5.800
Congressional Adds Subtotals	0.000	13.800

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Not Applicable

Exhibit R-2A, RDT&E Project Justification: PB 2024 Air Force			Date: March 2023
Appropriation/Budget Activity 3600 / 1	R-1 Program Element (Number/Name) PE 0601102F / *Defense Research Sciences*	Project (Number/Name) 613004 / *Education and Outreach*	

COST ($ in Millions)	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
613004: *Education and Outreach*	0.000	114.340	39.313	38.911	0.000	38.911	39.734	47.088	46.525	54.129	Continuing	Continuing

A. Mission Description and Budget Item Justification

The major efforts in the Science and Technology (S&T) Education and Outreach Project are to facilitate interactions between the international and domestic research communities and Department of the Air Force researchers, and to develop scientists and engineers with an awareness of Department of the Air Force basic research priorities. These professional interactions and collaborations benefit the Department of the Air Force by increasing awareness of basic research priorities in the research community as a whole and attracting talented scientists and engineers to address Department of the Air Force needs. International interactions foster relationships with scientific partners and leverage international expertise in nascent scientific developments. This project also seeks to enhance interactions with Historically Black Colleges and Universities, Hispanic serving institutions, and other minority institutions.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Title: Outreach to International S&T Community	32.393	13.410	14.008
Description: Foster international basic research cooperation by supporting direct interchanges with a broad range of key international researchers and communities. Identify and leverage international scientific advances when appropriate. ***FY 2023 Plans:*** Leverage international expertise and support international technology liaison missions to identify and maintain awareness of foreign science and technology developments. Explore current foreign investments and influence world-class scientific research on specific topics of interest to the Department of the Air Force. Pursue access to technical information on foreign research capabilities within our interests. Support international visits by scientists and high-level DoD science and technology delegations and provide a primary interface to coordinate international science and technology participation among DoD organizations. ***FY 2024 Plans:*** Continue leveraging international expertise to identify and maintain awareness of foreign scientific developments. Continue to explore foreign investments and influence world-class scientific research on specific topics of interest to the Department of the Air Force. Continue to pursue access to fundamental scientific discoveries outside the U.S. relevant to the Department of the Air Force. Continue to support international visits by scientists and high-level DoD fundamental science delegations, providing primary interface to coordinate international science and technology participation among DoD organizations. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** FY 2024 increased compared to FY 2023 by $0.598 million. Funds increased as described in above plans.			
Title: Outreach to U.S. S&T Workforce	57.588	24.903	24.903
Description: Strengthen science, mathematics, and engineering research and infrastructure in the U.S., thereby strengthening current and future Department of the Air Force S&T capabilities.			

Exhibit R-2A, RDT&E Project Justification: PB 2024 Air Force		Date: March 2023
Appropriation/Budget Activity 3600 / 1	**R-1 Program Element (Number/Name)** PE 0601102F / *Defense Research Sciences*	**Project (Number/Name)** 613004 / *Education and Outreach*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
FY 2023 Plans: Identify, recruit, and increase opportunities for new investigators to participate in critical Department of the Air Force research. Support basic science, mathematics, and engineering research including Historically Black Colleges and Universities, Hispanic-Serving Institutions, and other minority institutions. Foster Science, Technology, Engineering, and Mathematics (STEM) education and outreach activities for kindergarten through 12th grade (K-12) students. Complete activities that encourage elementary, middle, and high-school youths to develop an interest in and pursue higher education and employment in the science, mathematics, and engineering fields. ***FY 2024 Plans:*** Continue identifying, recruiting, and increasing opportunities for new investigators to participate in critical Department of the Air Force and Space Force research. Support basic science, mathematics, and engineering research efforts with Historically Black Colleges and Universities, Hispanic-Serving Institutions, and other minority institutions. Focus investment and outreach to HBCU's to include funding in microelectronics, materials, energy, aerospace, and chemistry and other fields of importance to the Department. In FY 2024, activities that encourage K-12, elementary, middle, and high-school youths to develop an interest in science, mathematics, and engineering fields is redesignated to Project 613005, STEM Pipeline Development, to consolidate STEM outreach and increase funding visibility. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** N/A			
Accomplishments/Planned Programs Subtotals	89.981	38.313	38.911

	FY 2022	FY 2023
Congressional Add: Program increase: basic research	24.359	1.000
FY 2022 Accomplishments: Conducted Congressionally directed effort		
FY 2023 Plans: Not Applicable		
Congressional Adds Subtotals	24.359	1.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Not Applicable

Exhibit R-2A, RDT&E Project Justification: PB 2024 Air Force			Date: March 2023
Appropriation/Budget Activity 3600 / 1	R-1 Program Element (Number/Name) PE 0601102F / *Defense Research Sciences*	Project (Number/Name) 613005 / *STEM Pipeline Development*	

COST ($ in Millions)	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
613005: *STEM Pipeline Development*	0.000	0.000	0.000	8.398	0.000	8.398	10.920	12.134	11.523	12.767	Continuing	Continuing

A. Mission Description and Budget Item Justification

The major efforts in the Science, Technology, Engineering, and Math (STEM) Pipeline Development Project are initiatives to support STEM education and outreach activities for kindergarten through 12th grade (K-12) students, and to support activities that encourage elementary, middle, and high-school youths to develop an interest in, and pursue, higher education and employment in the science, mathematics, and engineering career fields. These initiatives benefit the Department of the Air Force by cultivating a progressive pipeline of highly-trained and knowledgeable scientists and engineers aimed at filling Department of the Air Force science and engineering (S&E) workforce needs. This project seeks to cultivate STEM opportunities across the Department of the Air Force by supporting education and outreach activities that promote foundational knowledge building and experiential learning to inspire young students to pursue STEM-related career fields of critical importance to the Department of the Air Force.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Title: K-12 STEM Outreach	-	0.000	6.373
Description: Foster Science, Technology, Engineering, and Mathematics (STEM) education and outreach activities for kindergarten through 12th grade (K-12) students and their educators to encourage an interest in STEM, provide exposure to STEM careers and opportunities, and to inspire the pursuit of higher education and employment in the Department of the Air Force science, mathematics, and engineering fields. ***FY 2023 Plans:*** Described in Project 613004. ***FY 2024 Plans:*** Continue developing, institutionalizing and coordinating K-12 STEM outreach activities throughout the Department of the Air Force. Leverage ongoing partnerships with industry, schools, and other government agencies, in order to enhance the effectiveness of investments in outreach that promotes foundational knowledge building, experiential learning and STEM workforce development. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** FY 2024 increased compared to FY 2023 by $6.373 million. Funding increased because STEM education and outreach activities for K-12 students were reassigned to Project 613005 from Project 613004.			
Title: Leadership Experience Growing Apprenticeships Committed to Youth (LEGACY)	-	0.000	2.025
Description: Attract, inspire and develop the next generation of our nation's scientific and technical workforce, thereby strengthening future Department of the Air Force S&T capabilities.			

Exhibit R-2A, RDT&E Project Justification: PB 2024 Air Force		Date: March 2023
Appropriation/Budget Activity 3600 / 1	**R-1 Program Element (Number/Name)** PE 0601102F / *Defense Research Sciences*	**Project (Number/Name)** 613005 / *STEM Pipeline Development*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
FY 2023 Plans: Described in Project 613004. ***FY 2024 Plans:*** Continue identifying, cultivating, and increasing Science, Technology, Engineering, and Mathematics (STEM) opportunities across the Department of the Air Force through a progressive pipeline aimed at filling future science and engineering (S&E) workforce needs. Continue Supporting STEM activities that identify and retain talented elementary, middle school, high-school and undergraduate students to develop a young, diverse talent pool that will form the future S&E workforce. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** FY 2024 increased compared to FY 2023 by $2.025 million. Funding increased because activities that encourage elementary, middle, and high-school students to develop an interest in science, mathematics, and engineering fields were reassigned to Project 613005 from Project 613004, for increased visibility.			
Accomplishments/Planned Programs Subtotals	-	0.000	8.398

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Not Applicable