DRIVE Science Center Program Update

National Aeronautics and Space Administration

EXPLORESCIENCE

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Heliophysics Division
Science Mission Directorate

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Program Vision and Goals

Vision for a Successful DRIVE Science Center

Potential for breakthrough science within its 5-year lifetime
Talented, diverse, multi/inter/trans-disciplinary, and fully integrated team. May include modelers, theoreticians, laboratory experimentalists, computer scientists, and observers.
Empowered leadership that will define and manage all research tasks to realize the research center's vision
Supportive infrastructure and management system
Creative, substantive activities aimed at enhancing education, diversity, and public outreach (Broadening impacts).
Potential for impacts on other field(s) and/or benefits to society
Synergy or value-added rationale that justifies a center- or institute-like approach

Center Management: Considerations in Phase 1

Leadership of the center
How decisions will be made, including the roles of any internal committees
How synergy among projects and activities will be actively promoted in service of the DSC's vision
Mechanisms for the ongoing assessment of research outcomes and impact broadening activities
Implementation and periodic modification of strategic plans
Allocation of resources
Ability to initiate new lines of research and terminate support for lower priority efforts
Effective use of the center's communication capabilities to optimize science team interactions

Expected Types of Phase 1 Activities

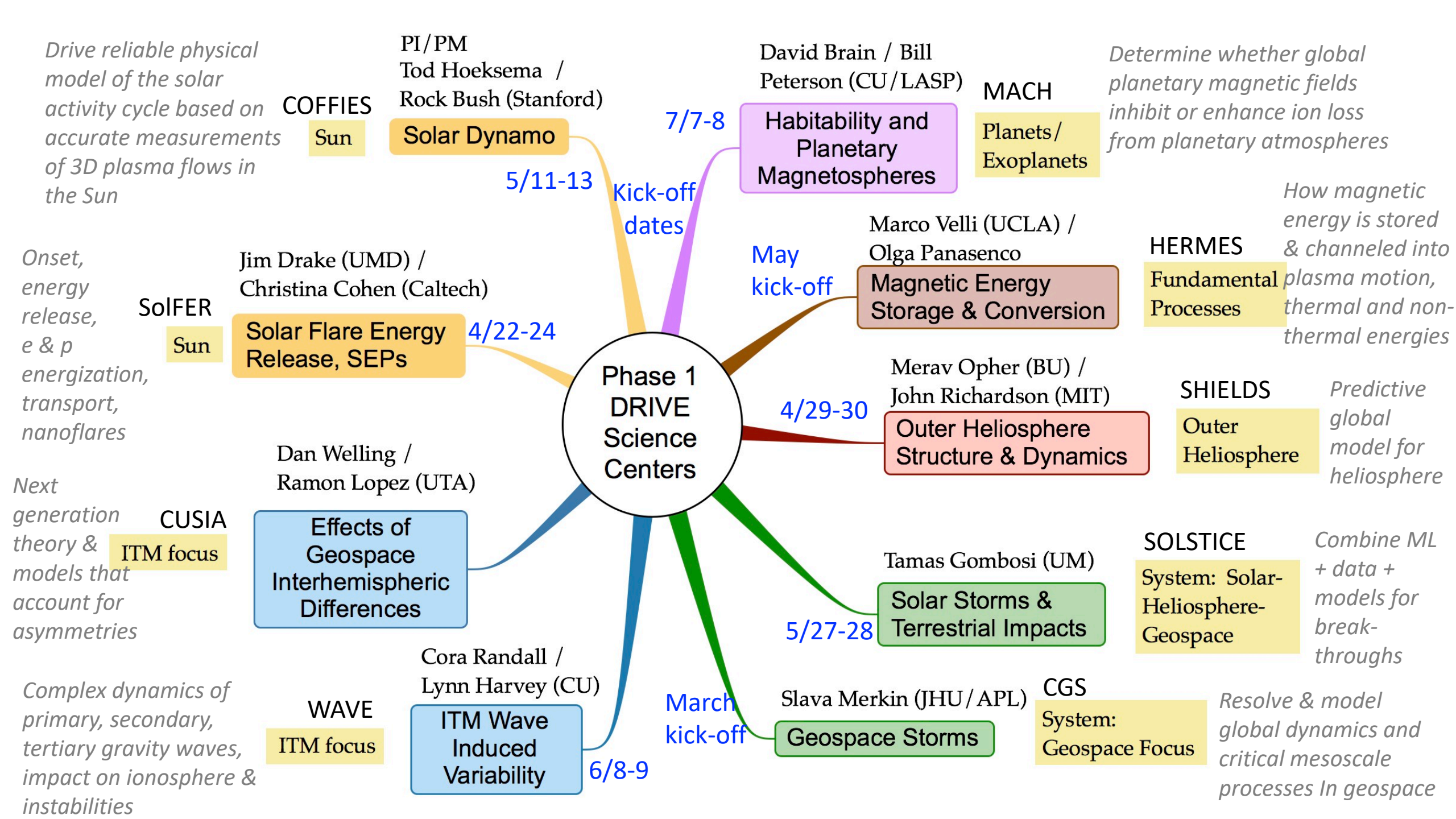
Refinement of interdisciplinary research theme
Creation of overarching goals that engage and excite all discipline areas
Team formation activities, including: filling expertise gaps, developing team charters, roles and responsibilities, aligning individual goals with overarching team goals, deep knowledge integration, and team communication plans
Setting up effective leadership/management structure
Planning for diversity/culture of inclusion
Development of relationships with stakeholder communities
Website and planning for broadening impacts

Phase 1 → Phase 2

- Phase 1 projects can apply for Phase II support in the 2nd year
  - ~ $3 million per year for five years for Phase 2
  - May be eligible for a five-year extension

- During both phases, the centers must participate in annual reviews by the agency, potentially including on-site visits.

Phase 1 DRIVE Science Centers: PIs, PMs, Science Focuses


Phase 1 DRIVE Science Centers
Kick-off dates
Drive reliable physical model of the solar activity cycle based on accurate measurements of 3D plasma flows in the Sun
COFFIES
Sun
PI/PM
Tod Hoeksema / Rock Bush (Stanford)
Solar Dynamo
5/11-13
7/7-8
David Brain / Bill Peterson (CU/LASP)
Habitability and Planetary Magnetospheres
MACH
Planets/ Exoplanets
Determine whether global planetary magnetic fields inhibit or enhance ion loss from planetary atmospheres
Onset, energy release, e & p energization, transport, nanoflares
SolFER
Sun
Jim Drake (UMD) / Christina Cohen (Caltech)
Solar Flare Energy Release, SEPs
4/22-24
May kick-off
Marco Velli (UCLA) / Olga Panasenco
Magnetic Energy Storage & Conversion
HERMES
Fundamental Processes
How magnetic energy is stored & channeled into plasma motion, thermal and non-thermal energies
4/29-30
Merav Opher (BU) / John Richardson (MIT)
Outer Heliosphere Structure & Dynamics
SHIELDS
Outer Heliosphere
Predictive global model for heliosphere
Next generation theory & models that account for asymmetries
CUSIA
ITM focus
Dan Welling / Ramon Lopez (UTA)
Effects of Geospace Interhemispheric Differences
5/27-28
Tamas Gombosi (UM)
Solar Storms & Terrestrial Impacts
SOLSTICE
System: Solar-Heliosphere-Geospace
Combine ML + data + models for break-throughs
Complex dynamics of primary, secondary, tertiary gravity waves, impact on ionosphere & instabilities
WAVE
ITM focus
Cora Randall / Lynn Harvey (CU)
ITM Wave Induced Variability
6/8-9
March kick-off
Slava Merkin (JHU/APL)
Geospace Storms
CGS
System: Geospace Focus
Resolve & model global dynamics and critical mesoscale processes In geospace

HPD Kick-Off Plans

NASA Kick-Off Part 1 held June 18, 2020
Initiate relationships between individual science centers and with NASA HQ
Establish atmosphere of openness and transparency
Build a forum for information that involves all Phase 1 DSCs
Nail down what success looks like
Put the DRIVE SC Program & DSC Teams on the same page about scope, goals, deadlines, timeline
Q&A Session
Talk about what is needed to get started and what comes next.

NASA Kick-Off Part 2 (Panel, Center Directors - 2 hrs)
15 min presentations on best practices and lessons Learned in 2-phase science centers
Q&A session

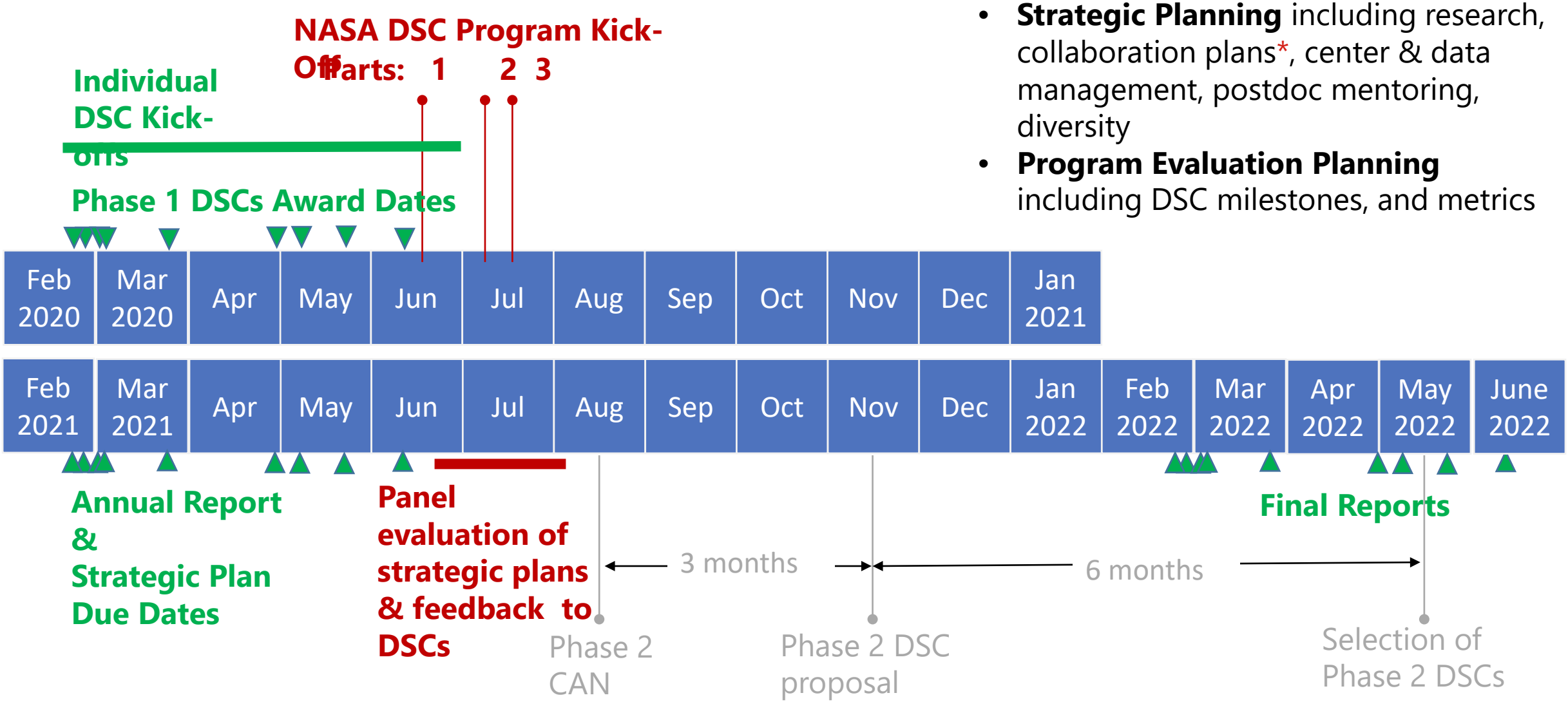
NASA Kick-Off Part 3 (Collaboration Planning)
Activities
Q&A session

High Level Schedule

HIGH-LEVEL SCHEDULE*

Phase 1 DSC Activities:

- **Prototyping**
- **Strategic Planning** including research, collaboration plans*, center & data management, postdoc mentoring, diversity
- **Program Evaluation Planning** including DSC milestones, and metrics



Program Resource:
Collaboration planning experts available (Toolbox Dialogue Initiative)

Strategic Planning

- Thanks to Kathy Covert (Program Manager of NSF's Centers for Chemical Innovation) for advice in developing NASA's 2-phase Science Center Strategic Planning Framework

Why create a strategic plan?

- Helps distinguish the DSC from more familiar individual investigator or collaborative awards, and fosters a clear Center identity;
- Sets priorities, assigns tasks, and increases team awareness of “the whole”;
- Encourages alignment: individuals aligned with team goals and the team aligned with key stakeholder (NASA, DSC Program, university) goals
- Identifies partners and potential collaborators
- *Identifies “misfit” projects or activities that aren’t scalable or collaborative, so you can replace them early*
- Enables the team to identify and address potential issues – places where there might be disagreement or conflicting priorities.
- Helps a Phase I Center position itself competitively for transition to Phase II.

Elements of the Strategic Plan

Strategic Plan covers all aspects of a Phase 2 DSC including:

- Research
- Team communication
- Deep knowledge integration

} Collaboration Plan

- Center management
- Center-wide data management
- Postdoc mentoring
- Diversity Plan (for new member recruitment, for students, etc.)
- Broadening impacts (i.e., innovation *leading to benefits to society*, workforce development, increasing diversity & inclusion, informal science communication)

Template

Your Center Name

Vision and/or Mission Statements

Research

- Goal Statement(s)
- Key outcomes (what would constitute “success”)
  - In Phase I
  - In Phase II
- Planned Activity/Activities
- Potential Partners
- Key Action Items

Management Plan

- Goal Statement(s)
- Key outcomes (what would constitute “success”)
  - In Phase I
  - In Phase II
- Planned Activity/Activities
- Potential Partners
- Key Action Items

Broader Impacts

One or more of four potential elements:, (1) Diversity and Inclusion; (2) Future Workforce Development, Higher Education and Professional Development; and (3) Informal Science Communication & Innovation for Public Benefit. Please treat the elements you are pursuing as a set

- Goal Statement(s)
- Key outcomes (what would constitute “success”)
  - In Phase I
  - In Phase II
- Planned Activity/Activities
- Potential Partners
- Key Action Items

Program Evaluation, Metrics & Milestones in Phase 2

Program Evaluation Plan – Year 2

As part of developing this plan, DSCs should design metrics best suited to demonstrate progress in achieving broadly defined science goals and specific objectives.

Metrics for DSC success would provide evidence of scientific impact. In addition to scientific publications and communications, other appropriate types of metrics, include providing:

- high-value community resources
- including models or model frameworks,
- model outputs, and
- value-added datasets;
- support of innovation,
- patents, and inventions;
- evidence of team formation and integration;
- community impacts such as student and postdoc involvement, degrees awarded,

  workshops, and opportunities for guest investigators and early career investigators

* Evaluation throughout the DSC lifetime by an external science center advisory group could be built into the process to ensure quality and give objective perspectives.

Collaboration Planning Support

Collaboration Planning Framework

- Useful for developing integrated and effective science teams.
- Developed by the Team Science Subcommittee (TSS), Networking and Information Technology Research & Development (NITRD) Program, Office of Science and Technology Policy (OSTP)
- Builds on findings in NAS report, "*Enhancing the Effectiveness of Team Science*".
- TSS solicited Inputs from government, industry and academy in the design.
- Toolbox Dialogue Initiative (TDI) led by Michael O'Rourke (Michigan State University), will present the Collaboration Planning Framework (Kick-Off Part 3)
- TDI:
  - An NSF-sponsored project
  - Team members drawn from 9 different universities.
  - Carried out 270 workshops worldwide with more than 2500 participants.
- One of the advisors of TDI, Kara Hall is:
  - Member of panel that authored "*Enhancing the Effectiveness of Team Science*"
  - Co-Chair of TSS in OSTP that developed the Collaboration Planning Framework.
  - Both Michael O'Rourke and Kara Hall authored chapters in a "follow-on" book to the NAS team science report, entitled "*Strategies for Team Science Success",* published in 2019.

Program Resource: Toolbox Dialogue Initiative

- Out of concern for the obstacles introduced by the unanticipated virtual-only environment in which the DSCs find themselves, bringing TDI group onboard to:
  - Provide ongoing consulting for interested DSCs
  - Helps them troubleshoot collaboration and communication problems introduced by different center environments.
- The proposed plan is for TDI to provide a dedicated research staff member for NASA and the DSCs for two years. This person would:
  - Work with NASA and personnel at interested DSCs to carry-out individual Toolbox workshops.
  - Prepare reports to DSC leadership groups that highlight key takeaways from these workshops.
  - Follow-up individually with each interested DSC, conduct regular capacity building webinars on topics suggested by the DSCs and provide ongoing consulting.
  - TDI would support this individual by making staff available to assist in running the workshops and writing the reports.
- The DSC Kickoff and planned TDI workshops are offered as assistance to the Phase I DRIVE Centers to help maximize success in spite of the present virtual-only environment.

Collaboration Plans: Planning for Success in Team Science

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COMPONENT	CONSIDERATIONS
1 Rationale for Team Approach & Configuration	✔ As the number of **collaborators increases**, so do the **potential challenges**. ✔ For **interdisciplinary teams**, the disciplines must be "scientifically ready" for collaboration. ✔ **Not all research questions are best addressed using a team approach** or require a large, complex, or distributed team. ✔ Generally, a team should **not include more researchers than necessary**, but should include **sufficient breadth** to gather the needed scientific expertise.
2 Collaboration Readiness	✔ **Individual characteristics** may increase success (e.g., interdisciplinary or team orientation, preparation for complexities and tensions of collaboration). ✔ **Team history of collaboration**, especially teams with some former collaborators and some new members, may increase success. ✔ **Institutional policies, procedures, resources, infrastructure** may influence success (e.g., promotion and tenure policies, research development officers, training for team science).
3 Technological Readiness	✔ **TR includes 3 components:** (1) technology must be available; (2) members must be willing to use the technologies; and (3) members must have the skills to use them. ✔ Additional issues may include: **compatibility and interoperability** of systems across collaborators; decisions concerning **whose systems or processes will be used.**
4 Team Functioning	✔ Strategies should **take into account the unique characteristics of the team and the scientific work**, such as collaborative history, complexity of the team (e.g., size, diversity, dispersion, task interdependence), phase of the research process. ✔ Strategies should be **directly tied to achieving key team processes** (e.g., generating a shared mission and goals, externalizing group cognition, creating shared mental models, generating shared language).
5 Communication & Coordination 	✔ **Plans should be specific to your team.** For example, **distance collaborations** increase potential communication and coordination challenges. Communication and coordination styles may vary among collaborators who vary in age, gender, and culture, and for collaborators from different disciplines. ✔ **Greater use of coordination mechanisms** leads to more successful outcomes. Direct supervision and face-to-face mechanisms have demonstrated effectiveness. **As team complexity and size increase, so does the need for more coordination.**

COMPONENT	CONSIDERATIONS
6 Leadership, Management, & Administration	✔ There are **numerous approaches to leadership** (e.g., hierarchical, heterarchical, transformational, transactional). The most successful outcomes are produced by combining various approaches as appropriate to the context. ✔ **Leadership and management are key influences on the success** of a scientific collaboration. ✔ More complex team science initiatives require more sophisticated leadership and management approaches.
7 Conflict Prevention & Management	✔ **Demographic and disciplinary diversity both may lead to conflict**, but the specific areas of conflict, and the ways in which conflicts play out, will vary with the unique combination of types of diversity on the team. ✔ **Team members with similar training may underestimate the potential for conflict** as a result of incorrect assumptions about areas of agreement. ✔ Subgroups may produce **fault lines.**
8 Training	✔ **Ongoing, rather than one-off, training is needed** to maintain and build competencies and address evolving needs. ✔ Training should be **designed to meet a wide variety of needs**–by career stage, learning style, interests, and practical constraints (e.g., web-based training for distributed teams). ✔ **Evidence-based training approaches exist for both individuals and teams** (e.g., team coordination training, team reflectivity training, cross-training).
9 Quality Improvement Activities	✔ Teams that engage in systematic and iterative reflection about team performance and subsequently adapt their team objectives and processes show better performance, including higher levels of innovation. ✔ For large or complex teams, it may be helpful to involve outside experts to design and implement quality improvement activities. ✔ **Options range** from frequent, brief opportunities for reflection about team performance (e.g., pre-briefing and debriefing) to more in-depth activities (e.g., surveys, facilitated discussions/workshops).
10 Budget & Resource Allocation 	✔ The prior 9 components all require investments of resources that require financial support. It is necessary to **allocate funds** to these activities to **ensure their successful implementation.** ✔ **Clear but flexible plans for funds may produce optimal results.** This can be particularly important in larger and more complex initiatives, where there is a greater likelihood for changes to the collaboration over the course of the initiative.

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Next Steps

Next Steps

- Collect dates of individual center kick-offs.
- Schedule two additional parts of HQ kick-off in July.
- Set up individual advice & input on team collaboration planning from the Toolbox Dialogue Initiative for interested centers.

Thank You!