

Recommendations for Generative AI in the Biological and Biomedical Sciences

From the Federation of American Societies for Experimental Biology (FASEB)
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FASEB

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for Experimental Biology

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Executive Summary

EXECUTIVE SUMMARY

In 2024, the Federation of American Societies for Experimental Biology (FASEB) Board of Directors convened the Generative Artificial Intelligence (Gen AI) Task Force, charged with developing recommendations for the appropriate and responsible use of Gen AI in routine research activities related to the biological and biomedical research community. These findings and recommendations are targeted at five key stakeholder groups: United States (US) federal agencies, policy makers, institutions (research, education, and corporate), scholarly societies, and individual researchers. Through Task Force research using an extensive review of rich resources, deliberation, and stakeholder engagement, working group sessions, and consultation with external experts, clear themes were identified and outlined below.

The Task Force identified the following five key recommendation themes to implement to reap the positive benefits of Gen AI while mitigating the negative impacts, ensuring research integrity, and respecting individual rights. A separate report is also exclusively available for FASEB member societies that includes additional recommendations, guidance, and resources for scholarly societies as they explore and adopt Gen AI for the benefit of advancing their missions.

Theme 1: Policy and Regulation

Theme 2: Scientific Integrity and Intellectual Property

Theme 3: Data Privacy and Security

Theme 4: Diversity, Equity, Accessibility, and Inclusion

Theme 5: Workforce Impact, Training and Education

Overall, there is a perception that Gen AI is a transformative technology that holds potential for significant benefits to stakeholders across the biological and biomedical science communities, yet, at the same time, has the potential to exacerbate existing problems and present new challenges. Close stakeholder collaboration is necessary to achieve the desired positive benefits this technology offers.

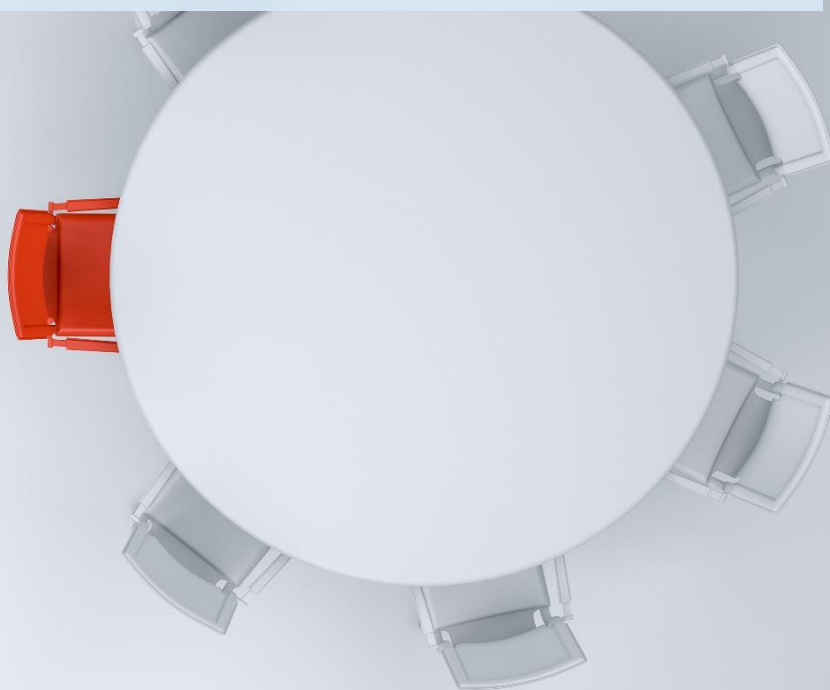
INTRODUCTION

Gen AI is a subset of artificial intelligence (AI) that creates novel content, including text, images, sound, and video. These tools show remarkable capabilities in tasks ranging from natural language processing to more complex biologically relevant tasks such as predicting protein structures. Gen AI tools provide time-saving paths to improve day-to-day tasks, hold potential to accelerate research, generate new hypotheses, and analyze complex datasets providing new, undiscovered connections and insights. However, their use also raises significant ethical, methodological, legal, and regulatory questions. Across biomedical and biological research, Gen AI applications are already taking shape. As these tools become widespread, it is imperative to establish guidelines and best practices to ensure their responsible use, maintain scientific integrity, and maximize their benefit while mitigating risk.

The Task Force was authorized by the Board of Directors to form in January 2024, with participants to serve on the Task Force identified and secured in the first quarter of 2024. The Task Force held the first meeting April 2024 with the following workplan:

1. Assess the current landscape of Gen AI use in biomedical and biological research;
2. Identify potential benefits and risks associated with Gen AI in research activities across biomedical and biological research; and
3. Develop recommendations for responsible Gen AI use inclusive of key stakeholder groups.

The task force conducted its work over an eight-month period, engaging as needed to secure feedback from researchers, ethicists, society executives, policy makers, legal and AI experts through interviews, surveys, and working groups.



Task Force Charge, Objectives, and Timeline

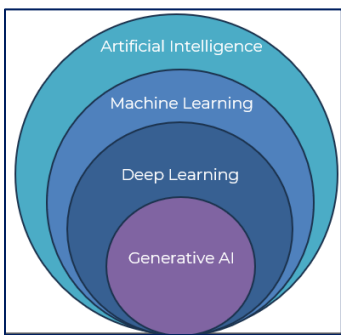
The FASEB' Board of Directors **charge** to the Task Force is to:

Develop recommendations for federal agencies, policy makers, societies, and researchers about the relevance and impact of Generative AI (Gen AI) to biological and biomedical science and scientific societies; and identify opportunities for FASEB and FASEB member societies to use Gen AI to meet our shared missions.

To meet this charge, the Task Force had these two **objectives**, translating into two deliverables:

1. Develop a report with recommendations on the appropriate and responsible use of Gen AI in routine research activities related to the biomedical and biological research community.
2. Identify potential FASEB and society applications of Gen AI that can enhance mission, improve staff scope, expand member engagement, and increase efficiency of operations.

To best achieve the objectives, the Task Force was composed of a Chair, Vice Chair, researchers, and staff representing different FASEB member societies, including two Early Career Researchers (ECRs), two regular members, one staff member, one representative from FASEB's Publications Committee, one representative from FASEB's DataWorks! Advisory Committee and supported by FASEB staff leadership. Nine scholarly societies across nine US states were represented, and academic, non-profit, and corporate leaders were members of the Task Force. For further details, see Task Force Members.



The first Task Force meeting was held April 2024. At this first meeting, members quickly realized that Gen AI is a subset of AI (Figure 1), and while the Task Force aims to ensure most recommendations resulting from their work will be Gen AI-specific, policy and regulation actions are being handled by agencies and policy makers as a subset of AI, necessitating some cross-over. The Task Force has clarified in the report where differences occurring on the policy front through the precise use of the terms Gen AI and AI.

Figure 1. Gen AI is a subset of AI.

The Task Force also recognized that there would be some objectives tailored to specific stakeholder groups, and others that applied to broader categories. The Task Force has been careful to focus on specifying recommendations to the stakeholder groups that can make the change and clarifies the stakeholder groups in this report with the stakeholder map (Figure 2).

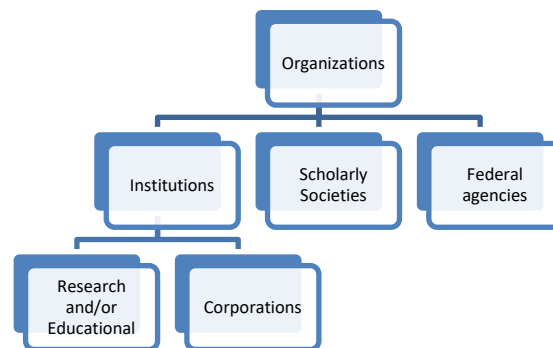


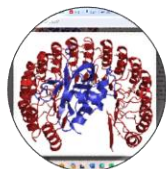
Figure 2. Stakeholder map.

The Task Force next conducted brief surveys among members and FASEB member society executive officers and developed a summary of known Gen AI applications and potential future applications in the biological and biomedical sciences space (Figure 3). With this framework, the Task Force started to consider the key challenges (Figure 4) where FASEB can best provide valuable feedback. The list of challenges outlined is not intended to be comprehensive for all of Gen AI; other issues may be of relevance to specific stakeholders, such as US federal agencies who would consider national security and international competition. Those issues were not considered within the scope of this report.

Applications



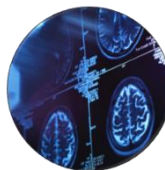
Accelerating drug discovery



Predicting protein structures, sequence design



Synthetic biology, gene circuit design



Medical imaging, diagnostics



Genomics



Workflow and system optimization

Potential Future Applications



Accelerating research and development



Precision medicine



Improved agricultural processes



Environmental conservation



Enhanced disease surveillance and management



Digital twins

Figure 3. Gen AI applications and potential applications in the biological and biomedical sciences environment.

The rapid advancement and adoption of Gen AI in biomedical and biological research necessitates the development of comprehensive policies and regulations. The Task Force noted that these policy and regulation frameworks should be developed to balance innovation with protection of scientific integrity and ethical standards, to respect intellectual property, address and support necessary data privacy and security, advance diversity, equity, accessibility, and inclusion, and provide resources that address the impact on the workforce, training, and education. These pillars were developed into five themes presented in this report (Figure 5).

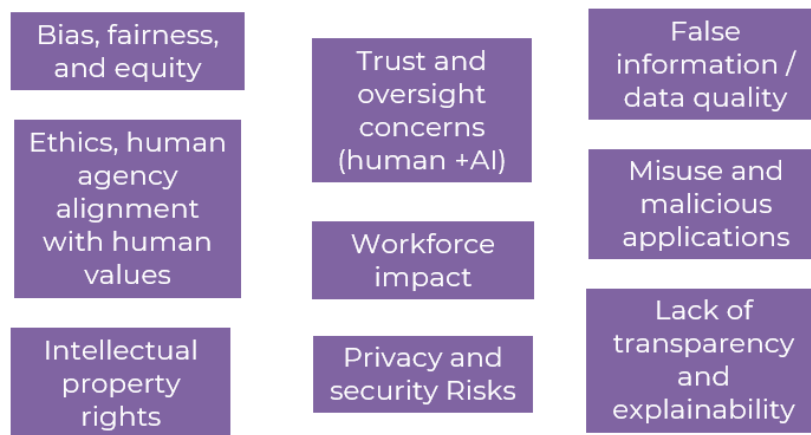


Figure 4. Gen AI challenges in the biological and biomedical research environment that FASEB can provide valuable feedback and insight.

Theme 1: Policy and Regulation

Theme 2: Scientific Integrity and Intellectual Property

Theme 3: Data Privacy and Security

Theme 4: Diversity, Equity, Accessibility, and Inclusion

Theme 5: Workforce Impact, Training and Education

Figure 5. Five central themes for FASEB recommendations on Gen AI

Survey data, working group feedback, and Task Force member debates and discussions were all bolstered by existing data and resources to help create well-informed recommendations. Additional resources utilized include reports, recommendations, and webinars from the National Academies of Science, Engineering, and Medicine (NASEM) (Engineering the Future: The Role of AI and Biotech, Artificial Intelligence for Scientific Discovery, and Generative AI and the Implications for Science Communication); the United Nations (UN) Resolution 78/265 and UN Recommendations on the Ethics of Artificial Intelligence, key U.S. Executive Orders and U.S. Federal agency reports (see Appendix 1), and other podcasts, webinars, and publications in scholarly sources and by reputable organizations including academic institutions such as MIT, Harvard Business Review, and financial organizations including Bloomberg, Morgan Stanley, McKinsey, and Gartner.

From August through November final recommendations were developed, with input and lively discussion from Task Force members. FASEB Executive Officers of member societies were engaged and the FASEB Board of Directors received reports of progress and provided input at the June and October meetings, with a final report presented with recommendations and approved in December 2024.

Theme 1 | Policy and Regulation



Theme 1: Policy and Regulation

The current policy and regulatory landscape include Gen AI as a subset of AI policies and approaches. Today, policy and regulations for AI and Gen AI in research lags technology advances and the on-the-ground real applications. AI and Gen AI, particularly in biological and biomedical research, should be a top priority area for policy development in the next two years.

The Task Force recognizes that although AI itself has been around for some time, the speed of Gen AI development may seem daunting. Nonetheless, the potential impacts (positive and negative) of these technologies are significant and the stakes are high, impacting all stakeholders. As federal agencies and policy makers seek to quickly establish more cohesive policies that address the unique challenges posed by AI and Gen AI in biological and biomedical scientific research, input and engagement from all stakeholders are urgently needed.

Recommendation 1.1 | All stakeholders, including FASEB, should engage with federal agencies and policy makers to provide feedback on AI and Gen AI policy development.

In the absence of regulations, the US White House and federal agencies have taken a variety of actions for policy and regulatory considerations; the Task Force has summarized these in Appendix 1. FASEB is committed to engaging with stakeholders to coordinate collective engagement with federal agencies and policy makers, including responding to RFIs and advocating with policy makers on behalf of the biological and biomedical sciences communities. Agencies are requested to provide a minimum of eight weeks from first issuing RFIs until the response due date to allow for more comprehensive and collective feedback.

Recommendation 1.2 | Federal agencies are recommended to collaborate and develop cohesive guidelines for Gen AI use and transparent reporting in federally funded research. Scholarly societies are encouraged to support agency efforts through engaging with member scientists and inclusion of federal guidelines in society programs.

The Task Force recommends that federal agencies collaborate with each other to develop a cohesive set of guidelines for the use and transparent reporting of Gen AI in federally funded research. Such an effort might be coordinated by the newly formed National Artificial Intelligence Advisory Committee (NAIAC) or the Office of Science and Technology Policy (OSTP). These groups should also be familiar with related government and funding agency efforts around the globe and, where feasible within the US infrastructure, should target consistent global approaches. Several US federal agencies have released policies that are not yet fully aligned in their approach, this can introduce confusion for researchers.

Research today is frequently cross-disciplinary, with a single research output frequently acknowledging funding from multiple U.S. federal agencies and funding agencies around the globe. Researchers will be challenged to understand and comply without cohesive guidelines between US federal agencies. These guidelines should include:

- Transparency and reporting requirements¹ for AI and Gen AI use in grant applications and research outputs (e.g., publications, data sets, software, and other reports). Given the broad use and integration of AI and Gen AI, it is expected to become impractical to request users divulge all use cases. Certain use cases will be important for disclosure (e.g., data processing and visualization) while other use cases (e.g., writing assistance) may not be important for disclosure. Gaining clarity on relevant use cases for reporting will support all stakeholders in ensuring appropriateness, accuracy, and transparency in reporting. Citation styles for Gen AI are already in place, see also MLA and APA style guides.
- The use or limitations on use of AI and Gen AI by reviewers, program officers, and other stakeholders who have access to confidentially submitted research proposals during the grant application and review.
- Standards for management of AI and Gen AI data sets and software. A set of comprehensive standards for how data sets and software should be managed in AI and Gen AI-assisted research in the biological and biomedical sciences will be valuable and avoid further confounding the data management and sharing environment.
- Research integrity considerations. Protocols should be developed for ensuring rigor and reproducibility of biological and biomedical research involving AI and Gen AI. This is particularly important for Gen AI given the continuous ongoing evolution of the tools and capabilities, presenting challenges for transparency, explainability, and reproducibility.

As guidelines are finalized, scholarly societies are encouraged to support federal agency efforts by engaging with member scientists and including guidelines, as appropriate, in society program efforts.

Recommendation 1.3 | Policy makers are recommended to develop and implement regulations requiring transparency for Gen AI tools. Software developers are recommended to be transparent and provide credit to underlying publications and datasets used in creating the tool to foster trust, allow proper use case application, and enable monitoring by stakeholders.

Regulations should require full transparency on how the tool is created, how it works, and the underlying source information, including references to all underlying data and publications used to

¹ Reporting requirements might include: detailed documentation of Gen AI models used, including version numbers, access information, and dates of use; outlining clearly what part of the research process involved Gen AI tools; describing the training data and publications; understanding the potential biases and addressing how the researcher worked to resolve; explaining how Gen AI results were validated; and outlining how the researcher plans to archive the model and/or reproducibility.

create the tool. Versioning should be developed and clearly noted. This is particularly important for Gen AI given the continuous ongoing evolution of the tools and capabilities, presenting challenges for transparency, explainability, and reproducibility. Stakeholders can only trust and use the tools when they can also build in processes to monitor for bias, address fairness and equity, and ensure scientific integrity is upheld.

Recommendation 1.4 | Policy makers, federal agencies, and organizations are encouraged to consider, when feasible, multi-stakeholder and international approaches.

Gen AI developments and applications in biological and biomedical sciences are already spanning geographic borders. Instead of each nation developing individual approaches, multi-stakeholder and international approaches could allow more rapid building of capacity and shared resources, requiring fewer overall added resources. Additionally, policy makers and federal agencies considering stakeholder input from non- western countries could provide a more thoughtful approach that respects geographic differences (See also Theme 4).

Specific programs at organizations require tailored Gen AI policies for certain use cases and communities. For example, at scholarly societies, journals, conferences, and award or grant programs require additional consideration across a wider group of stakeholders. For institutions, specific programs (research, educational, or corporate) may require protocols for approving and monitoring the use of Gen AI in research projects. Across both stakeholder groups, providing guidelines for proper attribution when using Gen AI tools, ethical review processes for Gen AI-assisted research, and mechanisms for reporting and addressing misuse or misinterpretation of Gen AI findings are key factors. To reduce complexity for communities, identifying paths to collaborate across the biological and biomedical sciences ecosystem between institutions and scholarly societies would be advantageous. Multi-stakeholder adaptive governance and collaboration could help the biomedical and biological sciences community more rapidly build capacity and share resources, and if inclusive of historically excluded stakeholders, could positively make progress on reducing inequities.

Recommendation 1.5 | All organizations are recommended to develop and implement organizational-wide Gen AI policies for staff.

Institutions (research, educational, and corporate) and scholarly societies should develop and implement thoughtful Gen AI policies for staff. Policies provide valuable frameworks for staff to experiment with recent technologies in a structured environment and provide guidance on issues where staff may lack the necessary level of knowledge. Policy components might include, among other topics, the scope of the policy, purpose, limitations, protection of privacy, copyright, and intellectual property, transparency and disclosure, and human oversight and accountability. Policies should be aware of and align where feasible with federal agency guidelines while also addressing any specific organizational needs. A staff task force could be established and charged with the development and implementation of

the policy, and to regularly review and update the policy, as necessary.

Policy and Regulation Conclusion

The development of policies and regulations in the US is moving significantly more slowly than the advances made in technology for AI and Gen AI. Stakeholders across the biological and biomedical sciences would do well to become actively engaged on this front in support of ensuring that policies and regulations are developed to support the benefits they deliver for advancing science, while also upholding and growing scientific integrity and ensuring no harm to individuals, particularly those in underserved communities.

Theme 2 | Scientific Integrity and Intellectual Property



Theme 2: Scientific Integrity and Intellectual Property

The introduction of Gen AI in biological and biomedical research increases the stakes for conducting research and reporting research findings, and, at the same time, exacerbates existing challenges and introduces new ones. Gen AI models can generate, analyze, and interpret vast amounts of data; those models learn from new data and query inputs over time. The Gen AI tool itself is modified by inputs, creating a new challenge for verifying or reproducing reported research findings both from researcher's own and others' laboratories. Similarly, the broad availability of Gen AI tools with enhanced features and products can readily create false reports, data, and images that can be convincingly presented as authentic new research findings.

“Scientific integrity is the adherence to professional practices, ethical behavior, and the principles of honesty and objectivity when conducting, managing, using the results of, and communicating about science and scientific activities. Inclusivity, transparency, and protection from appropriate influence are hallmarks of scientific integrity.”

NSTC Definition of Scientific Integrity

The National Science and Technology Council (NSTC) of the US defined scientific integrity in 2023 in *A Framework for Federal Scientific Integrity Policy and Practices*, cited above. This definition follows the 2021 Presidential Memorandum on Restoring Trust in Government Through Scientific Integrity and Evidence-Based Policymaking which notes *“Scientific and technological information, data, and evidence are central to the development and iterative improvement of sound policies, and to the delivery of equitable programs, across every area of government.”* The connection between scientific integrity and trust is clear. Ensuring scientific integrity is a significant community-wide effort that requires all stakeholders are fully committed to this central tenet, and applies to use of all research tools, including Gen AI.

In practice, scientific integrity covers a variety of topics in the research environment. In this report and for the purposes of discussing Gen AI in biological and biomedical sciences, we are focusing on these aspects:

- Ethical guidelines (this report focuses on authorship, human oversight, data management, interrupting bias, and sustainability),
- Rigor and reproducibility (this report focuses on scientific findings, data quality, and transparency including data sharing),
- Accuracy and clarity in communicating scientific findings (this report focuses on avoiding misuse of information and the spread of disinformation about science), and
- Intellectual property.

While the Task Force members believe Gen AI can significantly enhance their research capabilities and more rapidly advance biological and biomedical sciences for the benefit of humanity and earth, a concern remains regarding the ethical implications of its use in a framework currently lacking policies and regulations. Even when policies are available within disciplines, approaches seem fragmented, with little cohesion. As a result, researchers, staff, and students feel ill-equipped to

navigate the complexities of Gen AI use in their day-to-day science work. The Task Force came to an early consensus that a variety of actions are needed on this front from both a general perspective, and specific to biomedical and biological research, and these are divided according to the four themes above.

Recommendation 2.1 | Organizations should develop and adopt ethical guidelines for Gen AI use.

The Task Force recommends that overarching and application-specific guidelines for the ethical use of Gen AI in biomedical and biological research be developed and adopted broadly by funding agencies, institutions (research, educational, and corporate), and societies. In some cases, AI and Gen AI ethical guidance is already being developed for program-specific applications. For example, with society publications, existing infrastructure organizations such as the Committee on Publication Ethics (COPE), STM Association, and Ithaka S+R have released several key guidance documents this Task Force recommends to readers².

The National Academies of Science Engineering and Medicine developed a draft set of ethical guidelines, *Artificial Intelligence in Health, Health Care, and Biomedical Science: An AI Code of Conduct Principles and Commitments Discussion Draft*. For many organizations in the biological and biomedical sciences, this document serves as a valuable starting point for your own development of ethical guidelines, and as this is developed, the NASEM steering committee will provide updates. The Task Force endorses the NASEM AI Code of Conduct's ten principles (Figure 6) and six proposed commitments (Figure 7).

For organizations with heavier international components (e.g., international corporations, and scholarly society publishers, meetings, and award committees), the Task Force recommends that the NASEM AI Code of Conduct be supplemented with the United Nations (UN) Recommendations on the Ethics of Artificial Intelligence, given the more international nature of this approach. The UN Recommendations are based on four values (Figure 8) and ten principles (Figure 9), and the Task Force likewise endorses these recommendations.

² For publishers, see also [STM Generative AI in Scholarly Publications \(2023\)](#); [COPE Position Statement on Authorship and AI Tools](#); and [Ithaka S+R Generative AI in Scholarly Publishing Research Project](#). [CANGARU](#) is a separate newly emerging initiative that seeks to coalesce various publications guidelines for Gen AI.

BOX 2 | Code Principles

Applying the Trust Framework of the Learning Health System Core Principles

Engaged: Understanding, expressing, and prioritizing the needs, preferences, goals of people, and the related implications throughout the AI life cycle.

Safe: Attendance to and continuous vigilance for potentially harmful consequences from the application of AI in health and medicine for individuals and population groups.

Effective: Application proven to achieve the intended improvement in personal health and the human condition, in the context of established ethical principles.

Equitable: Application accompanied by proof of appropriate steps to ensure fair and unbiased development and access to AI-associated benefits and risk mitigation measures.

Efficient: Development and use of AI associated with reduced costs for health gained, in addition to a reduction, or at least neutral state, of adverse impacts on the natural environment.

Accessible: Ensuring that seamless stakeholder access and engagement is a core feature of each phase of the AI life cycle and governance.

Transparent: Provision of open, accessible, and understandable information on component AI elements, performance, and their associated outcomes.

Accountable: Identifiable and measurable actions taken in the development and use of AI, with clear documentation of benefits, and clear accountability for potentially adverse consequences.

Secure: Validated procedures to ensure privacy and security, as health data sources are better positioned as a fully protected core utility for the common good, including use of AI for continuous learning and improvement.

Adaptive: Assurance that the accountability framework will deliver ongoing information on the results of AI application, for use as required for continuous learning and improvement in health, health care, biomedical science, and, ultimately, the human condition.

Figure 6. NASEM An AI Code of Conduct Principles and Commitments Draft.

BOX 3 | Proposed Code Commitments

1. Focus: Protect and advance human health and human connection as the primary aims.
2. Benefits: Ensure equitable distribution of benefit and risk for all.
3. Involvement: Engage people as partners with agency in every stage of the life cycle.
4. Workforce well-being: Renew the moral well-being and sense of shared purpose to the health care workforce.
5. Monitoring: Monitor and openly and comprehensibly share methods and evidence of AI's performance and impact on health and safety.
6. Innovation: Innovate, adopt, collaboratively learn, continuously improve, and advance the standard of clinical practice.

The goal is that all decisions associated with, and actions taken, to develop and deploy AI in the health sector will be consistent with these Commitments to develop and foster trust.

Figure 7. NASEM An AI Code of Conduct Principles and Commitments Draft.



Figure 8. Values from the UN Recommendations on the Ethics of Artificial Intelligence.



Figure 9. Principles from the UN Recommendations on the Ethics of Artificial Intelligence.

Recommendation 2.2 | Organizations should establish review processes and research reporting guidelines for Gen AI-assisted research.

Funding agencies, institutions (research, educational, and corporate), and scholarly societies should develop and implement appropriate review processes for Gen AI-assisted research. These review processes should provide for human review and oversight, and should also:

1. Check for appropriate and sufficiently detailed disclosure of Gen AI use (see also Recommendation 1.2). Development and implementation of policies and practices that check for Gen AI disclosure, and that also do not seek to penalize researchers for using tools available within the guidelines will encourage greater researcher compliance and ensure scientific integrity.
2. In some instances, review processes may need to involve validation of Gen AI-generated content or research findings, or a review of whether the data is “clean” for purpose. Whether a validation step is warranted may depend on the type of organization, the use case for the Gen AI-assisted research, or other factors.

3. Develop paths for identifying and interrupting potential biases introduced by Gen AI use (see also Theme 4).
4. Consider and evaluate privacy and consent issues, particularly for sensitive data (see also Theme 3).
5. Check against intellectual property issues, ensure proper recognition of software developers, tools, and individual researcher contributions (see also Recommendations 2.6 and 2.7).
6. Find ways to measure and evaluate the long-term implications and potential misuse of Gen AI generated research.
7. Provide paths for researchers that support pausing or even halting a Gen AI-assisted research project as certain concern thresholds are met. Consider the approach “first do no harm.”

For reporting research findings, organizations should consider the benefits of collaborating to develop community-wide guidelines for specific programs (see also Recommendation 1.4). For example, with guidelines for reporting research findings, the following items should be addressed:

- Appropriate attribution and authorship for Gen AI-generated content,
- Use of Gen AI in review or decisioning,
- Transparency in reporting Gen AI-assisted research (specifically, what types of Gen AI use need to be reported).

Recommendation 2.3 | Organizations should weigh the impact of Gen AI on sustainable development goals and balance use cases judiciously.

Gen AI requires heavier energy resources, for storage and the continuous repetitive processes employed³. While energy use varies with the tool employed and the complexity of the query, the impact of higher energy requirements should not be overlooked as it relates to an organization’s goals. Understanding that experimentation is important, stakeholders are encouraged to judiciously use Gen AI as part of the implementation of these tools. These considerations should not be made at the cost of introducing new disparities or limiting access to underserved communities.

Scholarly societies might look to the Sustainable Development Goals (SDG) Publishers Compact for additional guidance on this topic. Many institutions (especially those in the corporate space) have established Sustainable Development targets that need to be considered in decisions on how/when to use Gen AI, and interested readers may learn more at SME Climate Club (for small and medium organizations), or Net-zero ambition 500 - Science Based Targets Initiative.

Recommendation 2.4 | Federal agencies should develop uniform coordinated standards for verifying Gen AI-generated data and research findings and create resources for stakeholders to leverage regarding Gen AI misconduct evaluation. Organizations should develop processes for verifying Gen AI-generated data and research findings and maintain records.

³ Here is how much data gets used by Generative AI tools for each request (Data Science Central).

Standards for verifying Gen AI-generated data and research findings will help build trust in the outcomes of research efforts using these tools.⁴ Resources that support stakeholders in evaluating Gen AI misconduct would similarly provide necessary infrastructure for use of Gen AI in scientific research. Federal agencies, either via National Institutes of Standards and Technology (NIST) or through another interagency effort such as OSTP, should develop and establish standards and resources.

Organizations should maintain a detailed record of the Gen AI-assisted research findings they produce and report on, and the information resources consumed that have Gen AI components. Organizations should develop best practices to avoid the misuse of Gen AI-assisted research findings and/or the proliferation of disinformation.

Recommendation 2.5 | Federal agencies and organizations should develop tools and platforms for Gen AI reproducibility.

The Task Force recommends the development and support of open-source tools and platforms specifically designed to enhance the reproducibility of Gen AI-assisted research. These might include:

- Solutions for creating reproducible Gen AI environments (computational).
- Platforms for sharing and reproducing, testing Gen AI-assisted research findings, and
- Paths to track the provenance of Gen AI-generated data and research findings.

Recommendation 2.6 | Intellectual property rights and the data of individuals, researchers, and Gen AI software developers should be understood and respected by all stakeholders.

The intersection of Gen AI and intellectual property is complex for US policy makers, funding agencies, and all organizations to navigate. Outlined below are several key approaches stakeholders can take to respect intellectual property rights and data throughout the process.

- Gen AI software developers create new intellectual property in the software. However, they do not do so in isolation or without the benefit of the intellectual property of others. Gen AI software is developed by utilizing vast stores of intellectual property rights belonging to others, including individuals and researchers. In this process, there must be understanding of and respect for individual rights and researcher intellectual property rights. Gen AI software developers should cite sources, recognize, and respect the intellectual property and other rights of researchers and individuals, and ensure they are

⁴ The Task Force recommends that standards include at a minimum these four items: 1) Methods for cross-validating Gen AI-generated results (with each other and also with traditional experimental approaches), 2) Statistical approaches to assess the reliability of Gen AI generated research findings and data; 3) Protocols for mitigating biases or other Gen AI challenges; and 4) Guidelines for peer review of Gen AI-assisted research.

properly obtaining the permissions and rights to use the information for the purpose of use. This may seem daunting given the significant amount of information Gen AI software developers use in creating a tool; however, collective opportunities are now growing to make this more achievable⁵.

- Researchers should have the right to choose when, how, and under what terms to communicate their research findings, in alignment with long-standing academic freedoms in the US⁶. Publishers should clearly communicate with society partners and researchers, authors upfront (prior to submission) and throughout the publication process to ensure researchers/authors are informed and understand how research outputs might be used to train Gen AI. For all research outputs, publishers, databases, and other reporting mechanisms for research findings should make clear to researchers what rights they are providing for reuse as it relates to their produced outputs then leveraged in Gen AI software development.
- Individuals and researchers may license and use Gen AI tools to assist in research endeavors, generate new works, and make new discoveries. In this process, there must be understanding of and respect for the Gen AI tool developers' intellectual property rights. Researchers should cite software tools, recognize, and respect the intellectual property rights of Gen AI software developers.
- Gen AI software developers should make clear and simple guidelines so that end-users easily understand how the queries and information they input into the tool will be used and provide one-click easy paths for end-users to turn off that access.
- All individuals should have the right to data privacy, as addressed in the Data Privacy and Security section of this report (Theme 3).
- All users should be mindful of copyright considerations when using Gen AI – both in terms of content and queries being entered by the user in the Gen AI tool, and the content being generated by the Gen AI tool, including the resources used by the Gen AI tool in development.

The Task Force recommends interested organizations refer to the World Intellectual Property Organization (WIPO) factsheet on generative AI for a more detailed understanding of this complex intersection of issues.

Scientific Integrity and Intellectual Property Conclusion

Scientific integrity and intellectual property are both challenged by the advent of Gen AI. Stakeholders across the biological and biomedical sciences should carefully consider the impact of their decisions to use or not use these tools and particularly the scientific integrity issues challenged

⁵ Wiley and Oxford University Press confirm AI partnerships as Cambridge University Press offers 'opt-in'; Opening doors to discovery of content and data with AI; and CCC launches collective AI license.

⁶ AAUP Statement of Principles on Academic Freedom and Tenure.

by their use, identifying paths to mitigate the risks. In all cases, the rights of individuals, researchers, and Gen AI tool developers should be mutually respected.

Theme 3 | Data Privacy and Security

```
mirror_mod = modifier_ob.  
#set mirror object to mirror  
mirror_mod.mirror_object  
operation == "MIRROR_X":  
mirror_mod.use_x = True  
mirror_mod.use_y = False  
mirror_mod.use_z = False  
operation == "MIRROR_Y":  
mirror_mod.use_x = False  
mirror_mod.use_y = True  
mirror_mod.use_z = False  
operation == "MIRROR_Z":  
mirror_mod.use_x = False  
mirror_mod.use_y = False  
mirror_mod.use_z = True  
  
#selection at the end -add  
mirror_ob.select= 1  
modifier_ob.select=1  
context.scene.objects.active  
("Selected" + str(modifier  
mirror_ob.select = 0  
bpy.context.selected_object  
data.objects[one.name].select  
  
print("please select exactly  
  
-- OPERATOR CLASSES ----  
  
types.Operator):  
X mirror to the selected  
object.mirror_mirror_x"  
mirror X"  
  
context):  
context.active_object is not
```

Theme 3: Data Privacy and Security

The White House Blueprint for an AI Bill of Rights provides a framework for data privacy and security in the U.S. Today, in practice, for individuals and researchers in the US, data protections are not the default, while in Europe, protections have been in place almost a decade, starting with the General Data Protection Regulations (GDPR). Additional information on this front can also be found in the European AI Readiness Act. In the U.S., some states are crafting specific bills related to this issue, notably California. In a Gen AI environment, the concerns about data privacy and security are escalated, and regulatory actions are warranted to protect US citizens.

“You should be protected from abusive data practices via built-in protections, and you should have agency over how data about you is used.”

White House Blueprint for an AI Bill of Rights

Recommendation 3.1 | US policy makers should create new regulations to ensure data protection, privacy, and security are the default for all individuals and researchers in the US.

AI and Gen AI software developers should be required to secure individual permissions, and respect individual decisions. The Task Force recommends that data protection, privacy, and security become an integral part of regulations and become the default for individuals and researchers in the US.

The Task Force also recommends the following specifics regarding data regulations for AI and Gen AI software:

- Regulations should allow only the data strictly necessary for the required functionality to be collected.
- Regulations should protect individuals from unchecked surveillance.
- Regulations should ensure there is no burden for individuals to change data privacy and security settings. Locating and understanding privacy settings should be simple. Privacy and security settings should use brief, plain descriptive language with appropriate context describing the collection, use, and reuse of data. Changing preferences should be immediately available within the tool.
- Regulations should ensure that individuals have access to reporting (where possible) to confirm their data privacy and security decisions are respected by organizations.

Recommendation 3.2 | All stakeholders employing Gen AI are recommended to identify use cases where misinterpreting and reusing data has elevated levels of potential harm and provide an enhanced level of privacy and security.

Gen AI emerging tools and technology provide an easy path for potential harm to individuals through the accidental inclusion of personally identifiable data. Notable examples include the healthcare and education fields. In medical practices, the informed consent process is well-established and serves to protect individuals. At institutions, an institutional review board (IRB) develops procedures to ensure that the appropriate steps are taken to protect the rights and welfare of humans participating as subjects in research. Similar approaches

could prove useful for such high potential harm use cases of Gen AI and in the initial stages of new tool exploration.

Recommendation 3.3 | All stakeholders employing Gen AI should develop and routinely update data management and security protocols for Gen AI-generated data, including robust data governance plans. Federal agencies should include Gen AI guidance in their data management and sharing plans.

Data management and governance protocols are valuable tools for managing an organization's data effectively and efficiently, and for ensuring integrity and accuracy. Many larger organizations have established data governance protocols, but smaller organizations may lag on this front and are encouraged to consider the potential benefits of developing data management and governance in a way that allows the organization to best benefit. Many resources⁷ are available to guide interested organizations, and companies that support small nonprofits in establishing data governance and applying Gen AI tools⁸.

Data Privacy and Security Conclusion

The US would benefit from addressing data privacy and security for individuals and researchers. Notably in the biological and biomedical sciences, there are use cases of AI and Gen AI where the potential for harm is significant. An enhanced level of privacy and security is warranted and both the organizations responsible for using the AI and Gen AI tools and the Gen AI software developers have roles to play in ensuring no harm. Data management and governance is a focus area for improvement and continued investments are needed on this front across all organizations.

⁷ Data Governance Toolkit: A Guide to Implementing Data Governance in Nonprofits

Theme 4 | Diversity, Equity, Accessibility, and Inclusion



Theme 4: Diversity, Equity, Accessibility, and Inclusion

FASEB has a long-standing commitment to diversity, equity, accessibility, and inclusion (DEAI), with a variety of unique programs supporting this commitment, and with DEAI integrated as a strategic priority across divisions and throughout our organizational approaches. Gen AI tools are built on existing data and information, known to include decades of inherent and problematic biases. As Gen AI tools are developed and implemented, inequities could easily be exacerbated. There are, however, also new opportunities within the Gen AI framework for organizations to level the playing field and to ensure new inequities are not introduced. Achieving this goal will require commitment by all stakeholders, a detailed understanding of the complexities involved in Gen AI, and transparency and thoughtful planning and implementation of Gen AI tools.

Recommendation 4.1 | All stakeholders should commit to achieving a disability, gender, racial, and resource equality perspective to ensure equitable access to tools, infrastructure, resources, and outcomes from Gen AI tools.

First, it is important for organizations to acknowledge current challenges with inequitable access to Gen AI tools. This goal is acknowledged and addressed throughout the US-led UN Resolution 78/265 Seizing the opportunities of safe, secure and trustworthy artificial intelligence systems for sustainable development.

Some of the challenges for underserved populations and Gen AI today include access to:

- Infrastructure (internet, energy) disparities exist preventing underserved people from gaining access.
- Usage information, use cases, and outputs are not readily discoverable and unavailable to many stakeholders.
- Affordability in that Gen AI with higher functionality is often available only on paid versions.
- Digital literacy issues in that the use of the tools (accessing, asking appropriate queries, understanding the tool) can require specialized knowledge.
- Privacy with desired limitations, such as protected data privacy, is often available only on paid versions.
- Online safety can be a challenge for underserved people.

Stakeholder organizations positioned to help alleviate some of these challenges include Core facilities, federal agencies such as National Libraries of Medicine (NLM), research and education institutions, or scholarly societies. Specific roles that might be valuable to consult are biostatisticians, bioinformaticians, librarians with Gen AI skills, research directors, diversity, equity, accessibility, and inclusion specialists, and/or legal counsel. Stakeholders should be aware that different U.S. states may have limitations imposed around this issue and should ensure compliance within any regulations that apply at both the state and federal levels.

Organizations should develop plans to alleviate the challenges, including developing guidance regarding how equitable access can be met, and implement workplans to achieve desired outcomes. Partnerships between research and education institutions, scholarly societies, and corporations are encouraged⁹.

Recommendation 4.2 | As organizations engage with Gen AI, they should develop and adopt measures that are aware of geographic differences, multilingualism, potential biases, and seek to respect cultural diversity. For proper monitoring, organizations are encouraged to consider continuous end-to-end human oversight and an understanding that Gen AI tools change with each use.

Software developers of Gen AI systems should seek to be aware of geographic differences and biases, inclusive of multilingualism in training data, and seek to protect and preserve cultural diversity. Funding agencies, institutions, and scholarly societies should adopt measures to support Gen AI tools that leverage multilingualism and are respectful of cultural diversity, while also working to alleviate the risks of outcomes that lead to further harm.

The goal of human oversight is to provide a safeguard, to ensure fairness and adopt the “first do no harm” principles. Ideally, humans would also seek out and interrupt bias and provide missing context to Gen AI tools and their outputs. This will require additional training of the workforce – while many are now aware of their inherent biases, fewer are experienced interrupting or detecting bias.

Organizations could develop uniform benchmarks and transparency guidelines to support monitoring and develop best practices. As new projects using Gen AI are being planned, including a description of how the researcher will check for bias could be a required part of the process, and included later in the project evaluation process.

Recommendation 4.3 | As they engage with Gen AI, organizations should develop and adopt measures that make progress to close the known digital divides. One example is the gender digital divide.

Digital divides are inequalities in access and use of technology and the internet, and exist for a variety of factors, including restrictive social norms, discrimination, and infrastructure. The US Department of States outlined commitments in 2022 to bridge the digital divide. Gender digital divide is when women and girls lack access to, use and development of information communication technologies (see also Inclusive Technology). Organizations are encouraged to pay particular attention to the digital divide as they engage with Gen AI, and work to reduce and eliminate the divide.

⁹ One exemplar program that seeks to address inclusivity in technology is SFSU’s Promoting Inclusivity in Computing

Diversity, Equity, Accessibility, and Inclusion Conclusion

While Gen AI tools hold the potential to exacerbate diversity, equity, accessibility, and inclusion challenges, they also hold the potential to, if applied correctly and with property human oversight, eliminate some inequities and accessibility challenges. Notably, accessibility might be enhanced with Gen AI tools providing underserved people with new modalities for engagement. All stakeholders should be engaged in addressing these issues and monitoring to prevent harm.

Theme 5 | Workforce Impact, Training, and Education



Theme 5: Workforce Impact, Training, and Education

The rapid pace of development of Gen AI tools and their potential applications in biological and biomedical sciences necessitates a comprehensive end-to-end workforce approach to training and education. The workforce lacks an understanding of Gen AI that would position them to identify the best use-case opportunities, effectively utilize tools, and responsibly use Gen AI tools within the complex parameters around data privacy, security, sensitive information, and intellectual property. Upholding research integrity and developing critical thinking skills are companions to the need for Gen AI training in support of a stronger workforce.

Recommendation 5.1 | Federal agencies and institutions should provide resources for, develop, and implement multi-tiered Gen AI training programs and toolkits to address the diverse needs of researchers at different career stages and roles. Institutions and other stakeholders should implement Gen AI training within the traditional undergraduate and graduate curriculum.

Along with policy development, it is critical that funding agencies and institutions, in partnership with other stakeholders, rapidly develop and map out a plan to implement Gen AI training and educational programs. The need extends beyond the traditional K-12 or undergraduate educational training, and must include researchers at all career stages, who present with differing needs. Developing the Gen AI skillset of the US biological and biomedical sciences workforce in academic and research institutions, non-profits, and corporations, is a priority for the US workforce to thrive.

At the same time, it is important for policy makers, funding agencies, and organizational leadership to understand that taking on these needs adds to the cost and responsibilities borne by stakeholders. They should seek to develop resources and redistribute existing workloads to minimize the activation barrier. Examples of impacted stakeholders include researchers, instructors, university grant officers, agency program officers, publications, meetings, and policy staff.

Multi-tiered Gen AI training programs should be funded, developed, and implemented. CITI program trainings might be one solution, as well as scholarly society developed training programs specific to their communities. The Task Force believed there was a significant opportunity in this area, and crafted several appendices to support the next steps:

- Suggestions for program structures can be found in Appendix 2, and should include basic and advanced modules, as well as hands-on workshops.
- Gen AI resource development for the undergraduate and graduate educational framework

might include the key principles outlined in Appendix 3.

- The biological and biomedical sciences community lacks a researcher-focused Gen AI toolkit; recommended items for a toolkit can be found in Appendix 4.

Recommendation 5.2 | Policy makers and funding agencies should create federal training grants for all stakeholders focused on the ethical and effective use of Gen AI.

Given the broad anticipated impact of Gen AI, particularly on the biological and biomedical sciences, policy makers and funding agencies should create training grants for stakeholders that focus on the ethical and effective use of Gen AI. Maximizing Opportunities for Scientific Academic and Independent Careers (MOSAIC) and Training Grants supplements issued by NIGMS could be exemplars for agencies to model training grants for Gen AI.

Recommendation 5.3 | FASEB encourages federal agencies to ensure adequate training of agency staff and program officers both on the appropriate use of Gen AI, monitoring Gen AI use, understanding bias, and their oversight role. Educational institutions are encouraged to add a Foundational Competency statement that outlines how the institute will train and educate students on the usage of AI modalities.

While organizations writ large need to focus broadly on adequate training, federal agencies have a particular role to play in oversight of federal funding for research and educational programs. Implementing training of staff, program officers across the breadth of issues related to Gen AI will better position them to successfully lead and address the recent technology challenges and continue to ensure scientific integrity is upheld. Educational institutions frequently include Foundational Competency statements as part of their process for the certification of their institution and updating that statement with a specific plan for how the institute will train and educate students on AI will be an important addition for continuing certification and will ensure transparency with stakeholders.

Recommendation 5.4 | Funding agencies should create and/or fund the creation of Gen AI educational resources and allocate resources to support continuing educational efforts designed to both improve the workforce and reduce inequities through Gen AI. Additionally, federal agencies could create a centralized repository of Gen AI educational resources.

For many biological and biomedical scientists, self-directed learning may be the fastest path forward. To facilitate this effort, the Task Force recommends federal agencies fund the creation of Gen AI-specific educational resources, and ensure they allocate resources to support educational efforts. Additionally, in their leading role, the federal agencies could develop a centralized

repository of educational resources on Gen AI in biological and biomedical sciences. Suggested items for inclusion in this repository can be found in Appendix 5.

Recommendation 5.5 | Corporations could foster the development of a Gen AI mentorship network connecting Gen AI experts with biological and biomedical scientists.

To support ongoing learning needs and address the rapid evolution of Gen AI technologies, it would be useful to establish new mentoring networks connecting Gen AI experts with biological and biomedical scientists. Corporations are well-positioned to foster such networks, given they benefit from the academic and research institution pipeline of researchers. Such networks could facilitate one-on-one mentoring relationships, including reverse mentoring, organize regular webinars and discussion forums, offer guidance and experience on integrating Gen AI into specific research projects, and address field-specific challenges.

Workforce Impact, Training, and Education Conclusion

Comprehensive training and educational resources for Gen AI are crucial for ensuring that the biological and biomedical research community can harness the full potential of Gen AI while also protecting scientific integrity and identifying paths to reduce inequities. These efforts aim to create a robust ecosystem that engages students and better prepares researchers at all career stages to effectively and responsibly integrate Gen AI into their work. These recommendations should be viewed as part of an ongoing process of skill development, and as Gen AI evolves, training and educational approaches should remain flexible and responsive. Collaborations between students, researchers, educators, Gen AI experts, ethicists across the spectrum will ensure the educational and training approach remains relevant.

Recommendations Conclusion

The variety of stakeholders involved in Gen AI create a complex environment that is rapidly evolving. The US federal government policy makers, funding agencies, research institutions, educational institutions, corporations, and scholarly societies are all partners to the researchers in the biological and biomedical sciences and to the public writ large.

Through external and internal input, the Task Force identified five areas of focus for stakeholders to take first steps to ensure Gen AI is leveraged productively to enhance research integrity, grow the benefits of science, and reduce inequities: 1) Policy and Regulation; 2) Ethics and Intellectual Property; 3) Data Privacy and Security; 4) Diversity, Equity, Inclusion, and Accessibility, and 5) Workforce Impact, Training, and Education. All stakeholders should consider the recommendations as the first steps to be acted upon in a brief time. Acting together, we can ensure the stability and integrity of the biological and biomedical sciences as they now interface with Gen AI and leverage this recent technology to accelerate research and knowledge across the fields critical to human health and the environment.

Acronyms and Abbreviations

Acronym/Abbreviation	Term definition
AI	Artificial intelligence
AIM AHEAD	Artificial intelligence and machine learning consortium on advancing health equity and research diversity at the United States National Institutes of Health
BIO	The biological directorate of the United States National Institutes of Health
Bridge2AI	Bridge to Artificial Intelligence initiative of the United States National Institutes of Health
COPE	Committee on Publications Ethics
DARPA	The United States Defense Advanced Research Projects Agency
DOE	The United States Department of Energy
DEAI	Diversity, equity, accessibility, and inclusion
ECR	Early career researcher
FASEB	Federation of American Societies for Experimental Biology
GDPR	General Data Protection Regulations
Gen AI	Generative artificial intelligence
LLM	Large language models
IRB	Institutional Review Board
MOSAIC	Maximizing Opportunities for Scientific Academic and Independent Careers
NAIAC	The United States National Artificial Intelligence Advisory Committee
NAIRR	The United States National Artificial Intelligence Research Resources
NASEM	National Academies of Sciences, Engineering, and Medicine
NIGMS	The United States National institute of General Medical Sciences
NIH	The United States National Institutes of Health
NIST	The United States National Institutes of Standards and Technology
NLM	The United States National Libraries of Medicine
NSTC	The United States National Science and Technology Council
NSF	The United States National Science Foundation
ODSS	The Office of Data Science Strategy of the United States National Institutes of Health
OMB	The United States Office of Management and Budget
OSTP	The United States (White House) Office of Science and Technology Policy
Postdoc	Postdoctoral scholar
R&D	Research and development
SDG	Sustainable Development Goals
UN	The United Nations
USAISI	The United States Artificial Intelligence Safety Institute
USDA	The United States Department of Agriculture
VA	The United States Department of Veteran Affairs
WIPO	The World Intellectual Property Organization

Appendices



Appendix 1. Key US Government Initiatives

A Task Force generated list of key initiatives from the Executive Office, the National Institutes of Standards and Technology (NIST), and the Office of Management and Budget (OMB)

The summaries are intended to be overviews and not comprehensive in nature. For full details, please see relevant links to each initiative.

- Executive Order 13859, *Maintaining American Leadership in Artificial Intelligence* launched the American AI Initiative (2019) focused on the following five approaches: Investing in AI R&D, Unleashing AI Resources, Setting AI Governance Standards, Building the AI Workforce, and International engagement and protecting our AI Advantage.
- The National AI R&D Strat Plan (2019) took forward a further seven commitments: Make Long-Term Investments in AI Research, Develop Effective Methods for Human-AI Collaboration, Understand and Address the Ethical, Legal, and Societal Implications of AI, Ensure Safety and Security of AI systems, Develop Shared Public D, Measure and Evaluate AI Technologies through Standards and Benchmarks, and Better understand the National AI R&D workforce needs.
- The Blueprint for an AI Bill of Rights (October 2022) outlines five principles (Figure 10) that are intended to guide the design, use, and deployment of automated systems to protect the American public in the age of Artificial Intelligence. One of the key outcomes of the Blueprint is the assignment to the National Institutes of Standards and Technology (NIST) to put frameworks for safe and effective systems into place.



Figure 10. Five Principles from The Blueprint for an AI Bill of Rights

- NIST is the agency charged in the Blueprint with managing an AI Risk Framework, developing AI resources centers, safety institutes, and roadmaps/guidance for other federal agencies. These efforts will guide federal agencies risk management and describe trustworthy and responsible AI use by agencies. Central to this effort is the NIST AI Risk Management Framework, including the following four functions and emphasizing issues such as the importance of documentation, having diverse perspectives, routine monitoring, and engaging with relevant stakeholders.
 1. “Govern: Establishes a culture of risk management, outlines processes and organizational structures to manage AI risks, and ensures accountability and diversity in risk management practices.
 2. Map: Establishes the context to frame AI risks by understanding the system's intended purpose, categorizing the AI system, mapping risks and benefits, and characterizing impacts on various stakeholders.
 3. Measure: Employs tools and methodologies to analyze, assess, benchmark, and

monitor AI risks and related impacts, including evaluating AI systems for trustworthy characteristics and tracking identified risks over time.

4. **Manage:** Involves allocating resources to prioritize, respond to, and manage mapped and measured AI risks, as well as planning strategies to maximize benefits and minimize negative impacts, manage third-party risks, and document risk treatments and communication plans.”

NIST supplemental resources for agencies include the Trustworthy and Responsible AI Resource Center, the NIST AI Roadmap, NIST AI Risk Management Framework Playbook with an interactive searchable tool, the recently formed U.S. AI Safety Institute Consortium at the US Artificial Intelligence Safety Institute.

- In October 2023, the White House laid out a strategy for the responsible development and use of AI in the US in a whole of government approach in the White House Executive Order on the Safe, Secure, and Trustworthy Development and Use of Artificial Intelligence, with collaborations between agencies and the National AI Advisory Council. The executive order takes a ‘requires disclosure’ approach in lieu of regulations – advocating for transparency on both the part of the developers and the government. It acknowledges the significance of AI in fostering innovation and economic growth, recognizes the importance of workforce development, and starts down the path of addressing issues of relevance to national security and human rights and privacy, including reducing bias and discrimination. The strategy covers eight key areas (Figure 11):

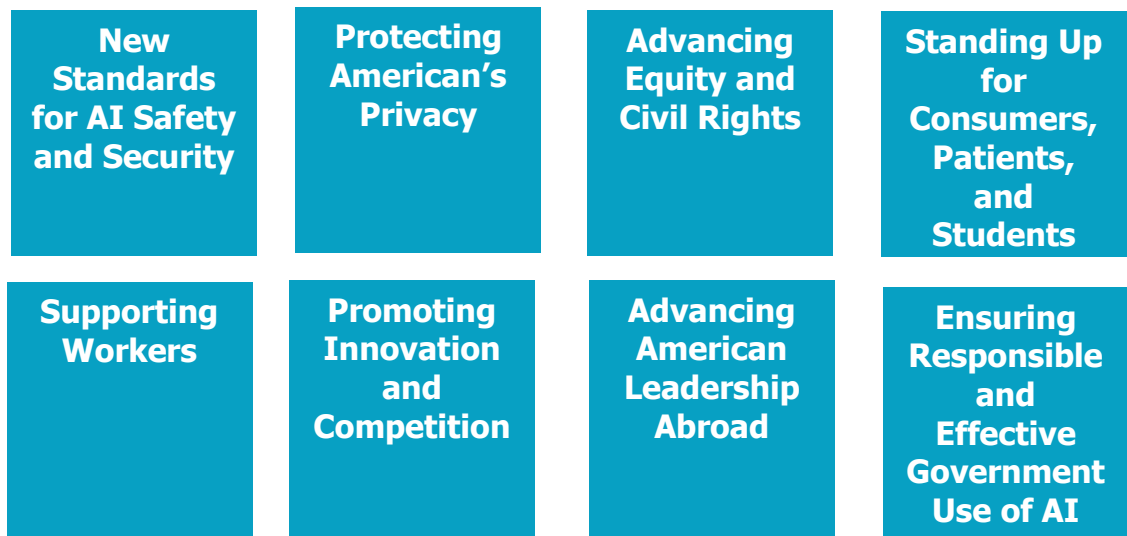


Figure 11. Eight Strategies from the White House Executive Order on the Safe, Secure, and Trustworthy Development and Use of Artificial Intelligence.

- In March 2024, the Office of Management and Budget (OMB) issued Advancing Governance, Innovation, and Risk Management for Agency Use of AI. This document provides timelines

for agencies¹⁰ to accomplish specific AI Risk Management goals. Those timelines are summarized below in Figure 12.

Date from Memo	Selected key required actions
60 days	Designate a Chief AI Officer (CAIO) (or evaluate existing CAIO roles/responsibilities)
60 days	Convene Agency AI Governance Bodies
180 days (of the memo or any updates) + every 2 years until 2036	Submit to OMB and post publicly on the agency's website either a plan to achieve consistency with this memorandum, or a written determination that the agency does not use and does not anticipate using covered AI
At least annually starting 2024	Individually inventory each of its AI use cases*, submit the inventory to OMB, and post a public version on the agency's website.
Within 365 days	Strategies, reducing barriers to responsible use of AI, and enterprise-wide improvements in AI maturity, AI talent, AI sharing and collaboration, and harmonization of AI requirements across agencies
By December 1, 2024	Implement minimum risk management practices, certify publication of determinations of waivers, and follow defined minimum process before using AI (and if/when using AI)

Figure 12. Timelines for Required Agency Actions from OMB Advancing Governance, Innovation, and Risk Management for Agency Use of AI.

- In January, 2025, the White House laid out an executive order entitled Advancing U.S. Leadership in Artificial Intelligence Infrastructure. This order seeks to ensure that large-scale data centers and new clean power infrastructure can be rapidly built and scaled in the United States. It provides a path for agencies to lease federal sites (DOD, DOE) to host large-scale (gigawatt) AI data centers, with developers bringing clean energy approaches to those sites, and includes additional permitting actions and interconnecting transmission lines.

A Task Force Generated List of Key Initiatives from Federal Funding Agencies in the Biological and Biomedical Sciences

The National Science Foundation (NSF) is the largest investing federal agency in AI research and development, with an estimated >\$700M annually dedicated to AI. For agency use itself of AI, the latest NSF’s inventory of AI use cases (agency use cases for AI) lists four use cases. The NSF approaches to AI can be summarized into three categories:

- National AI Research Institutes, launched in 2020, includes 25 AI research institutes covering collaboration between >500 funded institutes. This effort supports the “development of new AI institutes that focus on one of the following themes: astronomical sciences, materials research, and new methods for strengthening AI.”
- National AI Research Resource (NAIRR) Pilot, with a charge to create a roadmap for research infrastructure for researchers, educators, and students. NSF leads a

¹⁰ “defined as “any executive department, military department, Government corporation, Government controlled corporation, or other establishment in the executive branch of the Government (including the Executive Office of the President), or any independent regulatory agency,” but does not include the Government Accountability Office; the Federal Election Commission; the governments of the District of Columbia and of the territories and possessions of the United States, and their various subdivisions; or Government-owned contractor-operated facilities, including laboratories engaged in national defense research and production activities. 44 U.S.C. § 3502(1); see AI in Government Act of 2020 § 102(2) (defining “agency” by reference to § 3502); Advancing American AI Act § 7223(1) (same).) As a result, independent regulatory agencies as defined in 44 U.S.C. § 3502(5), which were not included in the definitions of “agency” in Executive Order 13960 and Executive Order 14110, are covered by this memorandum.”

partnership with twelve other federal agencies and twenty-six non-governmental partners to make available government funded, industry and other resources to support the research and education community. An implementation plan is underway.

- Research funding through directorate level support, including in the BIO directorate.

The National Institutes of Health (NIH) agency use cases of AI are a subset of the US Department of Health and Human Services (USDHHS) inventory. The NIH has various initiatives in place which can be summarized in these five categories:

- Office of Data Science Strategy (ODSS) initiatives focused on workforce in data governance, improving AI readiness of data outputs, administrative supplemental grants, and the AI ethics lab.
- Bridge2AI – an effort addressing the workforce gap in data governance for AI in biomedical outputs, providing grants, new datasets, software, standards, tools, resources, and training videos.
- A variety of research grants focused on multimodal AI and institute/center funded initiatives.
- AIM AHEAD – An AI/ML (machine learning) led consortium focused on advancing health equity and researcher diversity. This includes a new coordinating center at the University of North Texas including administrative networking, protocols for sharing de-identified data, data science training, infrastructure, and an early career researcher fellowship program.
- Advancing Health Research Through Ethical Multimodal AI, with grants for system level biomed challenges using collaborative approaches.

The United States Department of Agriculture (USDA). The USDA is expected to launch their AI strategy in the second half of 2024. As the inventory of use cases demonstrates, AI is already being applied inside the agency for a variety of purposes (39 use cases). Some related strategies are already in place that reference AI and are summarized here.

- USDA FY2024-2026 Data Strategy references upskilling USDA to support advanced analytics and AI, standardizing principles and best practices for analytics and AI, promoting data and AI ethics, responsible use, and transparency.
- Various innovation funds, grants and other related activities, including the ARS AI Innovation Fund and an AI focused Hackathon

The Department of Energy (DOE). The DOE has several key initiatives in place, most notably:

- the AI for Science, Energy, and Security Report (2023)
- The newly formed Office of Critical and Emerging Technology (December 2023) is collaborating with NSF and establishing a pilot program for training 500 new researchers by 2025, coordinating actions across the portfolio, supporting and informing policy making, and developing industry-academic partnerships to accelerate US innovation.
- Various innovation funds, grants, and related activities, including advancements for Artificial Intelligence in Science, and DARPA's AI Forward, an initiative to explore new directions for

artificial intelligence (AI) research that will result in trustworthy systems for national security missions.

DOE Inventory reports 180 AI uses within the agency in 2023.

The United States Department of Veteran Affairs (VA). The VA activities in AI are centered around three key initiatives, outlined below. The latest VA AI Use Case Inventory shows 127 applications in 2023.

- **National Artificial Intelligence Institute.** Focuses heavily on educating medical professionals and improving treatment for veterans.
- **Various Innovation Funds , Grants, Related Activities, including** Tech Sprints and a series of educational Summits.
- **Flagship Pilot Projects,** focusing on COVID-19 120-day mortality model, AI-to-Go Tool (research stats models), Digital Command Center, Suicidal Ideation Text Screening, and Smart Wearable Pilots.

Appendix 2. Task Force Recommendations for Needed Training Modules

The Task Force suggested programming modules and approaches for Gen AI training courses.

Basics Modules:

- Understanding Gen AI fundamentals, the opportunities, and the challenges
- Best practices/dos and don'ts for Gen AI
- Gen AI and scientific integrity and responsible use
- Gen AI and intellectual property
- Gen AI data privacy and security
- Human oversight of Gen AI

Advanced and Practical Modules:

- Understanding and setting your privacy settings
- Identifying effective use cases for applying Gen AI
- Critical evaluation of Gen AI-assisted outputs and mitigating challenges
- Integrating Gen AI tools into your existing workflow, research design, and methods
- Preparing and managing data for Gen AI applications

Hands-on workshops

- Gen AI applications for basic activities (CoPilot, Word, Excel, PowerPoint, email, etc.)
- Specific Gen AI applications in the biological and biomedical sciences
- Gen AI, rigor, and reproducibility

Appendix 3. Task Force Recommended Principles for Education

Task Force generated Key principles for Gen AI resource development in the undergraduate and graduate educational framework.

- Gen AI concepts and application will ideally be introduced throughout the curriculum, not only in dedicated Gen AI modules.
- Dedicated Gen AI modules might be stand-alone or may be integrated into a more comprehensive scientific literacy and ethics/scientific integrity training for biological and biomedical sciences.
- Hands-on experiences with Gen AI should be incorporated into laboratory courses and research projects with a focus on developing critical thinking skills for evaluating Gen AI-generated results and incorporating ethical implications and responsible use of Gen AI.
- Biological and biomedical science departments are encouraged to develop strong interdisciplinary collaborations with the information technology/computer science departments to support these efforts.
- Reverse mentoring, or students training instructors, could also be developed as an approach to reduce the activation barrier. Gen AI “train the trainer” style programming or resources should be developed for college and university instructors, assistant, associate, and full professors and department chairs. These programs might span the basic concepts, tools and applications for Gen AI, common misunderstandings in an educational setting, map out pedagogical strategies and use cases for creating engaging and interactive Gen AI learning experiences, and research integrity (ethical guidelines, SDG, and intellectual property).

Appendix 4. Task Force Recommended Toolkit

Task Force suggested items to include in a Gen AI toolkit geared towards the biological and biomedical sciences.

1. Checklists for ethical considerations related to Gen AI throughout the research life cycle stages and addressing the following issues:
 - a. Human oversight and accountability;
 - b. Strategies to identify and mitigate bias;
 - c. Privacy and content issues related to training data and user-generated Gen AI content;
 - d. Ensuring proper recognition of intellectual property (for the Gen AI software developed and the individual researcher's contributions)
 - e. Evaluating misuse or potential misuse of Gen AI;
 - f. Responsible use of Gen AI in sensitive research areas (e.g., personalized medicine, genomics).
 - g. Validating Gen AI-assisted research findings
2. Summaries of common ethical dilemmas in Gen AI use and corresponding decision-making workflows;
3. Case studies and best practices for how to ethically integrate Gen AI in research;
4. Tools and educational resources individual researchers can follow or engage with to stay current with evolving Gen AI issues; and
5. Templates for how to best report Gen AI use in publications, data, meetings presentations, award, and grant applications.

Appendix 5. Task Force Suggestions for Educational Repository

Task Force suggested items to include in a Gen AI educational repository.

1. A list of useful online courses, tutorials, and webinars on Gen AI in the biological and biomedical sciences
2. Links to open-source texts and review articles summarizing Gen AI applications in the biological and biomedical sciences
3. Case studies demonstrating successful integration of Gen AI in biological and biomedical research
4. Links to how-to-start Gen AI guidelines, field-specific ethical guidelines, and best practices for responsible use of AI
5. Demos of biological and biomedical research-specific Gen AI tools
6. A discussion forum for knowledge sharing

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Acknowledged Use of Generative AI

In the development of this report, Task Force members used a variety of Gen AI tools in seeking to understand the applications of Gen AI in the biological and biomedical sciences. Members also used more general tools in support of their brainstorming, organizing, conceptualizing, and editing the presentation of this material, and as support during meetings. Tools used include versions of ChatGPT, Anthropic's Claude, Microsoft's CoPilot, beautiful.ai, Zoom AI Companion and Summary.



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