asap Aligning Science Across Parkinson's

ASAP Blueprint for Collaborative Open Science

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Executive Summary

The *ASAP Blueprint for Collaborative Open Science* is a comprehensive report on how Aligning Science Across Parkinson's (ASAP) has worked towards its goals to date. This Blueprint presents initial findings on how our approach to open science has solidified and evolved over its first three years, data and metrics on progress, and CC-BY versions of assets that can be adopted and adapted by others. ASAP plans to update the Blueprint with new findings and updated versions of these assets on a regular basis.

Introduction

A Mission to Accelerate Discovery

The Aligning Science Across Parkinson's (ASAP) initiative is devoted to accelerating the pace of discovery and informing the path to a cure for Parkinson's disease through collaboration, research-enabling resources, and data sharing.

PRIMARY ASSUMPTION	Facilitating collaboration, research-enabling resources, and data sharing will accelerate discovery for research outcomes.
SECONDARY ASSUMPTION	Open science fuels collaboration. **Open science**—the public sharing of all research outputs early and often—will facilitate the rapid and free exchange of scientific ideas, ensuring that ASAP-supported research can be leveraged for future discoveries. ASAP hopes to provide a template for how nonprofits, philanthropies, academic institutions and government agencies implement collaborative open science research networks.
TERTIARY ASSUMPTION	Funders have the power to affect real and lasting change. ASAP seeks a comprehensive understanding of the research it has supported (including data and other assets from all stages of the research lifecycle) to establish a legacy of work that will contribute to future research endeavors.

The ASAP Goals

The mission can be broken down into three main components:

ASAP GOAL 1: Support Collaboration

Fund international multidisciplinary teams to encourage the exchange of ideas, foster innovation, and catalyze new experimental approaches. Collaboration over competition is key to achieving earlier successful outcomes and scientific breakthroughs. By supporting collaboration, we can break down silos in science to foster creativity and improve failure efficiency.

ASAP GOAL 2: Generate Resources

Build infrastructure to support the next generation of Parkinson's disease research through genetic analysis efforts, training support, natural history studies, and other research tools. By supporting resource generation, we can build an infrastructure that improves reproducibility of studies and process efficiency.

ASAP GOAL 3: Share Data

Implement open science policies to ensure that ASAP-funded research, outputs, and tools can be leveraged by the broader neurodegeneration community. By sharing outputs like data, code, and protocols, we can increase the power of our studies (through meta-analysis), attract new talent and expertise to the field, and increase collaboration among investigators.

This document serves as a roadmap of the ASAP funding initiative that tracks the efficacy of the ASAP approach and operates as an evolving toolkit and blueprint to help others implement open access policies and open science programs.

ASAP Vision, Mission, and Goals

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Vision, Mission, and Goals: A Theory of Change for Open and Collaborative Science

We adopted the Theory of Change (TOC) framework to approach this work. Utilizing this framework involves outlining a series of desired and actual outcomes with linked rationales mapped back to desired impact. Applying a Theory of Change approach allows us to work from an overarching vision through high level goals and work backwards to implement actions that will achieve these goals. It also allows us to always reflect and reiterate on process as we measure our progress to date.

VISION:

Collaborative and transparent research processes and environments that deliver faster and better outcomes.

MISSION:

The Aligning Science Across Parkinson's (ASAP) initiative is devoted to accelerating the pace of discovery and informing the path to a cure for Parkinson's disease through collaboration, research-enabling resources, and data sharing.

ASSUMPTIONS:

- *Facilitating collaboration, research-enabling resources, and data sharing will accelerate discovery and improve outcomes.*
- *Open science fuels collaboration as research outputs are publicly shared early and often.*
- *As a funder, ASAP can bring resources, policies, practices, and new incentives to bear to creating lasting culture change.*

GOAL 1:
Support Collaboration

Fund international multidisciplinary teams to encourage the exchange of ideas, foster innovation, and catalyze new experimental approaches.

GOAL 2:
Generate Resources

Build infrastructure to support the next generation of Parkinson's research through genetic analysis efforts, training support, natural history studies, and other research tools.

GOAL 3:
Share Data

Implement open science policies to ensure that ASAP-funded research, outputs, and tools can be leveraged by the broader community.

The Strategic Plan

In order to achieve these goals, ASAP developed a plan that rested on three pillars: people, incentives and rewards structure, and operational excellence.

- **People**—this broad category includes not only the multi-disciplinary investigators that are collaborating together and prioritizing open science, but also the team of project managers, ASAP staff and leadership that facilitate collaborative open science and data sharing.
- **Incentives and rewards structure**—that motivates researchers to work together, publish openly, and share research outputs.
- **Operational excellence—**the infrastructure, instruments, and workflows employed to support the program.

Each of ASAP's three goals can be broken down into its own body of work, with a set of intermediate goals and activities, including assumptions and inputs defined and communicated.

Achieving ASAP's Goals through Policy, Practice and Infrastructure

The three goals laid out by ASAP's leadership, Managing Director Ekemini Riley and Scientific Director Randy Schekman, are broad and ambitious. This document will map the steps that have been outlined and implemented to reach each goal. The Theory of Change approach has been taken with each of the three goals.

How ASAP's implementation is furthering each of its stated goals:

1. To support collaboration, ASAP is funding international multidisciplinary teams to encourage the exchange of ideas, foster innovation, and catalyze new experimental approaches. Implementation and progress to date is here.
2. To generate public resources, ASAP is building infrastructure to support the next generation of Parkinson's research through genetic analysis efforts, training support, natural history studies, and other research tools. Implementation and progress to date is here.
3. To increase data sharing, ASAP is implementing open science policies that ensure ASAP-funded research, outputs, and tools can be leveraged by the broader community. Implementation and progress to date is here.

Implementation and Progress to Date

The pursuit of collaborative open research involves establishing a new culture for research that shifts from publishing-based incentives and highly competitive practices to an environment that incentivizes early sharing and working together towards common goals.

ASAP has partnered with the Michael J. Fox Foundation (MJFF) as its implementation partner as well as experts in the fields of collaboration and open science to plan and launch the new funding initiative. Almost two years after awarding the first grants, ASAP is establishing a methodology to report findings and share data and assets that would be of value to other funders and institutions pursuing similar goals.

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Introduction

Scientific progress can be accelerated when researchers exchange ideas early and often, rather than withholding data and results from the larger scientific community until the final polished publication. ASAP established the Collaborative Research Network (CRN), an international, multidisciplinary, and multi-institutional network of collaborating investigators working to address high-priority basic science questions related to Parkinson's Disease pathology in an environment that fostered collaboration over competition across all of its grantees. Our hypothesis was that by supporting collaboration, we are breaking down silos in science to foster creativity and improve failure efficiency.

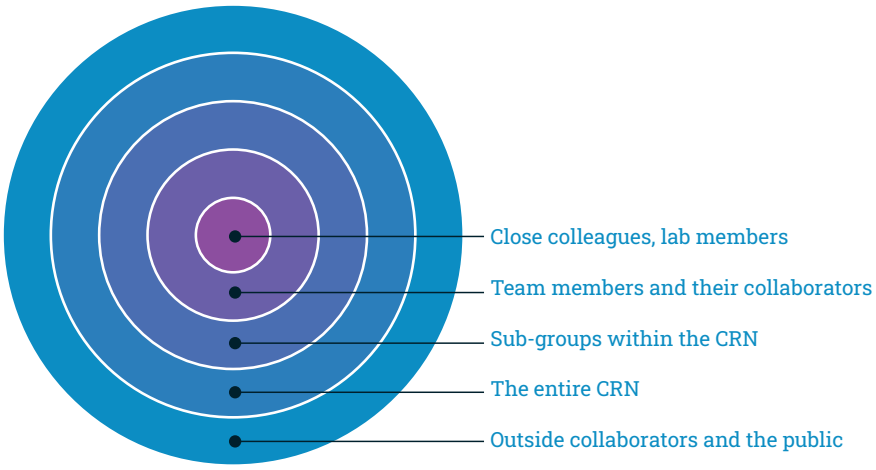
Through intentional actions—such as early communications about the grant application process, deliberate outlining of team structures to promote cross-lab and cross team interactions, onboarding of new grantees, and leading a network of trust—ASAP has carefully infused collaborative elements and guidance into its program. The CRN launched in October 2020 and currently funds 35 teams that are comprised of 163 team lead investigators from around the world. All grantees agree to our progressive open science policies, which require the sharing of methods, resources, and data throughout the network.

Here, we will discuss our guiding principles, our key infrastructural components to making the CRN a success, and lessons learned.

Changing the Culture

A culture of collaboration is created through a series of behaviors that are generally influenced by enlightened self-interest. The current research climate has been incentivizing extreme competition with a scarcity of funding and positions available to researchers. ASAP built into its program components that foster the sharing of early findings and receiving feedback from colleagues.

Collaboration moves at the speed of trust. ASAP recognizes that, at a basic level, trust within a network operates as a series of concentric circles with the smallest circle representing the highest level of trust. ASAP's vision was to grow trust from the inner circle (a single lab) to a team made of multiple labs across institutions that were awarded an ASAP grant to subsets of teams in topical subgroups, to the entire CRN made up of all the teams across the network, to the public at large.



When a team is ready to publish, the framework for ensuring that those research outputs are accessible and discoverable to the general public is governed by ASAP's open access policies. To promote public dissemination of findings, a team is required to post a preprint by time of submission to a journal for review. As of July 1st, 2022, ASAP has supported 35 publications from our CRN. Preprints were posted on average 153 days (~5 months) earlier than the final manuscript released for publication.

The open access and shared resources aspect of ASAP ensures that researchers outside the network can not only benefit, but advance, the work of other labs. In this way, ASAP aims to move the culture of PD research as a whole towards collaboration and data sharing, rather than simply within the CRN. With this infrastructure, those within the network begin to build connections across these circles, creating a matrixed interconnected environment conducive to promoting comfort in early data sharing and the formation of new collaborations.

Infrastructural Components to the CRN

There are seven aspects about the CRN which make it uniquely suited to foster open research practices and increased collaboration:

1. **Selecting for success:** grantees were screened during the pre-proposal stage for a history of collaborating, sharing datasets and/or protocols, and publishing open access articles and preprints.
2. **Structuring teams:** teams are made up of 3-5 separate labs with the following requirements:
    - History of collaboration between at least two labs,
    - At least one lab is a new collaborator,
    - At least one lab is led by an early career investigator,
    - At least two labs are from different disciplines,
    - At least two labs are at different institutions.

    The emphasis on cross-lab collaboration has led to the inclusion of labs working outside of PD, bringing fresh ideas and perspectives to the work, with over 90% of the teams including a team lead that is new to the Parkinson's field.

    Each team is also required to budget for a full time project manager. The project manager is embedded within the team, and their main roles are to facilitate communication across labs, ensure compliance with open science policies, and coordinate participation in network-wide activities outside of the team. As of July 1st, 2022, over 850 different research resources across the network were cataloged by project managers and shared on the CRN virtual platform.
3. **Promoting transparency:** To ensure that everyone within the network felt comfortable sharing, we created a private virtual platform—The ASAP Hub—that served as a centralized information resource for anyone who worked on an ASAP project regardless of career stage. The ASAP Hub is a custom-built, open source platform that houses researcher profiles, team and subgroup pages, recordings and notes from past events, and a library of all research outputs being produced by each team. All individuals working on CRN projects are also able to view all the funded team grant proposals and subsequent progress reports of each team. As of March 2022, we had about 850 users on the platform. In the past month, around 80% of all individuals that are part of the network logged in at some point to use the system.

4. **Facilitating idea exchange:** ASAP has identified cross-cutting themes across the awarded teams and established subgroup forums for multiple teams to come together to share preliminary data around a specific topic and receive feedback from others in the CRN. These subgroup meetings are private only to the CRN, allowing for early collaboration without requiring public sharing before the work is ready. Young investigators such as postdoctoral fellows and graduate students were also encouraged to present during these events to ensure that the network provided opportunities for those earlier in their career to participate.

   ASAP identified the groups based on emerging themes from the grant proposals, provided the virtual infrastructure, using Zoom as our video meeting platform, and a suggested frequency of meeting times throughout the year. Team leads from within our network volunteered to chair a specific track, with their team project manager subsequently assigned to assist with meeting coordination and taking notes. The notes focused on key takeaways, action items, and potential new collaborations identified. ASAP and MJFF Scientific staff also attend these meetings, focusing on where they could assist in facilitating introductions to experts either within the network or outside the network as needed.

   In our first year of hosting subgroups, 15 thematic tracks were identified by ASAP. At the end of our first year,

   - 106 presentations were made across the network. (41 total subgroup events)
   - 66% of meetings featured a graduate student or postdoctoral fellow as a presenter.
   - 60% of meetings discussed a new resource/tool.
   - 46% of meetings identified a new collaborative opportunity.
   - 2 working groups initiated from discussions focusing on developing best practices on common workstreams (such as standardizing reporting templates, analytical pipelines, and identifying preferred repositories for the whole network).

5. **Training and onboarding:** As part of the onboarding process, team leads were instructed on the policies and the expectations for grantees to embrace open science culturally beyond the requirements of the policies. Project managers embedded within each team received additional training to become ASAP ambassadors to educate their team on not just what was expected but also the value proposition for why those policies were in place.

6. **Providing collaborative tools:** To facilitate communication channels within a team, we provided access to collaboration tools such as:

    - Cloud storage space for teams to share files, meetings notes, in a centralized location. (Google Drive)
    - Centralized communication messaging for within team and across team communications. (Slack)
    - Virtual meeting hosting capabilities. (Zoom)
    - Private workspace environment for methods development. (Protocols.io)

    There was no requirement for a project manager or team to adopt our preferred tools, as we recognize that teams may already have existing workflows that would be better integrated into their communication strategy.

    As of July 1st, 2022,

    - 80% of teams use the provided ASAP Google cloud storage space.
    - 40% of teams take advantage of the private ASAP-licensed Slack team channels for communications within their team.
    - 49% of project managers asked to be on our Zoom licensed accounts.
    - 77% of teams have used Protocols.io to deposit protocols in the private workspace environment for early sharing within the network prior to publication.

7. **Rewarding desired behaviors:** Grantees are also made aware that in addition to the scientific findings coming out of the awarded proposal, ASAP is looking for evidence of and will reward collaboration through various forms of recognition as well as in its assessment and grant renewal processes. Policies that operate as a rule set rather than a suite of recommendations that are tied to grant renewals are a strong incentive structure. ASAP requires teams to self-report on compliance with policies, list out any new collaborations that have arisen from within the network, and highlight any CRN member outside of their own team whose shared resources have been useful through annual progress reports.

Lessons Learned

Our biggest concern from the outset was the buy-in from our investigator community. Pre-selecting for those that have demonstrated a commitment to open science and collaborative principles helped alleviate this risk. However, it became clear that there was a large gap between wanting to do open science and knowing what the best practices are to do open science. The open science ecosystem is rapidly evolving and for ASAP to be at the forefront, requires ASAP to always be continuously adapting its requirements. In partnership with DataSeer.ai, we developed a report for grantees submitting manuscripts to identify actions required to improve the open science components of the manuscript (datasets, software, code, lab materials and protocols). Along with these reports, we developed educational materials to better guide grantees, and used the preprint submission as a starting point to allow grantees time to update their manuscripts for final publication. We also began hosting monthly meeting sessions with our project managers, to help educate them on the open science process and allow them to become their team's open science champion.

ASAP GOAL 2: Generate Resources

Creating centralized tools for the ASAP network and broader neurodegeneration community

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Introduction

In addition to funding the Collaborative Research Network (CRN) whose initial focus is on the basic mechanisms responsible for the onset and progression of PD, ASAP is also funding work to support the discovery and validation of new genetic risk variants, biomarker candidates, and drug targets. These programs include:

- Global Parkinson's Genetics Program (GP2)
- Parkinson's Progression Markers Initiative (PPMI)
- Accelerating Medicine Partnership in Parkinson's Disease (AMP® PD) program
- iPSC Neurodegenerative Disease Initiative (iNDI) for PD

Each of these programs are generating critical infrastructure resources for our CRN to leverage as well as the entire research community. Through our research output management system (ROMS), the CRN is also cataloging the resources generated within their own teams resulting in an internal library for any CRN researchers to utilize early on in their own research endeavors. Any ASAP funded public resources are also posted on our external website.

By supporting resource development, we are building an infrastructure that improves access to research tools, reproducibility of studies, and process efficiency. Below is a brief description of our resource programs and how the programs leverage one another.

Resource Programs

Global Parkinson's Genetics Program

The Global Parkinson's Genetics Program (GP2) mission is to dramatically expand our understanding of the genetic basis of PD and to make that knowledge globally relevant. To this end, they have developed critical infrastructure to facilitate active engagement with researchers recruiting cohorts from around the world, a centralized workflow pipeline to analyze these datasets, a dashboard for all to view cohort selection and genotyping progress, as well as a centralized repository (AMP® PD's knowledge platform) for anyone to be able to access. Learn more by visiting: www.GP2.org.

Parkinson's Progression Marker's initiative

The Parkinson's Progression Marker's initiative's (PPMI) mission is to identify quantifiable biomarkers of Parkinson's disease onset and progression. Since 2010, PPMI has been collecting valuable resources for research, pairing biosamples (DNA, RNA, plasma, serum, whole blood, urine, saliva, and peripheral blood mononuclear cells) with clinical and imaging data to understand the underlying changes in the body as Parkinson's starts and progresses. ASAP support is enabling an expansion of PPMI, growing its clinical cohort to more than 4,000 participants at 50+ sites, with a focus on recruiting participants who are carrying clinical or genetic risk factors without manifesting PD. This expansion will facilitate an unprecedented look at the progression of Parkinson's from the molecular to the clinical scale, from pre-motor to later-stage disease. Researchers around the world have downloaded PPMI data more than eight million times, and the study has fielded more than 200 biosample requests. PPMI data is harmonized with the NINDS Parkinson's Disease Biomarkers Program (PDBP) data and Harvard Biomarker Study data. These harmonized AMP-PD datasets are shared alongside GP2 data through the AMP® PD's knowledge platform. Learn more at: www.parkinsonsroadmap.org/ppmi.

Accelerating Medicine Partnership in Parkinson's Disease

The Accelerating Medicine Partnership in Parkinson's Disease (AMP® PD) is supported by a public-private partnership between the National Institutes of Health (NIH), multiple biopharmaceutical and life sciences companies, and non-profit organizations. ASAP joined the partnership in 2019. The focus of this partnership is to create a platform with harmonized multi-omic data resources that is accessible to the broader research community, with a focus on supporting the identification of PD progression biomarkers and informing clinical trial design. Therefore, a critical

component of AMP PD is the development of the AMP PD knowledge platform, which under a biodata sphere model, brings together well-characterized cohorts with existing biosamples and clinical data that were collected under comparable protocols and using common data elements. Within two weeks of depositing the initial GP2 dataset into the knowledge platform, over a thousand users downloaded the data. Learn more by visiting: https://amp-pd.org

iPSC Neurodegenerative Disease Initiative for Parkinson's (iNDI-PD)

The iPSC Neurodegenerative Disease Initiative (iNDI) is the largest genome engineering initiative in research to date. ASAP is supporting and expansion of iNDI (called iNDI-PD) to ensure that additional mutations relevant to Parkinson's disease (PD) research are also included in this effort. These cell lines will allow researchers to attribute observed changes to specific mutations more quickly—cutting through the noise of genetic variation—and confidently.

Induced pluripotent stem cells (iPSCs) are derived from adult skin or blood cells and reprogrammed back into pluripotent stem cells. However, donors who provide these cells carry innumerable genetic differences, making it hard to pinpoint whether an observation is due to a disease-causing mutation or something else in the patient's genetic makeup. iNDI introduces disease-causing mutations to a set of cell lines that all have the same genetic background (called isogenic lines). All lines once properly QC'd will be commercially available online through Jackson Labs. Additionally, iNDI-PD will create isogenic controls for the popular PPMI cell line requests, to ensure that there are appropriate resources for the community to use when interrogating the function of PD associated genes in cell model systems. Learn more by visiting: www.parkinsonsroadmap.org/indi-pd.

CRN Resources

ASAP leadership has identified touch points across the resource programs to ensure seamless integration with the CRN. The resource programs are advertised to all teams, and representatives from these resource programs are regularly invited to participate in CRN subgroup conversations. Based on these interactions, GP2 has volunteered to sequence all of the postmortem tissue samples used by all investigators within our network. iNDI PD has made regular presentations to advertise the early lines available for the network to use as well as the lessons learned in ensuring the right quality control assays are in place for different model systems.

Research Output Management System (ROMS)

The teams within the ASAP CRN are also generating resources in the course of their projects. ASAP has also developed a Research Output Management System (ROMS) to track resources from all grantees that are available for the entire network to use. The goal of the ROMS is to log and track all outputs through a single centralized system. The ultimate goal is to make outputs accessible and discoverable for others to leverage in their own research as needed. The ROMS replaces the static Data Management Plans (DMPs) in use by funders and institutions. DMPs do not reflect that evolving nature of the research nor do they encourage or track outputs to ensure that they have been placed in the public domain with appropriate persistent identifiers and metadata to make them discoverable and useful to others.

Research outputs get inputted into the ROMS from three different sources:

- Grantee self-report through their team project manager on a rolling basis.
- Output pulled from grantee preprint/publication through the DataSeer.ai report.
- Output mentioned during an ASAP meeting and flagged by ASAP staff for follow up.

With the support from both PMs and the ASAP operations team, outputs in the ROMS are associated with appropriate metadata and links to where outputs have been stored in FAIR Repositories. FAIR stands for Findability, Accessibility, Interoperability, and Reuse of digital assets and the set of principles helps to determine which repository to use. PMs continuously update the catalog throughout the year, but are also required to submit their ROMS report along with their annual progress report, a milestone for releasing the next year of funds from their grant budget.

Our ROMS catalog intakes the following information:

- Type of output (Article, Protocol, Lab Resource, Dataset, Software/Code)
- Stable URL (unless it's a physical resource)
- Subtype dependent on output (see matrix schema below) to help with filtering and search
- Title of output to be shared
- Brief description of what the output is
- ASAP Funded (yes,no)
- Referenced in a publication (yes,no)
- Sharing status (within network only, public)
- Methods (dropdown list of methods)
- Organisms (drop down list of organisms)
- Environment (drop down list: in vitro, in vivo, ex vivo, in situ, in silico, in cellulo)
- Keywords
- Permanent Identifier
- Usage Instructions (if additional information for how to access output is needed)
- Date added to system
- Date published (i.e. date output is publicly available)
- Authors contributing to the generation of output
- ASAP Teams associated with output
- ASAP Labs associated with output

ARTICLE	BIOINFORMATIC TOOLS	DATASETS	LAB RESOURCES	PROTOCOLS
Assay	Code	Behavioral	Assay	Analysis
Preprint	Data Portal	DNA	Animal Model	Cell culture & differentiation
Published	Software	Electrophysiology	Antibody	Cloning
		Microscopy & imaging	Biosample	Genotyping
		Protein	Cell line	Model System
		RNA	Compound	Protein expression
		Spectroscopy	Plasmid	Sample Prep
			Viral vector	Shipment Procedure
				3D Printing

Table 1: Matrix schema for subtype categories within a specific research type to provide more context for those using our catalog.

As of July 1st, 2022, there have been over 850 resources that have been cataloged and shared within the network.

RESOURCE TYPE	NUMBER SHARED	PUBLIC V. WITHIN NETWORK ONLY	ASAP FUNDED	USED IN PUBLICATION
Software/Code	50	100% Public	20%	80%
Datasets	66	83% Public	38%	90%
Protocols	419	42% Public	26%	31%
Cell lines	76	38% Public	7%	28%
Plasmids	187	85% Public	36%	68%
Viral vectors	29	31% Public	28%	38%
Animal models	29	76% Public	0%	79%

Lessons Learned

Although many were familiar with the concept of sharing data and citing reference numbers from repositories for specific datasets, there was less familiarity with obtaining persistent identifiers for code and lab materials or for how to deposit a lab material into a repository. Therefore, ASAP has focused on the following tools to provide additional resource support:

- SciCrunch for obtaining research resource identifiers (RRIDs) and registering any software generated from ASAP funds. Through our support, Dataseer.ai began pulling from the SciCrunch database suggested RRIDs for lab materials identified in manuscripts into the DataSeer comprehensive reports, lowering the barrier for our network in using RRIDs when citing other lab materials. In the next few years, we will leverage the infrastructure around RRIDs to also start pulling information on which RRIDs associated with ASAP funding are being cited in other manuscripts as a measure of impact.
- ASAP Tools Program—working with the Michael J. Fox Foundation, an ASAP implementation partner, we provide assistance in the deposition of lab materials such as plasmids, antibodies, cell lines, and organisms generated with ASAP Funds into third party repositories. Our philosophy is to reduce any administrative roadblocks for our grantees. As we are still in early days, no one has utilized the program offering as of yet. The only ASAP lab materials available so far have been plasmids, which Teams are able to coordinate with the Addgene repository directly to deposit those tools.

Recognizing that logging and tracking of outputs takes time, ASAP supports a project manager position with each CRN team to assist with curation of items shared. A growing list of these resources includes plasmids, antibodies, animal models, cell lines, and more. Each lab material funded by ASAP grant funds received an RRID to ensure that it can be cited and referred to using standard linking and metadata.

ASAP Goal 3: Share Data

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Introduction

One of ASAP's objectives is to ensure that other researchers can build upon the datasets generated through the ASAP funding initiative. Our hypothesis is that improved discoverability and accessibility of data, allows one to:

- Increase the power of research studies (through meta-analysis),
- Attract new talent and expertise to the field, and
- Increase collaboration among investigators.

Based on this assumption, one of our measures for success was to:

- Have datasets be shared as early as possible, and
- Ensure that all datasets associated with ASAP-funded publications are located in publicly-accessible repositories with appropriate metadata associated to allow for future powered metadata analyses.

Data sharing is not a trivial matter. It takes time, energy, and expertise to curate datasets to ensure they are meaningful and usable for others. Therefore, ASAP invested in human resourcing, policies, and tools to assist our network in depositing datasets and other outputs following best practices in the data curation field.

Human Resourcing

ASAP required each CRN team to budget for a Project Manager (PM), who can work within their teams to support implementation of the research plan and oversee data curation to ensure that the team is meeting the stated requirements and intent of the ASAP funding initiative. PMs also meet as a group with ASAP leadership, specifically the Deputy Director, and work together on establishing best practices and reporting.

The role of the PM is crucial to the success of the open science program. Having a full time, well-trained open science practitioner embedded within each team has taken the burden off of the researchers in the lab, making compliance less onerous. With the Deputy Director leading the group, the PMs have also created a network to learn from each other and share best practices, tackle problems as they arise, and create joint solutions.

Policies as Incentives

The strongest incentive structures balance carrots and sticks, and funders have the power to change behavior by acknowledging and utilizing these positive and negative associations with grantees. Policies that are clearly defined and well-communicated help grantees understand from the outset what is expected of them for grant award and renewal.

In consultation with Stratos and Rapid Science, two open science advising firms, ASAP developed a strong set of policies that included:

1. **Mandatory preprint**—Manuscripts have to be posted on preprint servers before or at the time of submission to a journal.
2. **Open access**—All journal articles and reviews must be published open access, in the spirit of Plan S. ASAP covers article processing fees for these articles.
3. **FAIR repository use**—All research outputs (e.g., datasets, software, protocols, lab resources) must be posted in appropriate FAIR repositories with persistent identifiers.
4. **ASAP ROMS use**—All research outputs must also be logged in the ASAP Research Output Management System (ROMS) (see Goal 2: Generate Resources—Research Output Management System section for more details).
5. **Persistent researcher identifier**—All ASAP-funded team members have an ORCID.

ASAP codified requirements 1 through 4 in grant agreements that ASAP enters into with grantee institutions. Grantees are also made aware that compliance with policies is a factor in receiving future funding from ASAP. Requirement 5 was a condition of both applying for an ASAP award and getting an invitation to join our virtual Hub platform to access ASAP resources.

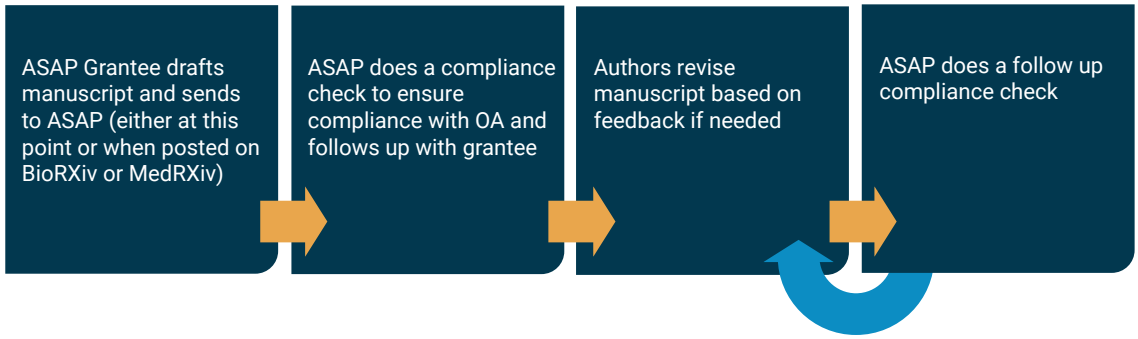
Share Data—Operations

To help enforce our open science policies, ASAP partnered with an AI startup—DataSeer—who use Natural Language Processing to find sentences where authors describe data collection (e.g., "X-ray data were collected under a cryogenic nitrogen stream at the FMX beamline") or the generation of other research outputs, then checks whether those outputs are publicly shared.

The current workflow is as follows:

- ASAP grantees upload a preprint to bioRxiv or medRxiv and notify ASAP staff.
- DataSeer then tallies the datasets the authors generated and determines which have been made public; this process is repeated for code & software, protocols, and lab materials.
- DataSeer also checks whether authors adequately cite re-use of existing resources.
- The authors and associated project manager for the Team are then sent a detailed report requesting that any missing items be shared/properly cited.
- DataSeer would then assess the next version to ensure that all issues have been corrected. Click here to see an example report.

One of the biggest barriers to following open science practices was the lack of clarity on what needed to be done. Since July 1st, 2021 DataSeer has run 161 compliance reports with a turnaround time of less than 3 business days from when a manuscript is uploaded into their system. Since the start of the compliance workflow, some teams have unexpectedly started sending their manuscripts prior to preprint posting. They view this report as useful information that can assist with their own editing of the draft manuscript.



Having the compliance check at the preprint stage is an opportunity for ASAP to educate our network on the best practices for open science. We can run compliance checks and work with grantees through their project manager to ensure that any additional deposition of research outputs and curation required (such as datasets, protocols, software and even research resources, such as antibodies, plasmids, and other materials) are updated for final publication. This approach of guiding grantees along the publishing journey has been effective.

Evidence of Impact

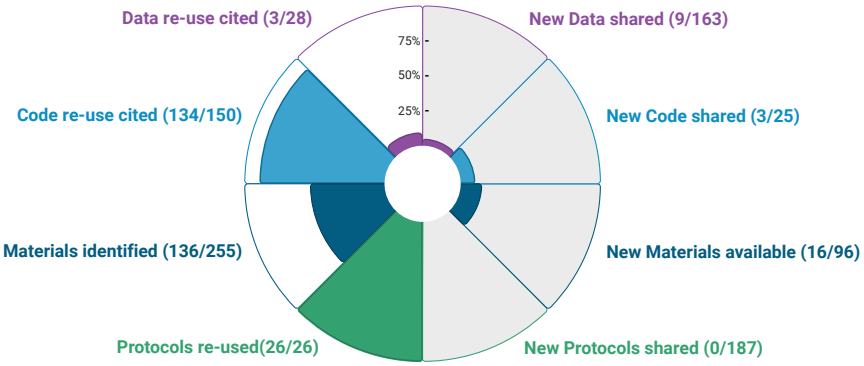
To establish a baseline of output sharing among these researchers, we examined 20 articles from 2019 by the same lab groups that subsequently received ASAP funding at the end of 2020. These groups shared very few of their outputs as evidenced by the 20 articles selected: only 9 datasets (5% of total identified), 3 code objects (12% of total identified), 16 new lab materials (17% of total identified), and 0 protocols. These very low proportions are—unfortunately—typical for research articles. Correct source citation of re-used existing datasets also fared poorly in the 2019 articles (only 3 of 28 re-used datasets in the 20 articles accurately cited the re-used datasets, or 10%).

We next assessed the first 18 preprints posted by ASAP grantees in 2021. These represent the authors' first efforts to comply with ASAP's policy. In line with previous experience of data policy compliance, the proportion of shared outputs was still low. Taken together, these 18 preprints shared 24 new datasets (12% of the total), 14 new code objects (45% of the total), 15 new lab materials (17% of the total), and 4 new protocols (3% of the total). There was some improvement in citing re-used existing datasets (6 of 9, or 66% of the total).

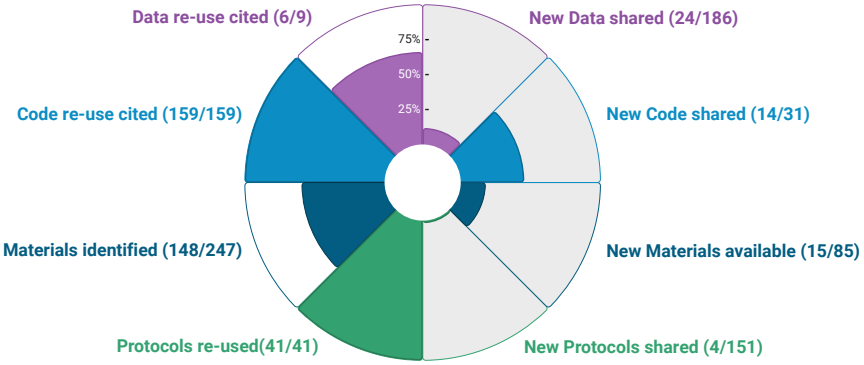
After DataSeer had assessed these preprints and ASAP staff reported back to the authors, 10 were posted as second versions and DataSeer reassessed the versioned manuscripts. A vastly higher proportion of their outputs were shared: 91 datasets (81% of the total), 12 code objects (80% of the total), 23 new materials (31% of the total), and 37 protocols (39% of the total). The proportion of previously published datasets that were correctly cited rose to 100%. See figure below for a visualization of how DataSeer reports dramatically improved sharing of new datasets, code, and protocols.

Our grantees have actively shared the preprint posting with ASAP staff, but are not as likely to share the final publication once it is out. In 2022, ASAP began partnering with OAWorks to assist with discovery of new preprints and published articles through monthly reports on articles attributing ASAP as a source of funding in the acknowledgements. We use these reports in addition to self-report from project managers to have a comprehensive overview of preprints and publications in the space that we can put into our DataSeer workflow and track our impact over time.

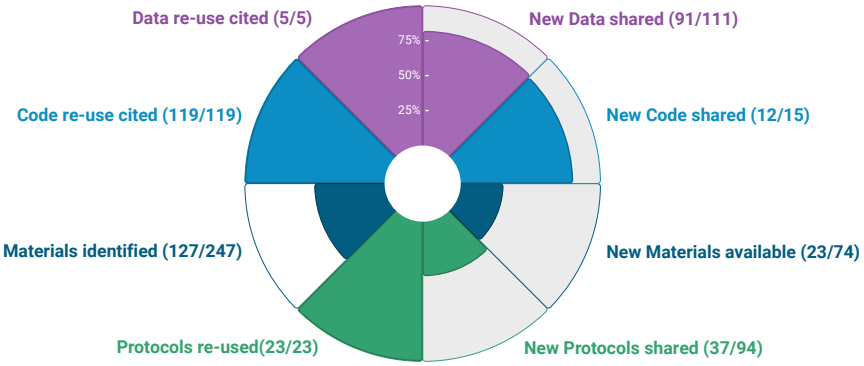
PRE-ASAP FUNDING



FIRST PREPRINT



VERSIONED PREPRINT



Establishing communities within repositories

ASAP's minimum requirement is that all public data be in repositories upholding FAIR standards. However, grantees requested guidance on where to deposit protocols and which repositories to consider for specific datasets that had large file sizes such as imaging or video data along with recommendations for the file formatting to use when depositing.

Therefore, ASAP established communities within:

- Protocols.io for sharing protocols—we established a private workspace for protocols to be freely exchanged within the CRN. This allowed users to be comfortable with using the platform. As of July 1st, 2022, 419 protocols were shared within the network. Once a protocol is on the private site, it's just a click of a button to get the protocol published with a DOI assigned. This gradual transition to public sharing reduces the barrier for our grantees to have protocols ready to go and linked in the final publication. Currently, 42% of protocols in our community have been made public. The successful utilization of the private workspace prior to making protocols public is now adopted by other funding agencies.
- Zenodo is an all-purpose repository for datasets and can also be linked to GitHub to assign a permanent identifier for GitHub code citation. We established an ASAP community to make it easier for our researchers to deposit datasets or code here if they were not already using another repository for their file format.
- bioRxiv for posting preprints. We set up an ASAP channel on bioRxiv, which allows us to curate all ASAP-acknowledged preprints from medRxiv and bioRXiv. Having this channel also allows you to aggregate metrics on the backend, such as usage metrics, versioning, and when a preprint is linked to a publication.

Lessons Learned

As we embarked on establishing better resources for our community, we started compiling a list of frequently asked questions coming from our network. Below is a summary of some of the common themes:

1. **Not understanding what a Creative Commons (CC) license option is and why it mattered**—A creative commons license is a standardized way to grant the public permission to use creative work under copyright law. Most researchers are not thinking about licenses and are not well versed in what a license even means. When we began requesting the use of a CC BY 4.0 license, there was confusion about what that meant. A CC BY 4 license is also known as a CC BY license, and it allows reusers to distribute/remix/adapt and build upon the material in any medium/format as long as the creator gets attribution. Under PlanS, the license was referenced as CC BY 4.0 (CC BY version 4) which generated confusion as the "4.0" was not often an option in dropdown menus for license selections. Moreover, our grantees were also assuming that derivatives of the license CC BY-NC (use for non commercial purposes only) or CC BY-ND (no derivatives or adaptations of the work are permitted) were also allowed in our licensing requirements. We invested additional time in clarifying our rationale as Plan S members by sticking to either the CC BY without any increased restrictions or allowing for the more permissive license CC0 (also known as Creative Commons zero, where a creator gives up their copyright completely).
2. **Understanding the landscape of transformative journals**—As a Plan S member, we considered phasing in the Plan S requirement of only allowing certain open journals (those that are Gold, Transformative, or have transformative agreements with the author's institution) to be allowed for publishing. However, it became apparent that it is not clear which journals are transformative and that the transformative agreements could exacerbate inequities within the global landscape (as wealthier institutions were more likely to have those agreements in place). As our ultimate goal was to promote open access, we decided to stay with our initial policy of allowing any article to be published in any journal as long as the article was open access. To defray the cost of open access, the article processing fees could be covered by ASAP provided that the article was compliant with our additional open science policies. We recognize that our current policy could be cost prohibitive for many funding agencies. As of July 1, 2022, the article processing fee to make a journal open access has averaged to around $3,930 US dollars per article.

3. **Moving the need for research outputs to be available by time of preprint to time of final publication**—Not all repositories issue references right away, and this generated concern as individuals wanted to share their early findings through preprint but were also dependent on the repository to provide a reference number. Therefore, we placed the emphasis on having everything correctly referenced and cited by time of final publication with the preprint (to be posted at time of submission to a journal for review) as the latest time for individuals to deposit their outputs in a repository. This allowed the grantee to have enough time to ensure that everything could be updated for the final version.

4. **Providing instructions on best practices on metadata along with data deposition**—Our goal was to not only deposit data in a repository but ensure that there was enough metadata to provide adequate context to the data thereby making the information more accessible. Therefore we developed a checklist for repository deposition, explaining the components to consider and the rationale for why it mattered.

5. **Creating open science champions**—In our model, we have a project manager embedded within each of the teams. They are a budget line item required by the grant. Part of the project manager's role is to assist with open access compliance policies. We learned that if we could make the project manager an open science champion, they were more likely to do the appropriate follow-up and education needed for their teams. ASAP cannot effectively reach the 900+ individuals within our network, but by working with the project managers as open science advocate nodes, we can more effectively communicate policy and resource assistance updates to the entire network.

Appendix

The ASAP Toolkit Resources

Implementation Instruments

Below are the various components of the ASAP toolkit required to operationalize the open science components within ASAP.

People

1. **Human Capital:** Descriptions of staff roles within organization
    a. Organizational Chart Overview
    b. Team Structure
    c. Definition of the project manager role

Incentives/Rewards

2. **Incentives and Rewards**
    a. Network Spotlights (nominations from within the network for those who are advancing the mission)
    b. Open Science Champions (nominations from ASAP leadership)
    c. Assessing open science commitment, collaborative nature and types of resources shared from a Team in follow-on funding decisions

Operations

3. **Policy:** Clearly written policies that can be tracked and monitored
    a. Open Access Policy: https://parkinsonsroadmap.org/open-access-policy/

4. **External Communications:** Key documents discussing the program externally
    a. Overview of ASAP
    b. Request for applications [RFA]
    c. Pre-proposal application and guidance language
    d. Pre-proposal webinar discussing submission and evaluation process
    e. Instructions for pre-proposal triage
    f. Pre-proposal triage scorecard
    g. Instructions for grant reviewers on full proposals
    h. Peer Review Criteria for full grant proposals
    i. Interview process for finalists
    j. FAQs
    k. ASAP Website, ASAP Twitter, ASAP LinkedIn

5. **Internal Communications:** Strategies for continued engagement with the network
    a. Biweekly newsletters to the network highlighting progress and updates.
    b. Affinity networks to stay abreast of and circulate information around our areas of interest.
    c. Subgroup meetings on specific themes identified from ASAP leadership that overlap across teams that meet 2-4 times a year. (Guidance Document)
    d. Working groups—ad hoc groups formed around concrete deliverables to improve process efficiency across teams working on overlapping resources. Example working groups include an iPSC working group drafting QC recommendations for the network or a post-mortem brain sequencing working group aligning on protocols/pipeline review/ samples and repositories to deposit sequencing data across the network.
    e. Monthly all project manager meetings to ensure that project managers are connected and up to date with information.
    f. Annual meeting bringing core leadership and project managers together in person to foster collaborations and identify key questions that the network may be poised to tackle together.
        i. Post-doc and Student engagement through our Celebration of Scientific Achievement. As we launched during COVID, we utilized a virtual poster events platform to host a virtual poster session event across the network.
6. **Grantee instruction and guidelines**
    a. Grant agreements
    b. Welcome packet
    c. Project Manager how-to-guide
    d. Post-award Team & Budget Guidelines
    e. Using the ASAP Hub
    f. ASAP Tools Program
    g. How to use Zenodo
    h. ASAP Research Output Deposting, Logging, and Publishing Checklist
7. **Tracking, monitoring, gathering data**
    a. Example Shared Resource Output Card on the Hub - generic version using dummy data
    b. Example DataSeer report for open access manuscript compliance and template compliance email accompanying report
    c. Flowcharts to clarify rules around compliance
    d. Annual Team Report or Progress report templates and guidance language
    e. Establishing metrics and processes that ask:
        i. Are these resources findable and accessible? What are the usage/engagement stats around shared resources?

ii. Are we accelerating discovery? When does a user share the output compared to final publication? Has another grantee pivoted their own research based on this early sharing? Are these outputs being cited in other publications?
iii. Are we helping change the culture of open science? How does the time/cost invested in ensuring open science within our network evolve over time?

8. **Adopting a Growth Mindset:** Strategies to incorporate re-iteration of process
    a. Conducting post-mortem assessments on a quarterly basis.
    b. Documenting and tracking how policies evolved over the years and tracking lessons learned.
    c. Joining open science organizations such as CoalitionS and Open Research Funders Group to have a pulse on what others in the field are doing.
    d. Establishing clear metrics on what we want to accomplish and how we will be evaluating those accomplishments.

About Authors

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Kristen Ratan is the Principal of Strategies for Open Science (Stratos), working with open science funders, advocates, open content and infrastructure providers to produce tangible results towards open scholarship. Recently, Kristen worked with Sarah Greene of Rapid Science to launch ICOR, a project in collaborative open science. Kristen has a 20-year history working to accelerate advances in science and research communication through work at Coko, PLOS, HighWire, Atypon, and BIOSIS. Kristen is on the board of the American Institute of Physics Publishing, Rapid Science, and ASAPbio. She holds advisory/editorial board positions with Stencila, DataSeer, PREreview, and the Journal of Electronic Publishing.

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Dr. Hetal Shah is a Program Officer at the Coalition for Aligning Science and serves as an ASAP Program Officer. She completed her PhD in Neuroscience and Cognitive Science in the laboratory of Dr. Richard Youle in the Graduate Partnership Program, a partnership between the National Institutes of Health and the University of Maryland. She earned her BS in Neurobiology and BA in French at the University of Iowa and completed post-baccalaureate training at the National Institute on Deafness and Other Communication Disorders.

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Dr. Sonya Dumanis is the Executive Vice President of the Coalition for Aligning Science, and serves as the ASAP Deputy Director. Previously, Dr. Dumanis was the Vice President of Research and Innovation at the Epilepsy Foundation. Prior to joining the Epilepsy Foundation, she worked at the Milken Institute Center for Strategic Philanthropy, tasked with identifying key philanthropic opportunities poised to have a transformative impact on the state of research and developing research programs. Dr. Dumanis completed her postdoctoral training at both the Johns Hopkins University and the Max-Delbrück Center in Berlin, Germany. She earned her PhD in neuroscience from Georgetown University.

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Managing Director - Aligning Science Across Parkinson's (ASAP)

Dr. Ekemini A.U. Riley is the Founder & President of the Coalition for Aligning Science, and serves as the ASAP Managing Director. Prior to ASAP, Dr. Riley was a director at the Milken Institute Center for Strategic Philanthropy where she helped to shape and co-direct the center's medical research practice. She designed and facilitated several multi-sector think tank sessions to inform the strategic deployment of philanthropic capital, crafted research programs, and seeded multi-funder collaboration. Dr. Riley is a trained molecular biologist who has authored scientific articles, received honors, and served as an advisor to several scientific and policy initiatives. She earned her BA in Natural Sciences from the Johns Hopkins University and PhD in Molecular Medicine from the University of Maryland School of Medicine.

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About Us

Aligning Science Across Parkinson's

Aligning Science Across Parkinson's (ASAP) is a coordinated research initiative to advance targeted basic research for Parkinson's disease. ASAP is managed by the Coalition for Aligning Science and is working with The Michael J. Fox Foundation to implement its programs. ASAP builds on the significant strides made by the research community, funders, other experts and strategists around the world. With input across sectors and disciplines, we've developed a strategic roadmap to collectively tackle field-wide challenges together. To learn more, visit the ASAP website at www.parkinsonsroadmap.org.

Coalition for Aligning Science

The Coalition for Aligning Science (CAS) is a strategic advisory firm that specializes in designing and implementing programs to address unmet needs across biomedical research and the science policy landscape. Dr. Ekemini Riley led the development and launch of the ASAP initiative while at the Milken Institute and has since continued ASAP program leadership and management under the auspices of CAS. ASAP is the largest program currently under management; however, the CAS portfolio extends to other neurological disorders, COVID-19 research and diagnostics, wastewater-based epidemiology, policy, and more. To learn more, visit the CAS website at www.aligningscience.com.

Michael J. Fox Foundation for Parkinson's Research

The Michael J. Fox Foundation for Parkinson's Research (MJFF) is a nonprofit dedicated to finding a cure for Parkinson's disease through funded research and ensuring the development of improved therapies for those living with Parkinson's today. MJFF is the implementation partner for the ASAP initiative and has been involved since the initiative's inception. ASAP leverages the MJFF grantmaking infrastructure and staff to coordinate and manage resource acquisitions and data sharing. To learn more, visit the MJFF website at www.michaeljfox.org and to learn more about the MJFF role in ASAP, visit www.michaeljfox.org/asap.