

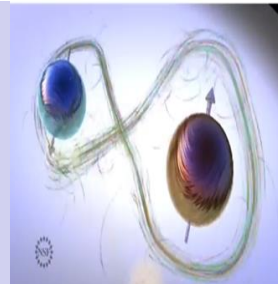


WHERE DISCOVERIES BEGIN



# Expanding Capacity in Quantum Information Science and Engineering (ExpandQISE)

## Informative Webinar for prospective PIs and Co-PIs FY2024



# National Science Foundation

Directorate for Mathematical and Physical Sciences

Directorate for STEM Education

Directorate for Technology, Innovation and Partnerships

Directorate for Computer and Information Science and Engineering

Directorate for Engineering

Directorate for Biological Sciences

Office of Integrative Activities

Office of International Science and Engineering

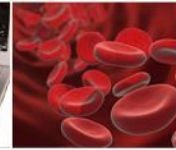
Directorate for Social, Behavioral and Economic Sciences

AND: U.S. Dept. of Energy





WHERE DISCOVERIES BEGIN



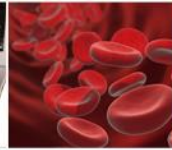
# REVISED SOLICITATION

The Expanding Capacity in Quantum Information Science and Engineering (ExpandQISE) solicitation is available at:

[Program Solicitation NSF 24-523](#)

(replaced previous versions: NSF 23-551 and 22-561)

The Proposal and Award Policies and Procedures Guide is available at: [PAPPG Introduction \(nsf.gov\)](#)



# REVISION

The Expanding Capacity in Quantum Information Science and Engineering (ExpandQISE) solicitation is available at:

[Program Solicitation NSF 24-523](#)

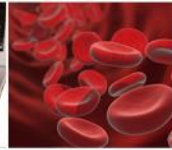
(replaced previous versions: NSF 23-551 and 22-561)

The solicitation for FY24 has been revised as follows:

- The submission deadlines have been revised.
- Addition of one example in Focus Area 1 (biochemical processes)
- Addition of one example in Focus Area 2 (quantum sensors for living systems, earth and planetary sciences and medicine)



WHERE DISCOVERIES BEGIN



# ExpandQISE

The National Quantum Initiative Act of 2018 establishes specific roles of agencies such as NSF, DOE and NIST, in implementing the all-of-government approach to ensure the continued leadership of the United States in QISE.

Broadening participation, lowering barriers for access, and expanding the diverse pool of education opportunities are the activities central to NQI Act.

ExpandQISE) program aims to increase research capacity and broaden participation in Quantum Information Science and Engineering (QISE) and related disciplines.

Institutions at which more than 50% of enrolled students come from groups that are currently under-represented in the sciences, e.g. minority-serving institutions (MSIs), are especially encouraged to apply.



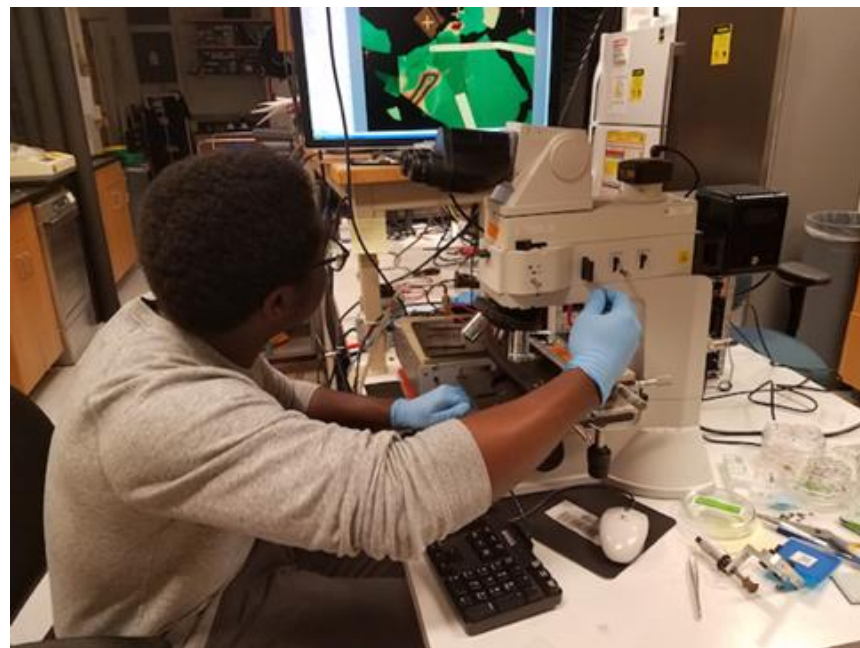
WHERE DISCOVERIES BEGIN



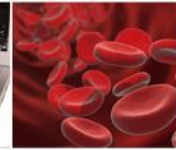
## ExpandQISE is intentional and deliberative.

ExpandQISE solicitation will enable colleges and universities which have a strong interest in developing vibrant QISE efforts in research and education, leading to increased participation, capacity building and increasing critical mass of research and education.

The program seeks to support such institutions by providing resources to faculty to develop research and education activities that offer opportunities for students at all levels to engage in QISE-related research.







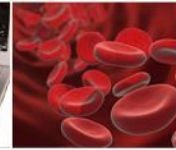
# ExpandQISE - Tracks

The ExpandQISE program offers two distinct funding tracks:

- **Track 1 is designed for individual PIs** initiating planning for a research program in QISE, paired with an external co-PI with deep QISE research expertise as noted above. Track1 awards are anticipated to be up to \$800,000 total per award for a duration up to 3 years.
- **Track 2 is designed for small- to medium-scale teams** of 2 to 5 collaborators, also paired with one or more external Cco -PIs with deep QISE research expertise as noted above. Track 2 awards are anticipated to be up to \$5,000,000 total per award for a duration up to 5 years.



WHERE DISCOVERIES BEGIN



# ExpandQISE - Eligibility

ExpandQISE helps build a connection between new and existing efforts and create critical mass at Institutions not yet fully involved in QISE.

This funding opportunity applies to Institutions of Higher Education (IHEs) **not** currently classified as a Doctoral University with "Very High Research Activity (R1 institutions) according to the Carnegie Classification.

All accredited IHEs, including R1 institutions, are eligible to participate as partnering institutions funded through subawards.



# ExpandQISE – role of Co-PI

- Institutions that do not meet the lead institution requirements, and are pursuing active programs in QISE, are encouraged to participate by providing expert Co-PIs to the ExpandQISE projects.
- For lead institutions it is critical to establish a close connection with existing institutions possessing cutting-edge research and infrastructure.
- This is accomplished by a requirement of collaboration with at least one Co-PI or Co-PIs from institutions with established programs in QISE.
- The total amount of subawards to such Institutions is limited to no more than 30% of the full award amount.





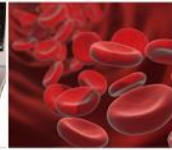
WHERE DISCOVERIES BEGIN



# ExpandQISE - Eligibility

- At least one full-time faculty PI/co-PI from a partnering institution must be identified, who must show evidence of an established and productive research career in the area of Quantum Information Science and Engineering.
- Funding of partnering institutions must be requested via subawards;
- Separately submitted collaborative proposals will not be accepted.
- Total amount of subawards to partnering institutions are limited to no more than 30% of the full award amount.





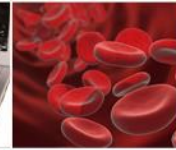
# ExpandQISE – submission limits

## Limit on Number of Proposals per Organization:

- Up to two (2) Track 2 proposals per lead institution are allowed.
- There are no limits on the number of Track 1 proposals.

## Limit on Number of Proposals per PI or co-PI: 1

- There is a limit of one proposal per PI, independently of the track.



# REVISED Submission Deadlines

## Track 1:

- FY2024 Full Proposal: April 01, 2024

## Track 2:

- FY2024 Letter of Intent: March 08, 2024
- FY2024 Full Proposal: April 01, 2024

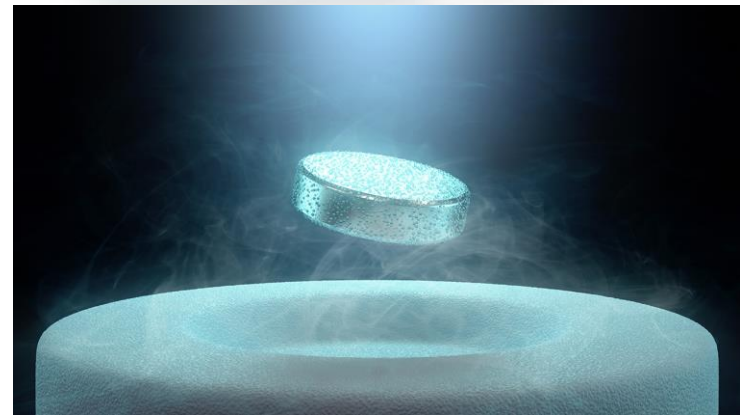
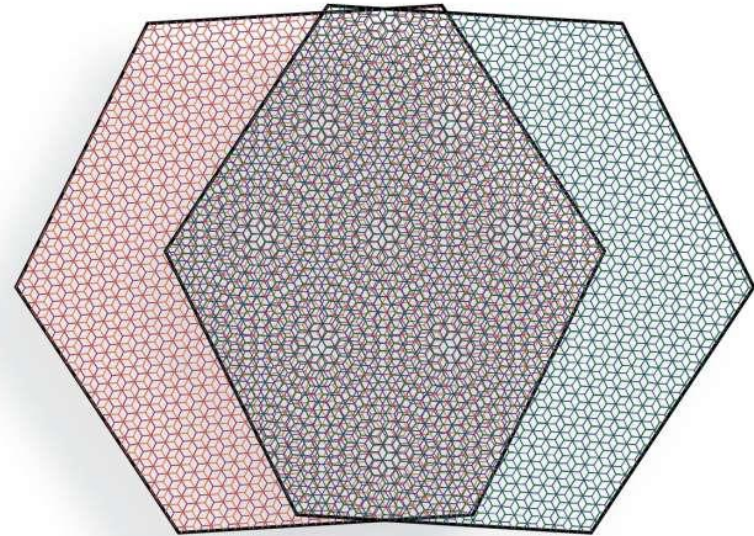


# ExpandQISE – Focus Area 1

## Focus Area 1: Quantum Fundamentals

Fundamental understanding of uniquely quantum phenomena and their interfaces with classical systems, for example:

- quantum decoherence;
- quantum entangled states;
- quantum algorithms and simulations
- quantum complexity theory;
- quantum many-body states of matter
- quantum materials with tailored properties
- control of multiple degrees of freedom with light-matter interactions at fine resolutions;
- quantum phenomena in biochemical processes that can be exploited for quantum technologies.





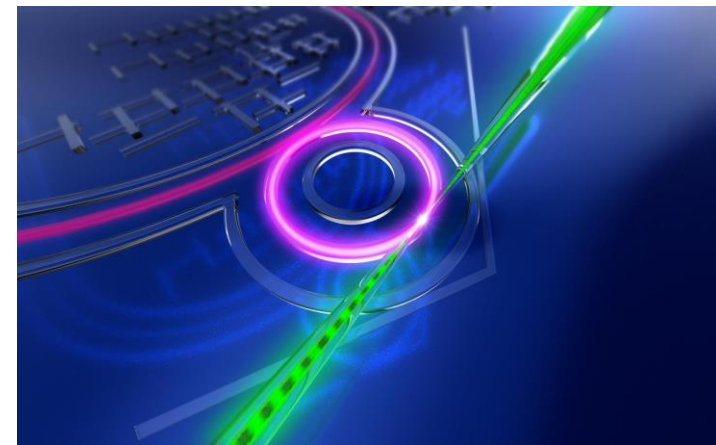
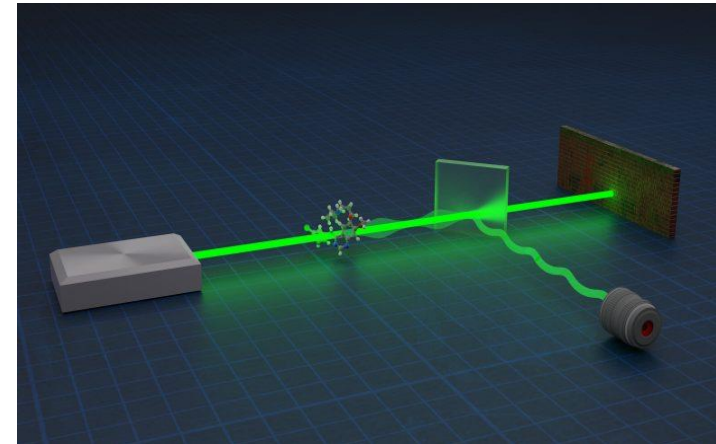


# ExpandQISE – Focus Area 2

## Focus Area 2: Quantum Metrology and Control

Ability to measure, model, control, and exploit quantum phenomena in single and multi-particle systems, for example:

- Utilize quantum superposition of states, entanglement and quantum squeezing in metrology;
- Characterize and minimize noise and develop, test and implement quantum error corrections in quantum computing environments;
- Develop efficient high-resolution methods to generate, control, manipulate, read, and write quantum bits (qubits);
- Design and optimize quantum sensors to provide increased sensitivity and resolution for use in living systems, earth and planetary sciences, medicine, and other fields and applications.



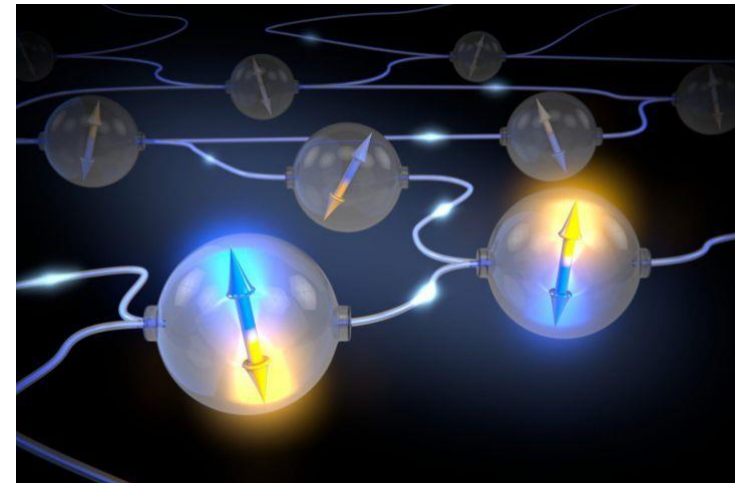
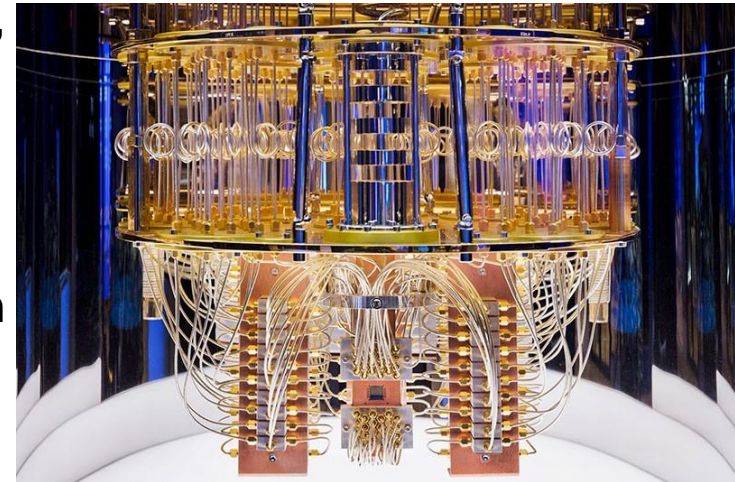




# ExpandQISE – Focus Area 3

**Focus Area 3: Co-Design and Quantum Systems,** Hardware and algorithms for of stable, controllable, scalable, error-free, low-dissipation platforms, for example:

- circuit and computing devices for optimally design monolithic or hybrid systems;
- quantum circuits, systems and programming paradigms for QISE;
- viable platforms for quantum computing
- testbeds for rapid prototyping, system characterization and optimization;
- system integration techniques for combining quantum and classical computing platforms;
- scalable systems of quantum objects in superposition states;
- novel and emergent applications of quantum information technology.



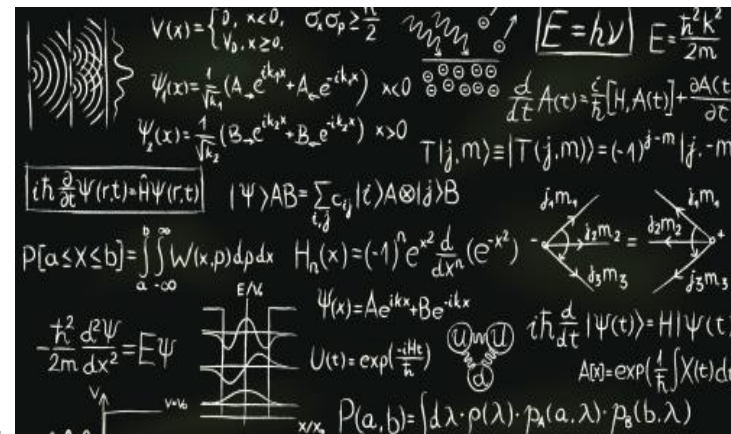


# ExpandQISE – Focus Area 4

## Focus Area 4: Education and Workforce Development

Increasing the spectrum of graduate and/or undergraduate programs, number of students, diversity, by connecting to QISE research and removing barriers for entry, for example:

- new degree programs in QISE;
- new QISE-relevant curricula;
- opportunities for students to interact with industry;
- collaboration on research projects, internships, fellowships or entrepreneurial activities;
- implementation of evidence based educational approaches;
- development of skilled and diverse QISE workforce through formal and informal education.





# ExpandQISE – Focus Areas

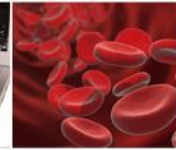
All proposals **must address** the scientific merit of the activities in at least one of these three Focus Areas:

1. Quantum Fundamentals,
2. Quantum Metrology and Control,
3. Co-Design and Quantum Systems.

In addition, **each proposal must include** a specific activity in **Focus Area 4, Education and Workforce Development**

Following the context of the National Strategic Overview for Quantum Information Science, the proposed **research plan must fit within the scope of at least one** of the four areas of QISE identified therein: quantum computing, quantum sensing, quantum communications or quantum simulations. Proposals must explicitly identify one or more of the areas.

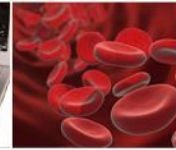




# ExpandQISE – Measure of Success

The long-term aim of the ExpandQISE program is to create conditions necessary for the emergence of a vibrant, productive, and sustained QISE research community that extends to all regions of the U.S:

- lead to an increase in QISE scientific research outcomes
- improve retention in QISE-relevant graduate and undergraduate programs
- increase the number of students applying to programs and graduating
- achieve continuous and sustained productivity of funded efforts
- investing in needed people and infrastructure.
- achieve local impact by catalyzing involvement of communities, private and public institutions, industrial partners, and local governments.



# Required components – Track 1

## Track 1 required components:

- **Research:** Strong and compelling research proposal
- **Alignment** with one or more of the three Focus Areas 1, 2, and 3
- **Integration** with activities under Focus Area 4.
- **External connection:** research connected to established and productive research effort(s) in QISE, with a key person or persons representing that effort acting as co-PI of the proposal. No more than 30% of budget can be allocated to external connection (through subawards).
- **Education:** proposal needs to include plans to integrate QISE principles and research outcomes into existing courses or new coursework



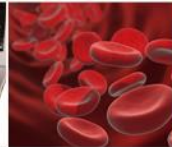


# Examples of allowable costs – Track 1

## Track 1 allowable costs can include:

- Release time or summer salary for faculty
- Faculty and Staff training costs
- Travel and networking costs
- Student support
- Materials and small equipment purchase and installation. Materials and equipment costs in Track 1 proposals must be explicitly associated with the research project and the need appropriately justified. **The total materials and small equipment request cannot exceed 20% of total award budget.**





# Required components – Track 2

All Track 1 required components are also required in Track 2. In addition, the following components are additionally required in Track 2:

- **Faculty line building:** description of planned faculty development and demonstrating commitment to building a critical mass of tenured or tenure-track faculty to expand and maintain capacity.
- **Institutional Sustainability Plan**, containing
  - (i) plan for expansion and continuation of QISE efforts at the Institution beyond the award duration, including infrastructure, resources, faculty and Institution's vision of future QISE research effort,
  - (ii) a statement confirming readiness to grant release time to faculty if needed
  - (iii) Institutional vision of collaboration with industry, government, private organizations etcA timetable of planned activities must be included. The Institutional Sustainability Plan is signed by the Institution president, provost, or appropriate designee authorized to speak on behalf of the Institution
- **Infrastructure and facilities:** description outlining how access to all the infrastructure needed to pursue the proposed research will be provided, either on-site, or via partnership, access to external facilities and/or collaboration, and role and timetable of specific instrumentation purchases, development and installation.
- **Academic Degree Program:** The proposal should include plans for the development of new, or re-focusing of existing Associate, Bachelors and/or Masters degree academic programs that support QISE training.
- **External Advisory Board (EAB):** (3-person) charged with periodic assessment of funded activities, and evaluating progress in achieving the goals of the Institutional Sustainability Plan. EAB members must be established and recognized researchers in the field of QISE. To avoid potential conflicts of interest during the NSF review process please **do not** contact potential EAB members before award is made, and do not include names of potential EAB members in the proposal text.



# Examples of allowable costs – Track 2

**Track 2 allowable costs can include, in addition to costs allowed in Track 1:**

- **Equipment and Materials and Supplies:** Acquisition of instrumentation necessary to establish an in-house activity, explicitly associated with the research project. **Total materials and equipment costs cannot exceed 35% of proposal budget and must be part of the lead institution's budget and not part of a sub-award.**
- Faculty Line building costs, including salary support for the first two years for new faculty when hired into tenure-track positions.
- Costs associated with operation of the External Advisory Board (required) and external evaluator (if applicable).





WHERE DISCOVERIES BEGIN



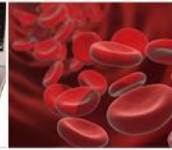
# Letter of Intent (Track 2 only)

- Submission of Letters of Intent is required **only for Track 2** proposals.
- LOI deadline: March 08, 2024
- No more than **three** Letters of Intent per organization as the lead institution are allowed.
- There are no limits to how many times individuals may appear as Senior Personnel (Principal Investigator/Project Director, co-PI, and Faculty Associate or equivalent) on Letters of Intent.
- Letters of Intent must include the following:
  - Program Solicitation Number (NSF 24-523)
  - Selection of Primary NSF Organization/Division to process the proposal.
  - Proposal title.
  - Synopsis (maximum 2500 characters): Proposed vision, key components, main activities, and major goals of the proposed activity.
  - Other Comments (maximum 2500 characters): a list of Senior Personnel (Principal Investigator, co-PI(s), and Faculty Associate(s) or equivalent), including funded and unfunded collaborators, and providing names, affiliations, email and area(s) of expertise for all participants. Estimated total budget for each year of award.





WHERE DISCOVERIES BEGIN



# Proposal Preparation

Proposal Title:

The proposal title must begin with "ExpandQISE:", followed by "Track 1:" or "Track 2:", depending on track chosen, and followed by an informative project title.

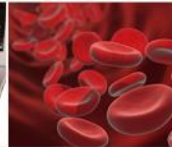


NOTE:

All aspects of proposal submission not covered by the solicitation are covered by PAPPG



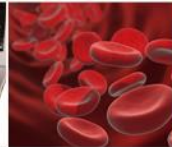




# Proposal Preparation – Track 1

**Project Description for Track 1 proposals** (maximum 15 pages) must include the following subsections:

- **Vision and Goals:** linked to at least one of the Focus Areas 1-3, addressing Focus Area 4, explicitly addressing how it will build capacity and create conditions necessary for emergence of a vibrant, productive and sustained OISE research community beyond the current practitioners.
- **Approach and Methodology:** used to achieve the research vision and goals.
- **Proposed Research:** Strong and compelling research proposal: research plan must be aligned with at least one of the Focus Areas 1-3 and be well integrated with other proposed activities under Focus Area 4, such as involvement of students, education and outreach efforts.
- **Thrust Area(s):** Describe the activities envisioned and the expected outcome(s), as well as possible inter-relation and/or feedback between the different efforts/topics.
- **Role of External Connection:** describe the role of, and leverage provided by collaboration with the external Co-PI or Co-PIs, which may be funded through a subaward of up to 30% of the total budget and forming a connection with established and productive research projects, centers, institutions and other efforts enabled by investments made by NSF, DOE and NIST in the area of QISE.
- **Workforce Development:** Describe how the proposed project builds capacity and expand the talent pool within QISE, enhance U.S. competitiveness in the area, and grow the diverse QISE research community.
- **Results from Prior NSF Support:** Please follow the guidance provided in the NSF Proposal & Award Policies & Procedures Guide (PAPPG) for reporting results from prior NSF support. Please also describe the prior research of each PI or co-PI funded by NSF that is directly relevant to the proposed project.
- **Broader Impacts:** This section addresses the planned Broader Impact activities encompassing the potential to benefit society and contributing to the achievement of specific, desired societal outcomes.



# Proposal Preparation – Track 2

**Project Description for Track 2 proposals.** (maximum 25 pages) must include ALL information required for Track 1 and in addition, the following subsections:

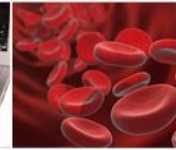
- **Faculty Development Plan:** Provide details on planned means of faculty development, demonstrating commitment to building a critical mass of tenured or tenure-track faculty to expand and maintain capacity. Provide a description of communication strategy, data tracking, management of personnel within the project group, management of intellectual property resulting from the project, and timeline of activities.
- **Discussion of the Institutional Sustainability Plan:** This subsection must contain a discussion of the Institutional Sustainability Plan (ISP) prepared by the Institution and attached as Supplementary Document, and include details regarding approaches, methods and timeline of activities funded under this award and relevant to implementation of the ISP, including a detailed timetable of institutional sustainability activities. This subsection is not a copy of ISP.
- **Academic Degree Program:** describe planned development of new, or re-focusing of existing, Bachelor's and/or Master's degree academic programs that support QISE training.
- **External Advisory Board:** Describe the formation of a 3-person External Advisory Board (EAB), charged with periodic assessment of funded activities, and evaluating progress in achieving the goals of the Institutional Sustainability Plan. EAB members must be established and recognized researchers in the field of QISE. To avoid potential conflicts of interest during NSF review please do not contact potential EAB members before award is made, and do not include names of potential EAB members in the proposal text.
- **Infrastructure:** provide a description and a table of equipment to be purchased, including purpose and cost, as well as purchasing, delivery, and installation timeline. All acquisition of instrumentation necessary to establish an in-house activity that forms the basis of a dedicated program in QISE needs to be described in this section. Total materials and instrumentation cost in Track 2 proposals cannot exceed 35% of proposal budget.



# Supplementary Documents allowed in both tracks

## Allowed in both tracks:

- **Letters of Collaboration** (maximum 1 page per letter): Letters of collaboration from other Institutions, industrial partners, national laboratories and all other funded or unfunded collaborators may be included. Such letters should follow the format required by the *NSF Proposal & Award Policies & Procedures Guide (PAPPG)*, and be limited to stating the intent to collaborate. Details about collaborative work to be done under this project should be included within the Project Description, not in supplementary documents.



# Supplementary Documents required only in Track 2

## Required only for Track 2 proposals:

- **List of Personnel:** (maximum 1 page): A list of key personnel involved with a succinct description of what each person uniquely brings to the project and how their expertise is to be integrated with the broad effort.
- **Institutional Sustainability Plan** (maximum 3 pages): Institutional Sustainability Plan must contain:
  - A convincing design for expansion and continuation of QISE efforts at the Institution beyond the award duration, including plans for faculty line development, infrastructure, and resources, matching the Institution's vision of future QISE research effort,
  - Statement confirming readiness to grant release time to faculty if needed for performing duties associated with the award,
  - Partnership plan including vision of collaboration with local industry, government, organizations and other institutions to expand the impact of activities.
  - A timetable of planned activities.



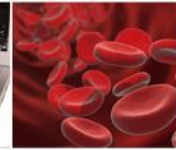
# Single Copy Documents

The following Single Copy Document is required both for Track 1 and Track 2 proposals:

- **Proposed Reviewers** (maximum: 2 pages): a list of individuals who might be "suitable reviewers" to act as impartial reviewers.
- Include their names, affiliations, phone numbers, e-mail addresses, and areas of expertise.
- PIs can also designate persons they would prefer not review the proposal, indicating why.

Single Copy Documents are used by NSF staff only and are not available to reviewers.





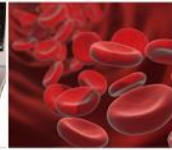
# Merit Review Process

## NSF Merit Review Criteria:

- Both criteria, **Intellectual Merit** and **Broader Impact**, will be given full consideration during the merit review and decision-making process. Each criterion is necessary but neither, by itself, is sufficient. Proposers must fully address both criteria.

## The following elements will be considered in the proposal's review:

- What is the potential for the proposed activity to:
  - advance knowledge and understanding within its own field or across different fields (**Intellectual Merit**); and
  - benefit society or advance desired societal outcomes (**Broader Impacts**)?



# Merit Review Criteria

- To what extent do the proposed activities suggest and explore creative, original, or potentially transformative concepts?
- Is the plan for carrying out the proposed activities well-reasoned, well-organized, and based on a sound rationale? Does the plan incorporate a mechanism to assess success?
- How well qualified is the individual, team, or institution to conduct the proposed activities?
- Are there adequate resources available to the PI (either at the home institution or through collaborations) to carry out the proposed activities?



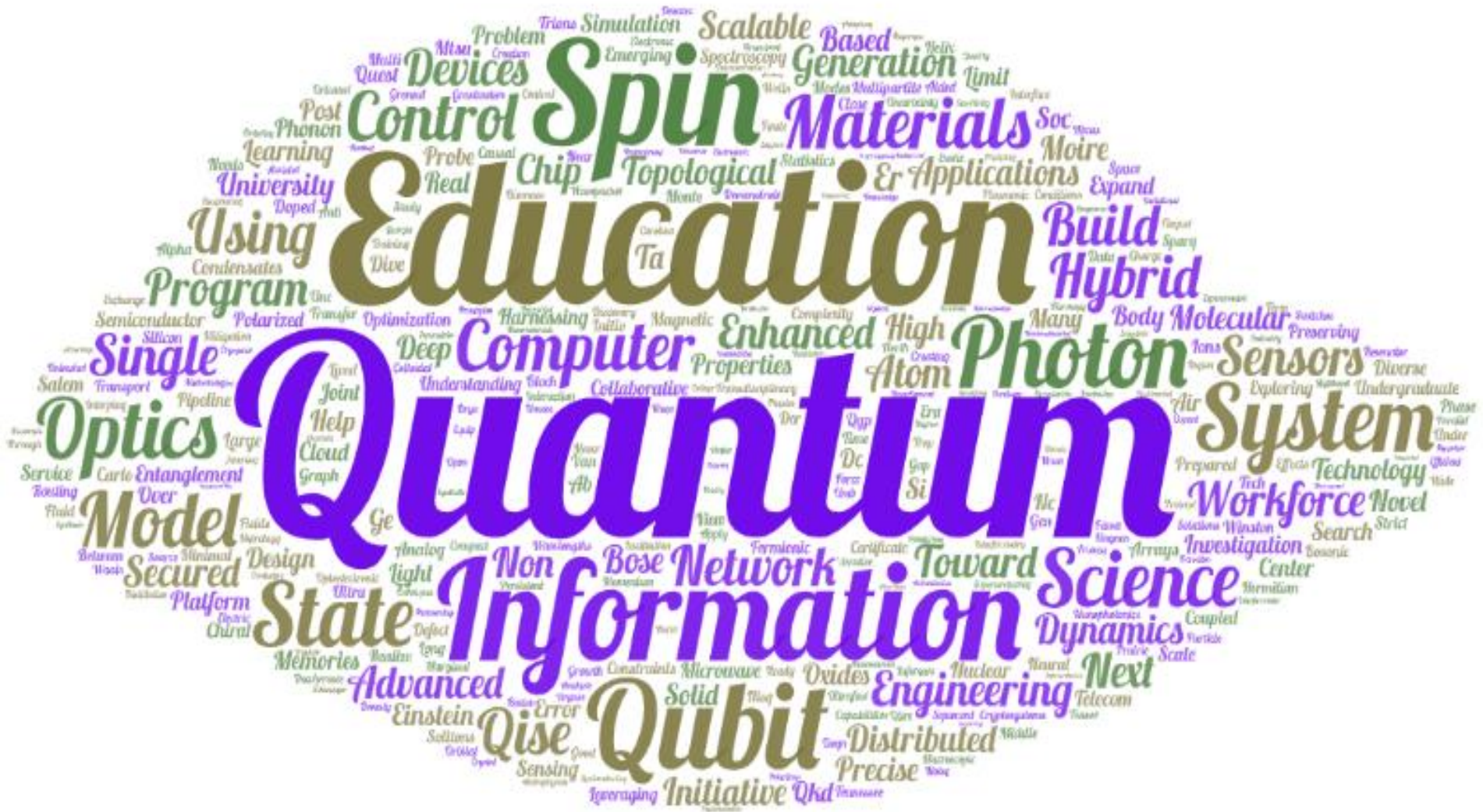
# Additional Merit Review Criteria

- **Participation:** To what extent does the proposal advance the NSF goal of increasing the participation of all members of society in the scientific enterprise?
- **Alignment:** To what extent is the Intellectual Merit of this proposal aligned with at least one of the Focus Areas? To what extent is the proposed workforce development activity aligned with the capacity expansion goals outlined above?
- **Capacity:** Will the proposed efforts lead to an increase in US capacity in the area of QISE by enabling the Lead Institution to develop or expand needed programs, infrastructure and critical mass?
- **External Connection:** Does the proposal contain meaningful leverage of efforts and impacts through close collaboration and cooperation with the external Co-PI, projects, centers and efforts enabled by investments made by NSF, DOE and NIST in the area of QISE?
- **Sustainability [only in Track 2]:** Does the Institutional sustainability Plan offer a clear and convincing path towards increasing capacity, building critical mass and sustainability of efforts beyond the lifetime of the award?





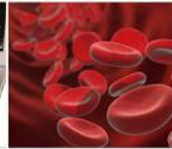
# Word map – award abstracts







WHERE DISCOVERIES BEGIN



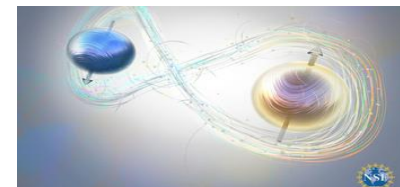
# Useful Links:

**ExpandQISE solicitation NSF 24-523:**

<https://new.nsf.gov/funding/opportunities/expanding-capacity-quantum-information-science/nsf24-523/solicitation>

**Proposal & Award Policies & Procedures Guide (PAPPG):**

<https://new.nsf.gov/policies/pappg/24-1>



**Dear Colleague Letter: Advancing Quantum Education and Workforce Development:**

<https://www.nsf.gov/pubs/2021/nsf21033/nsf21033.jsp>

**Quantum Information Science and Technology Workforce Development National Strategic Plan:**

<https://www.quantum.gov/wp-content/uploads/2022/02/QIST-Natl-Workforce-Plan.pdf>

**Q2Work, QIS Key Concepts, and K-12 Quantum Education Framework:**

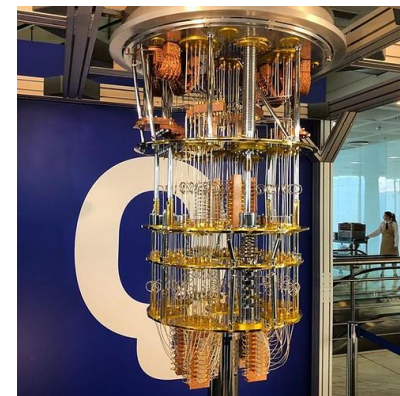
<https://q12education.org/>

**Post-NQI all-of-government approach:**

<https://www.quantum.gov>

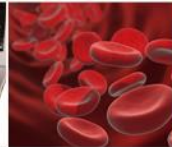
**Quantum Information Science and Engineering Research at NSF**

[https://www.nsf.gov/mps/quantum/quantum\\_research\\_at\\_nsf.jsp](https://www.nsf.gov/mps/quantum/quantum_research_at_nsf.jsp)





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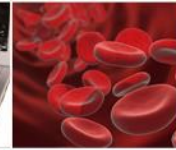


# ExpandQISE management team

Tomasz Durakiewicz	<a href="mailto:tdurakie@nsf.gov">tdurakie@nsf.gov</a>	MPS/DMR
Wu He	<a href="mailto:wuhe@nsf.gov">wuhe@nsf.gov</a>	EDU/DRL
Richard Dawes	<a href="mailto:rdawes@nsf.gov">rdawes@nsf.gov</a>	MPS/CHE
Nadia El-Masry	<a href="mailto:nelmasry@nsf.gov">nelmasry@nsf.gov</a>	ENG/EEC
Tingyu Li	<a href="mailto:tli@nsf.gov">tli@nsf.gov</a>	MPS/CHE
Vinod Lohani	<a href="mailto:vlohani@nsf.gov">vlohani@nsf.gov</a>	EDU/DGE
Ale Lukaszew	<a href="mailto:rlukasze@nsf.gov">rlukasze@nsf.gov</a>	ENG/ECCS
Matthew McCune	<a href="mailto:mamccune@nsf.gov">mamccune@nsf.gov</a>	ENG/ECCS
Elizabeth Behrman	<a href="mailto:ebehrman@nsf.gov">ebehrman@nsf.gov</a>	CISE/CCF
Engin Serpersu	<a href="mailto:eserpers@nsf.gov">eserpers@nsf.gov</a>	BIO/MCB
David Darwin	<a href="mailto:ddarwin@nsf.gov">ddarwin@nsf.gov</a>	TIP/ITE
May Yuan	<a href="mailto:mayuan@nsf.gov">mayuan@nsf.gov</a>	SBE/BCS



WHERE DISCOVERIES BEGIN



# Thank you!!!!

## Questions?

More Questions? Planned Office Hours:

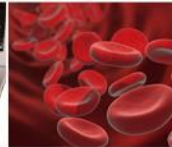
Wed, Feb 21, 1PM

Wed, Feb 28, 2PM

Mon, March 18, 3PM



WHERE DISCOVERIES BEGIN



# Office Hours – no need to register:

**Wed Feb 21st, 1PM – 2PM**, ExpandQISE Office Hour 1 for prospective PIs and CoPIs (virtual)

- Meeting URL:  
<https://nsf.zoomgov.com/j/1614127429?pwd=ZFplaWxVSsnN2SnJYMUpmSIBJQ0pwZz09&from=addon>
- Meeting ID: 161 412 7429
- Passcode: 591165

**Wed Feb 28th, 2PM – 3PM**, ExpandQISE Office Hour 2 for prospective PIs and CoPIs (virtual)

- Meeting URL:  
<https://nsf.zoomgov.com/j/1607724307?pwd=N0J4bG8yL2V2eFNVYnlaZmxlb1lGdz09&from=addon>
- Meeting ID: 160 772 4307
- Passcode: 563508

**Mon March 18th, 3PM – 4PM**, ExpandQISE Office Hour 3 for prospective PIs and CoPIs (virtual)

- Meeting URL:  
<https://nsf.zoomgov.com/j/1612791362?pwd=VmpYmjl4RUUVQbktEOUo1ay9EemQ5QT09&from=addon>
- Meeting ID: 161 279 1362
- Passcode: 393826

During office hours NSF Program Officers will be available via zoom to answer questions about the solicitation, proposal submission, merit review process etc.