

Agency Science Workforce Study Phase 1 Report

Science Workforce Study Team

February 16, 2021

Table of Contents

- Background Drivers 3
- Study Objectives 4
- Study Team Membership 5
- Study Methodology 6-7
- Summary Findings and Recommendations 8-12
- Anticipated Outcomes 13
- Key Findings and Recommendations. 14-67
 - Current State Science Workforce 14-30
 - Career Paths 31-38
 - Leadership Development 39-53
 - Project Scientist 54-67
- Appendices 68-77
 - Study Charter (Appendix A) 69-70
 - Action Plan (Appendix B) 71-72
 - Communication Strategy (Appendix C) 73
 - Non-SMD Scientist Data Chart (Appendix D) 74
 - Benchmark – Space Career Leadership Enhancement (Appendix E) 75
 - Benchmark – Systems Engineering Education Development (Appendix F) 76
 - Benchmark – Flight Projects Development Program (Appendix G) 77

Background Drivers

- The Science Mission Directorate (SMD) expressed concerns about the science workforce:
 - Science workforce has little insight into the varied science career paths leading to science leadership roles, including organizational leadership, technical leadership, and programmatic leadership
 - There is a lack of consistency in the workforce development and readiness assessments for key leadership positions
 - There is a lack of clearly understood roles, accountability, and authority within the programmatic leadership roles, especially for strategic/flagship missions

Study Objectives

- The SMD AA commissioned a study team to develop NASA science workforce strategies, specifically to:
 - Formalize the career paths available for NASA's science community
 - Identify systemic developmental gaps that may impede advancement or limit preparedness for key science positions and career paths
 - Clarify science leadership roles, accountability and authority and the optimal policy guidance needed for these key positions, especially for strategic level missions
 - Identify developmental strategies for all key positions that may broaden the scientist's knowledge, skills, and experiences to better prepare them for senior level roles and responsibilities
 - Identify communication strategies and mechanisms to ensure career opportunities and development requirements are broadly available for the science workforce
- The first phase of the study included the data collection effort and the development of recommendations. The second phase will involve the implementation of those recommendations.

Study Team Membership

Core Leadership:

- Karen Flynn/SMD, DAAM and Study Senior Champion
- Ellen Gertsen/SMD, Administration Branch Chief
- Leo Gomez/SMD, Administrative Officer
- Lori Simmons/B-Line Express, Consultant and Facilitator
- Nancy Rackley/B-Line Express, Consultant
- Alfred Gamble/OCHCO, HR Business Partner

Team Members:

- Dave Draper/OCS, Deputy Chief Scientist
- Michael New/SMD, Deputy AA - Research
- Tom Wagner/SMD, Program Scientist, Planetary Science
- Jack Kaye/SMD, Program Director, Earth Science
- Sharmila Bhattacharya/SMD, Program Scientist, Biological & Physical Sciences
- Joanne Hill/GSFC, Deputy Director for Sciences & Exploration Directorate
- Trina Dyal/LaRC, Acting Director, Science Directorate
- Fernan Rodriguez/OCHCO, HR Specialist
- Rich Zurek/JPL, Chief Scientist, Mars Program Office
- Louise Prockter/APL, Chief Scientist, Space Exploration Sector

Study Methodology

- Qualitative data collection focused on workforce strategies, career paths, leadership development, policy, etc.
 - 16 individual interviews with science leaders across NASA
 - HQ, GSFC, LaRC, ARC, JPL, & APL
 - 10 focus group sessions with early and mid-career scientists
 - ~60 participants from HQ, ARC, GRC, GSFC, JSC, LaRC, KSC, MSFC, JPL, & APL
 - 6 focus group sessions with senior and/or supervisory scientists
 - ~40 participants from ARC, GRC, GSFC, JSC, LaRC, KSC, MSFC, JPL, & APL
 - Benchmarked development programs
 - Flight Projects Development Program (GSFC)
 - Systems Engineering Education Development Program (GSFC)
 - Project Management Certification (Agency)
 - Space Career Leadership Enhancement (SCALE/APL)
 - NASA leadership program status (OCHCO)
 - Review of NASA policy documents

Study Methodology (Continued)

- Quantitative data collection
 - OCHCO provided a five-year workforce data set (FY17 – 21) of civil servant scientists to use for analysis and creating various data charts
 - OCHCO also provided a data set of science Gains and Losses for FY17 - 20
 - Headcount data for JPL and APL scientists were added to the data charts as applicable
- Held three virtual workshops with study team to provide input and prioritization for final recommendations
- Several team reviews and edits of final report

Summary Findings and Recommendations

- Based on the requirements of the study charter (see Appendix A), our data collection, this report, and the accompanying recommendations focus on four main topics –
 - Current state of the NASA science workforce
 - Career paths
 - Leadership development
 - Project Scientist role and authority
- The following represents the summary findings and recommendations of each of these topics. Greater detail for each is provided in the body of this report.

Summary Findings and Recommendations

- **Current State** – The Civil Servant SMD science workforce exists within all NASA Centers, but is predominately located at six key Centers: GSFC, ARC, LARC, JSC, HQ and MSFC. NASA is also dependent on two federal labs, Jet Propulsion Lab (JPL) and Applied Physics Lab (APL), to support NASA science missions.
 - Space and Earth sciences make up the vast majority of the skill discipline within the science workforce. (Charts CS-7 & 8)
 - It is a highly educated workforce with over 80% of the Civil Servants holding PhDs. (Charts CS-9 & 10)
 - About 50% of all new hires over the last four fiscal years were hired at the GS-13 level or below. (Chart CS-15)
 - Similarly, about least 50% of all new hires during that same timeframe were 40 years old or younger. (Chart CS-14)
 - About 9% of the workforce serves in a supervisory role, with some serving in a part-time status. (Charts CS-11 and Exhibit CP-1)
- **Recommendations** – There are no specific recommendations directly related to the “current state” of the NASA science workforce. However, the workforce snapshot provides linkage to the other recommendations designed to enhance the development of science leaders.

Summary Findings and Recommendations

- **Career Paths** – A common understanding of career path options and requirements for NASA scientists is not documented.
- **Recommendations:**
 - CP-1) Adopt the nomenclature of the five career tracks identified in the NASA science workforce
 - CP-2) Develop a web-based career path tool that lays out each science career track and summarizes the key positions within each track. For each position, the tool will provide a summary of the major roles and responsibilities, ideal experiences and/or competencies, recommended training for that position, and transition possibilities to other positions.

Summary Findings and Recommendations (Continued)

- **Leadership Development** – A comprehensive strategy for developing NASA science leaders has not been identified.
 - **Recommendations:**
 - LD-1) Develop a virtual agency-led orientation for newly hired scientists
 - LD-2) Develop a virtual series of “career opportunities” workshops for mid-career scientists
 - LD-3) Develop a rotational program for scientists to experience leadership roles
 - LD-4) Establish entry-level, part-time supervisory roles that are time-limited
 - LD-5) Develop a comprehensive program for science leadership development led by Office of the Chief Scientist (OCS) in partnership with OCHCO.
 - LD- 6) Using the Science Council, routinely share best workforce practices among the NASA science community

Summary Findings and Recommendations (Continued)

- **Project Scientist** – This science leadership role does not benefit from agency policy/governance documents similar to other project leadership roles (Project Manager/Systems Engineer). As a result, there isn't a source for a shared definition of the role and authority, which can result in differences in implementation.
 - **Recommendations:**
 - PS-1) Codify the roles and responsibilities of the Project Scientist at the agency level in an NPR. The team proposed content for Project Scientist roles and responsibilities for strategic/directed missions. Recommend a similar review and evaluation be done for competed and lower level missions.
 - PS-2) Wherever possible, ensure a deputy project scientist is funded for missions to ensure the next generation of Project Scientists.
 - PS-3) Develop a Project Scientist training course.

Anticipated Outcomes

- Implementation of the study recommendations will ensure that NASA has a science workforce that has:
 - A greater understanding of the various science career paths and how to navigate within them.
 - Training and development opportunities available to prepare for leadership roles and advancement.
 - A greater clarity of the roles, accountability, and authority for science leadership roles.
- If successfully implemented, these collective strategies will develop the next generation of science leaders

Current State Science Workforce

Workforce Utilization

- The Civil Servant science workforce exists within all NASA Centers, but is predominately located at six key Centers: GSFC, ARC, LARC, JSC, HQ and MSFC. NASA is also dependent on two federal labs (JPL and APL) to fulfill a number of science leadership roles on NASA missions. (Charts CS-1 – 6)
- The science workforce represents about five percent of the total NASA workforce. As of October 2020, there were ~888 Civil Servant scientists supporting the Science Mission Directorate (SMD). There are also 391 scientists at the labs (264 at JPL and 127 at APL), for a total of 1279. (Charts CS-1&2)
 - There are about 171 scientists that support other mission directorates (Appendix D)
- The Civil Servant workforce is augmented with interns, post-docs, university scientists, contractor scientists, and emeritus scientists (who serve as mentors)
 - Civil Servant positions are typically used for key leadership roles, distinctive capabilities, and hardware delivery.
- About 25 Civil Servant scientists are on a temporary or term appointment
 - Some express concern about ability to recruit top candidates on term/temp appointments
 - On the other hand, term/temp appointments provide an opportunity to hire early career scientists before they have all of their credentials

Workforce Utilization (Continued)

- Both JPL & APL have scientists in multi-disciplined organizations
 - This may broaden their experiences and career path opportunities.
- There is little cross-utilization of scientists between centers and labs
- APL does not have representation on the Agency's Science Council, which may limit the ability to routinely connect APL with the rest of the science community
- NASA's Mission-support Future Architecture Program (MAP) exercise, which realigned a sizable amount of Center Management Operations (CMO) funds, has adversely impacted strategic investments at the centers
 - Previously, some percentage of scientists relied on CMO funding to take technology to maturity.
 - Formal leadership development programs have been paused for several years during this process.

NASA Science Data Set

- OCHCO provided the study team with a five year data set of all NASA Civil Servant scientists supporting SMD, which includes Physical Sciences (1300 occupational series), Biological Sciences (0400 occupational series), and a scrubbed list of Mathematical Sciences (1500 occupational series) positions. (Not all of the 1500 occupational series were serving as SMD scientists)
 - 122 scientists supporting other mission directorates were excluded from this data set (Appendix D)
 - An additional 49 scientists charging to agency overhead (SSMS) were excluded from the data, as it wasn't easily discernable which mission directorate they supported. (Appendix D)
- Each year reflects the on-board data at the beginning of the fiscal year (Oct. 1)
- Data includes permanent, term, and temporary appointments. Students were not included in the data set for this report. (Just FYI, only two students were noted at ARC at the beginning of FY21).
 - Technicians and other science support roles were not included in the data set
- APL and JPL provided a headcount and supervisory count of their science workforce, which was added to the relevant data charts and annotated accordingly. The labs did not provide demographic or trend data.

Workforce Current State Themes – Civil Servants

- Half of the Civil Servant science workforce resides at Goddard (N=445). The remainder of the Civil Servant science workforce is split among the other centers and Headquarters. (Chart CS-2)
 - While Goddard has four of the main science disciplines, the smaller science centers tend to have science specialties
- The data shows a healthy amount of science “early career” hires as evidenced by the number and percentage of recent hires who are GS-13 and below and/or under 40 years old. (Charts CS-14, 15, & 16)
- A highly educated workforce, with more than half holding PhDs (Charts CS-9 & 10)
- The data suggests little to no student population in the civil servant science workforce.
 - Only ARC currently has students (two). Four years of hiring data shows a total of 9 student science hires (ARC, KSC, LaRC, GRC)
 - The use of Pathways as a hiring option is being explored by GSFC

NASA Civil Servant scientists make-up about 2/3 of the broader NASA science workforce, which includes JPL and APL. Goddard represents about 1/3 of the broader workforce and 1/2 of the Civil Servant workforce.

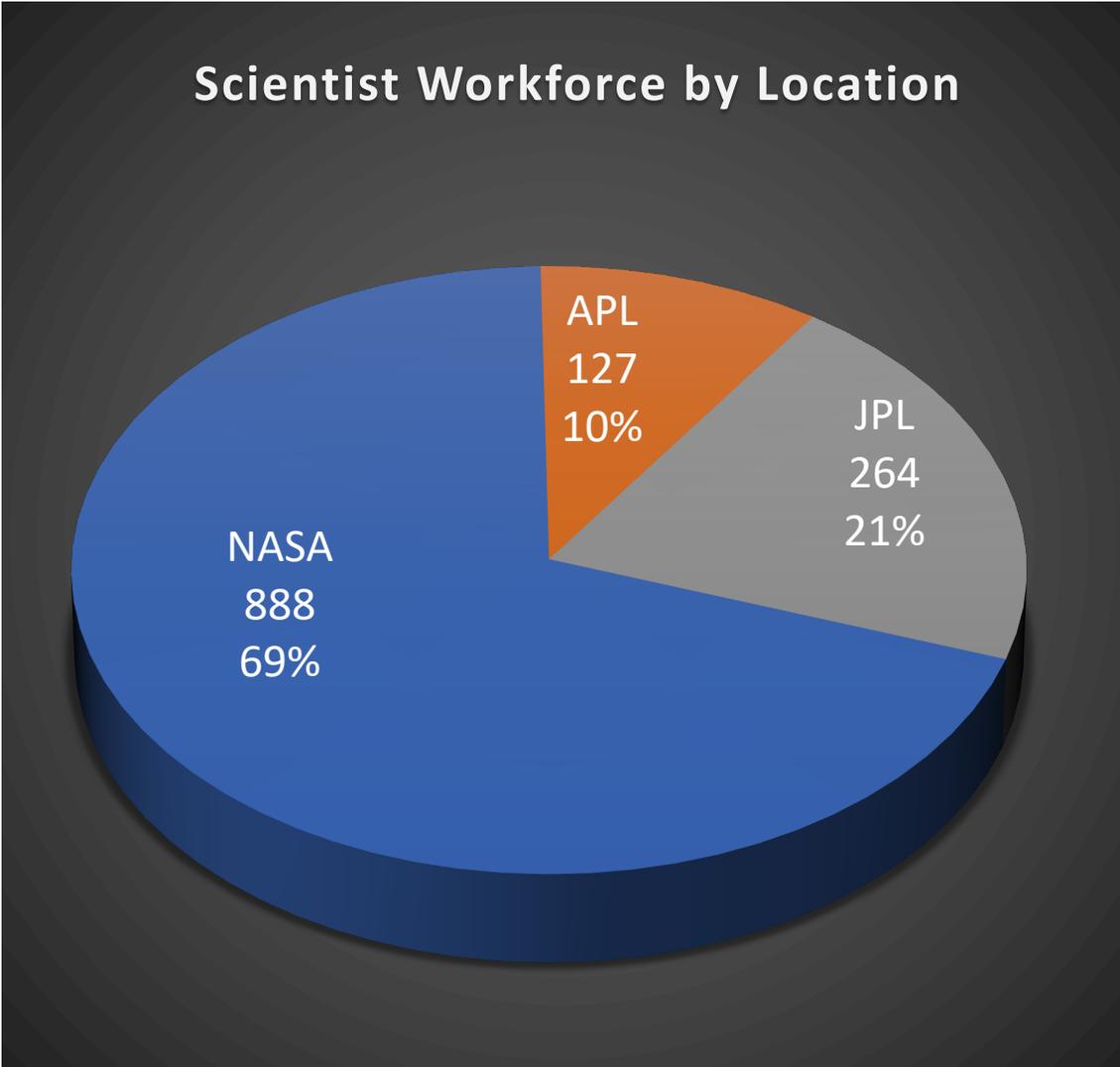


Chart CS-1

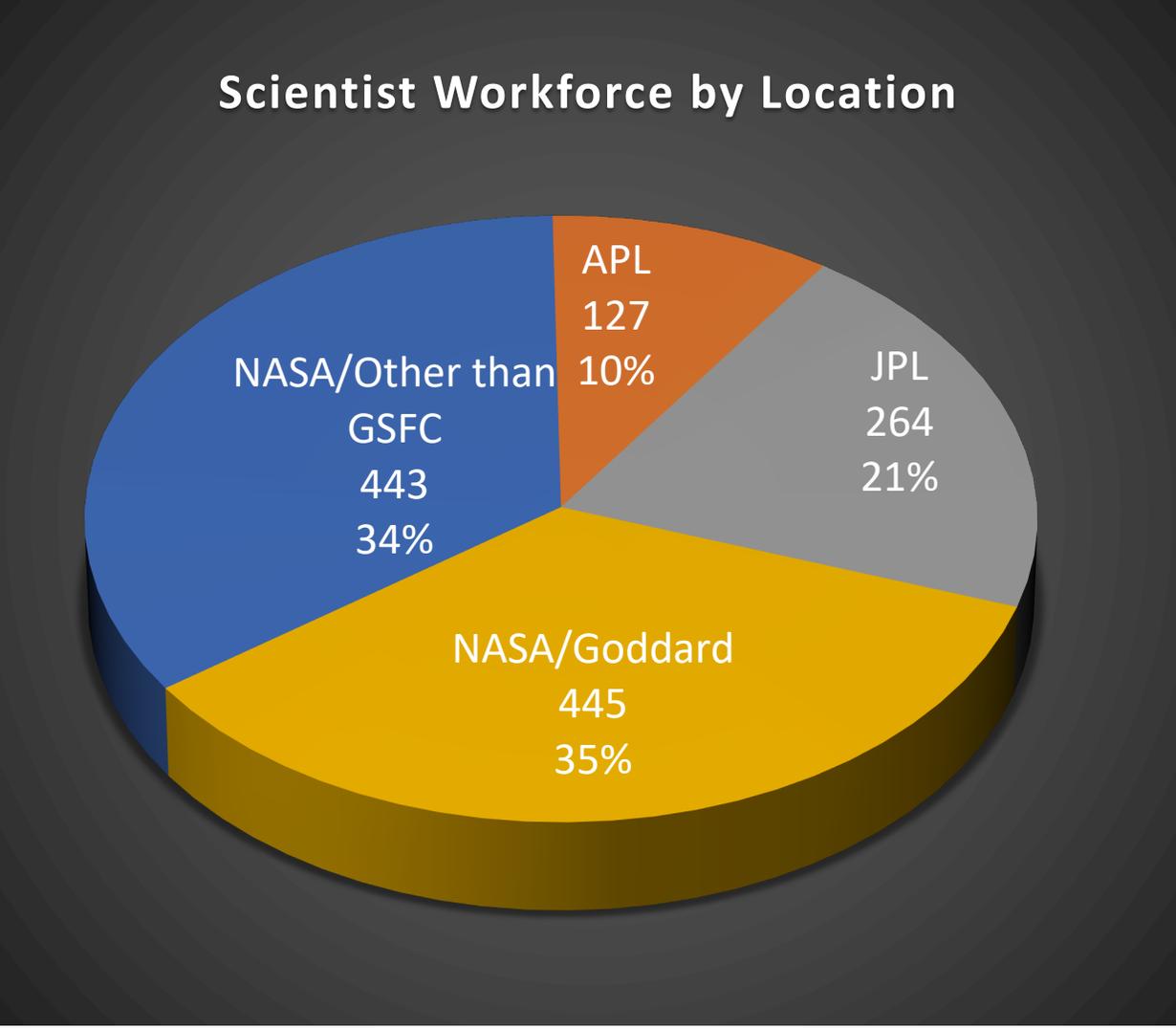
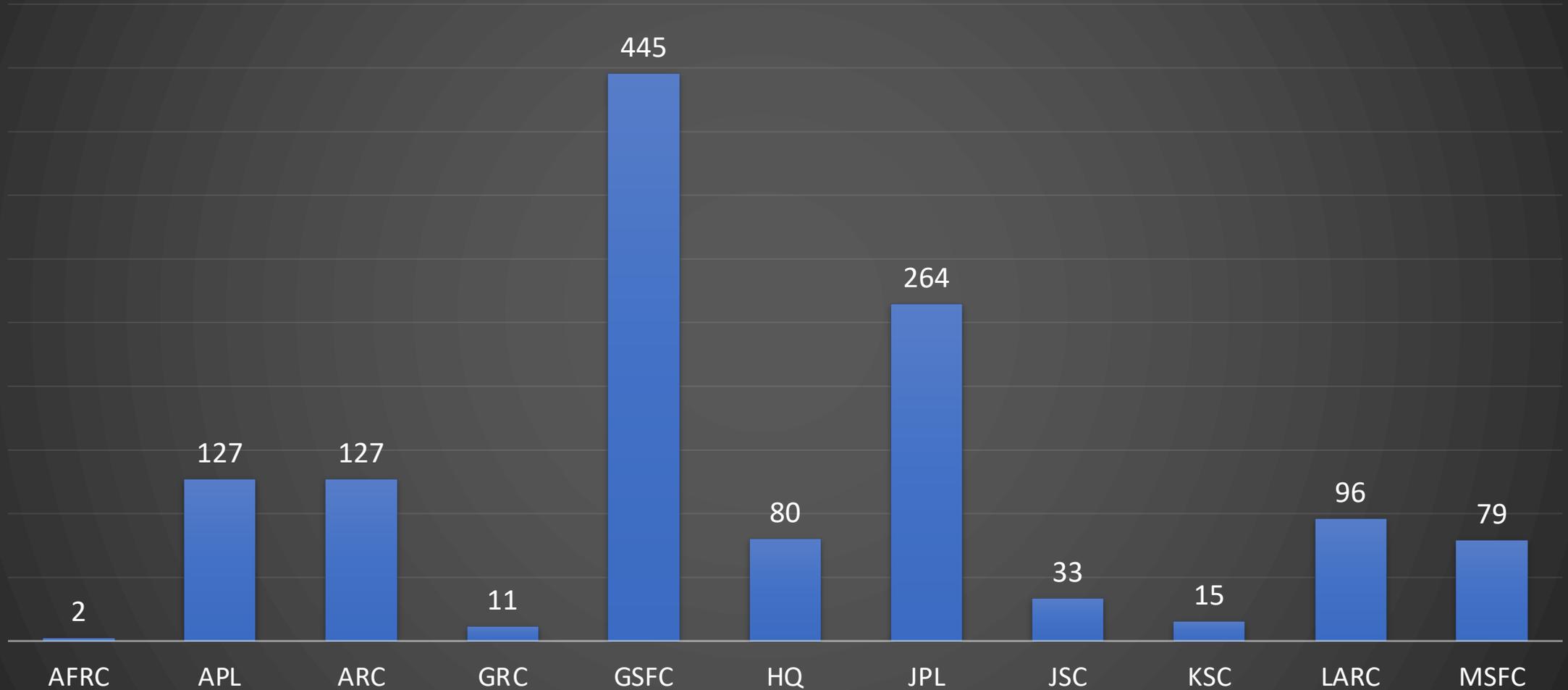


Chart CS-2

(NASA Civil Servant scientist data excludes students, post-docs, and contractors)

NASA Scientists by Location



GSFC has the largest population of NASA scientists.

(NASA Civil Servant scientist data excludes students, post-docs, and contractors)

Chart CS-3

Allocations of SMD Budget and Science Workforce by Location

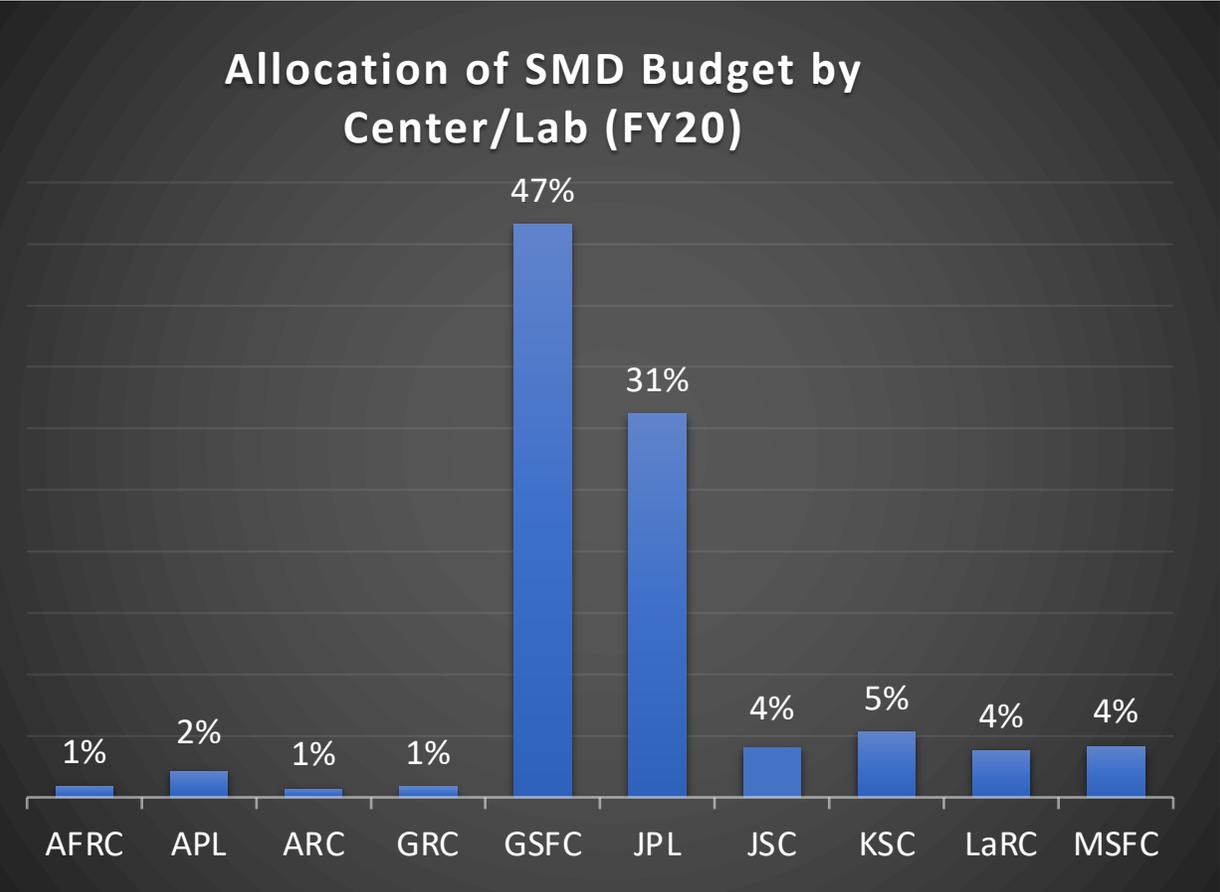


Chart CS-4

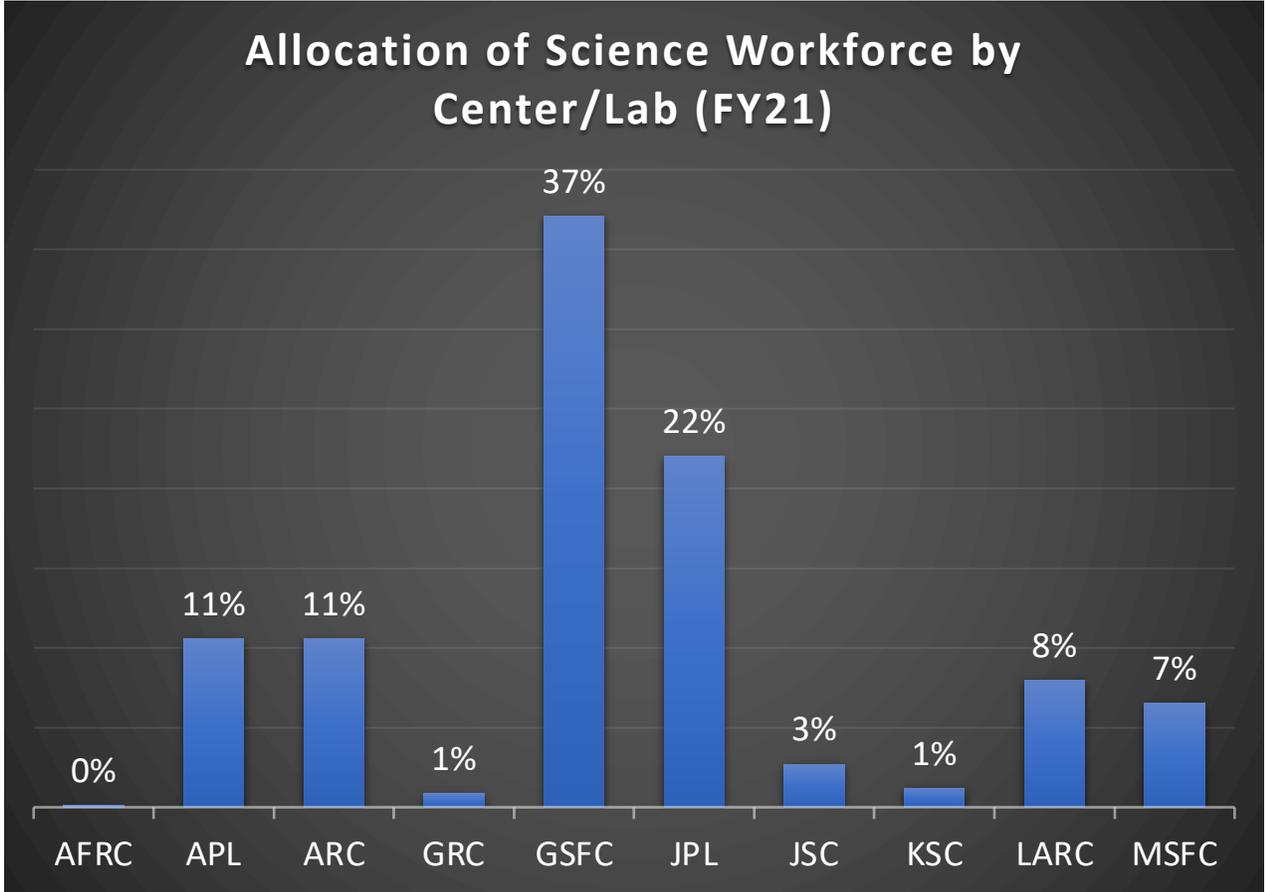


Chart CS-5

The budget allocation represents all elements of work, while the workforce allocation only reflects the scientists. HQ budget and workforce are not included in either chart.

Science Workforce Compared to Total Workforce by Center

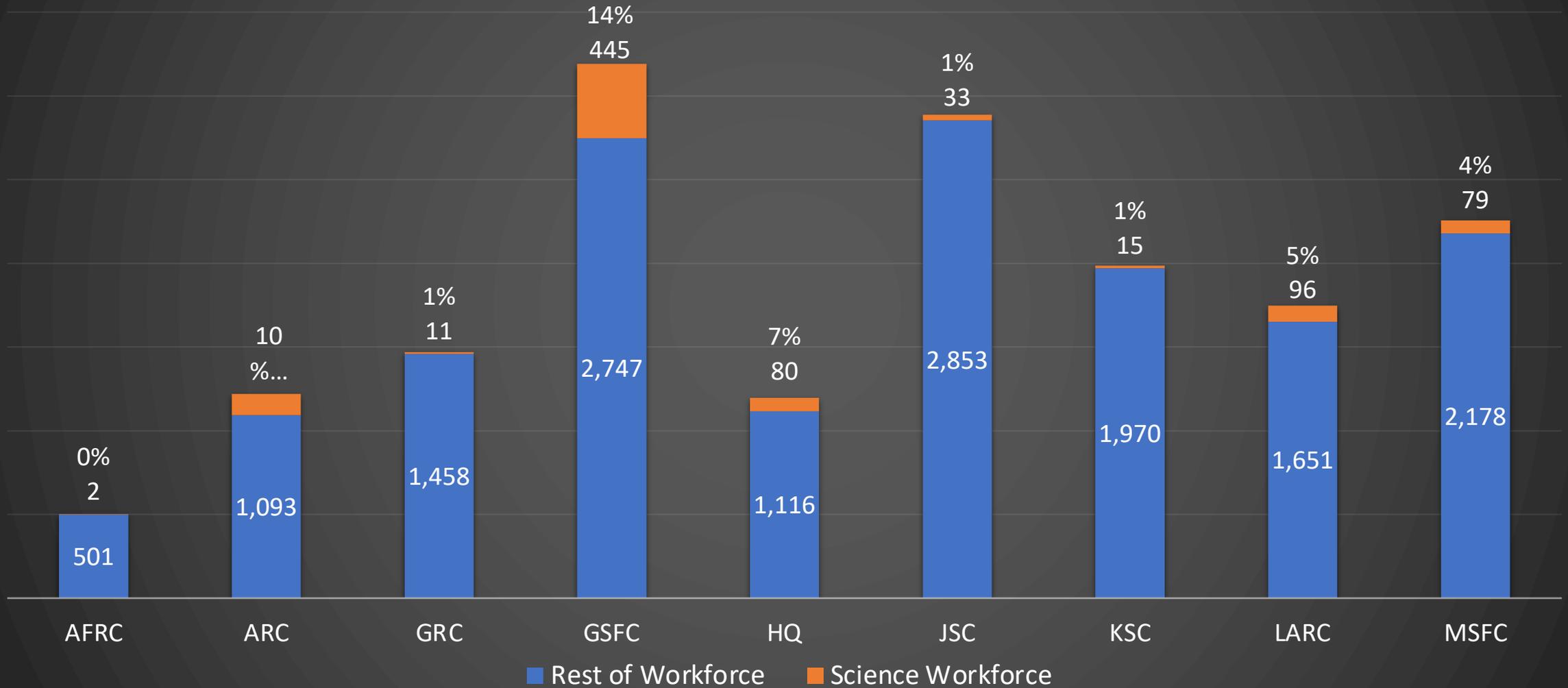


Chart CS-6

While the science workforce makes up ~5% of NASA’s overall workforce, each center’s science proportion varies, depending on their role.

NASA Civil Servant Workforce by NASA Class Codes (NCC)

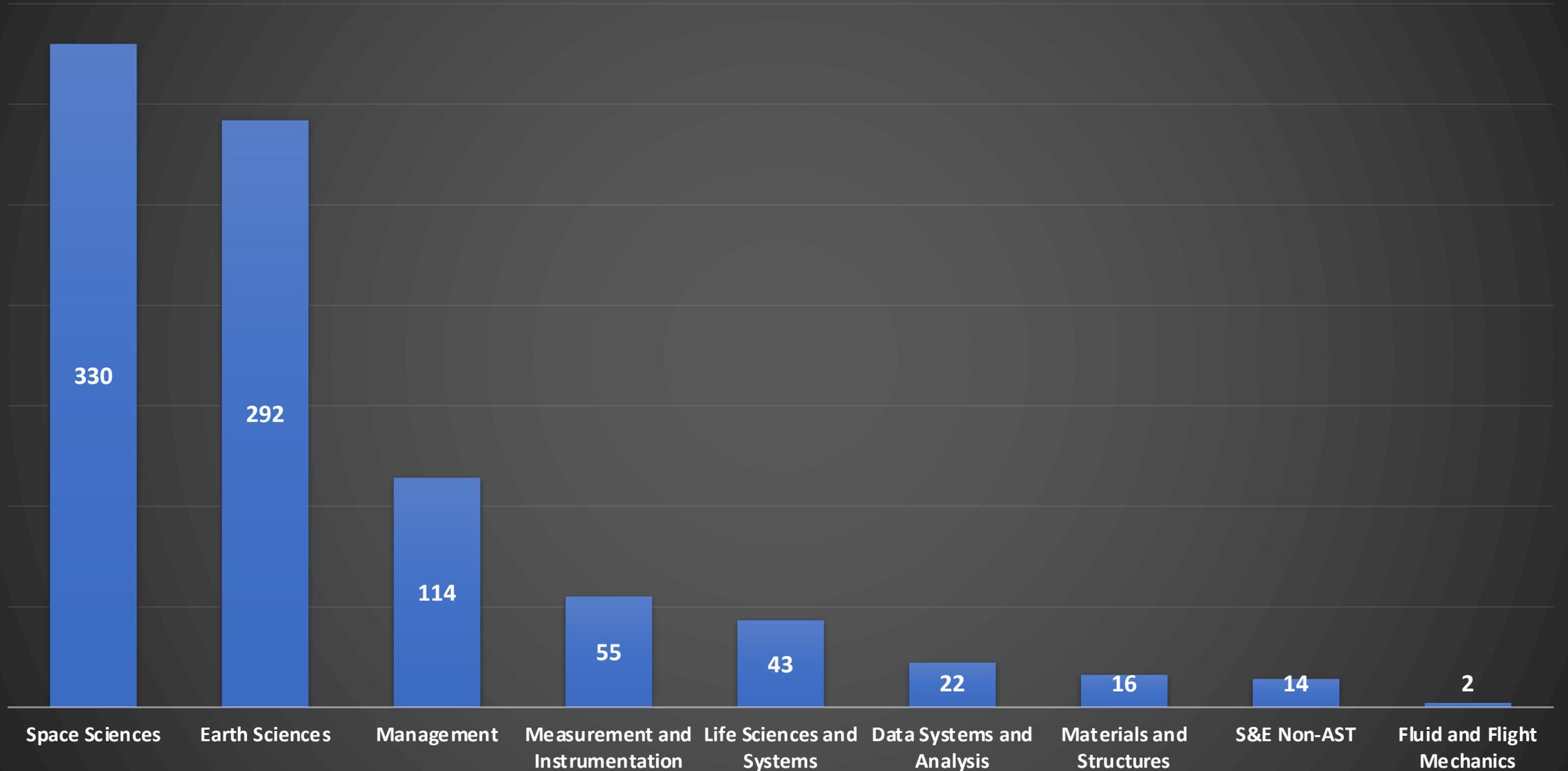


Chart CS-7

Space and Earth sciences make up the vast majority of the skill discipline within the SMD science workforce

NASA Centers by NASA Class Codes

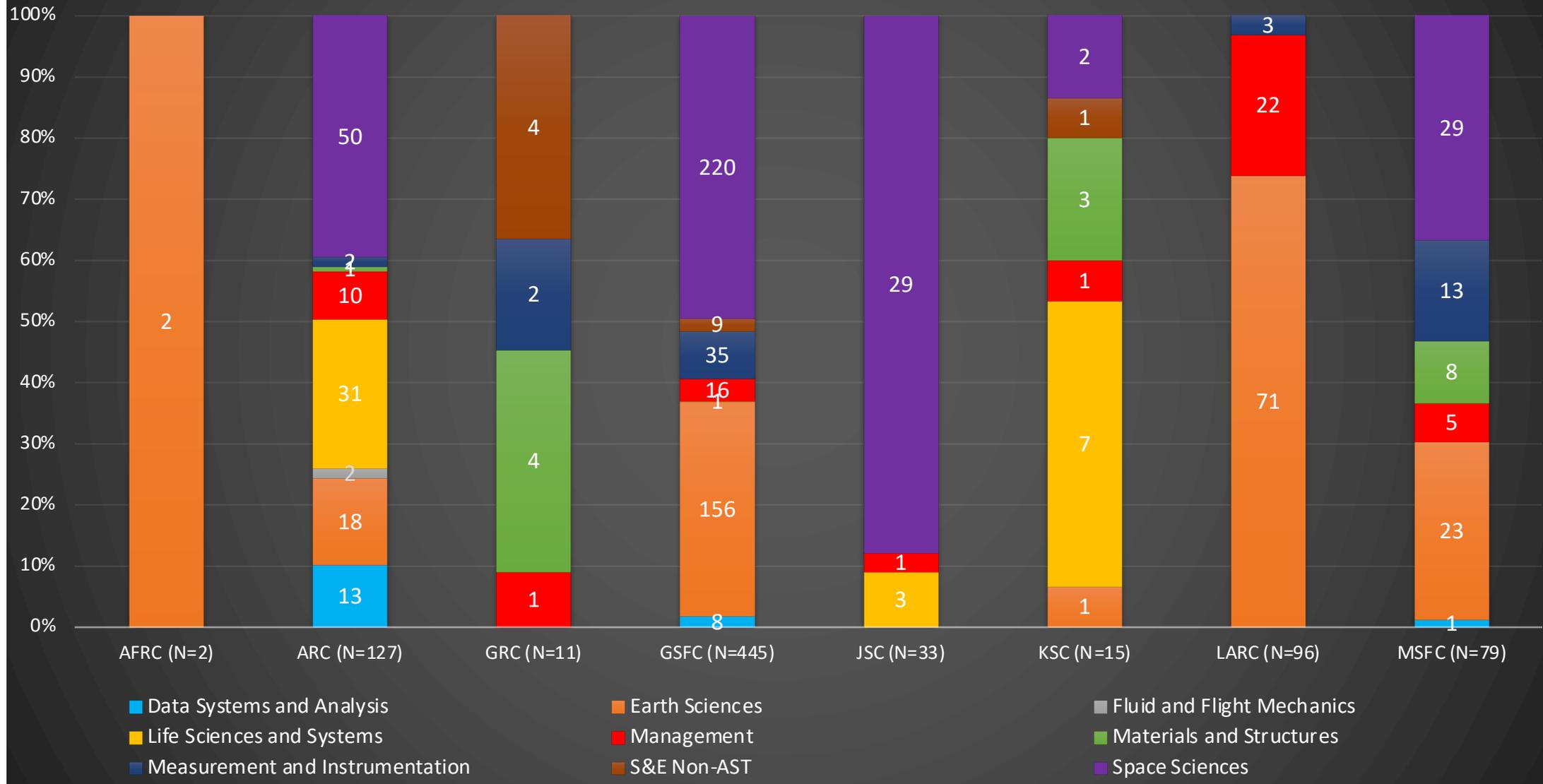


Chart CS-8

Space and Earth sciences make up the vast majority of the skill discipline within the science workforce

Scientist Education Level

Scientist Education Level - All Centers

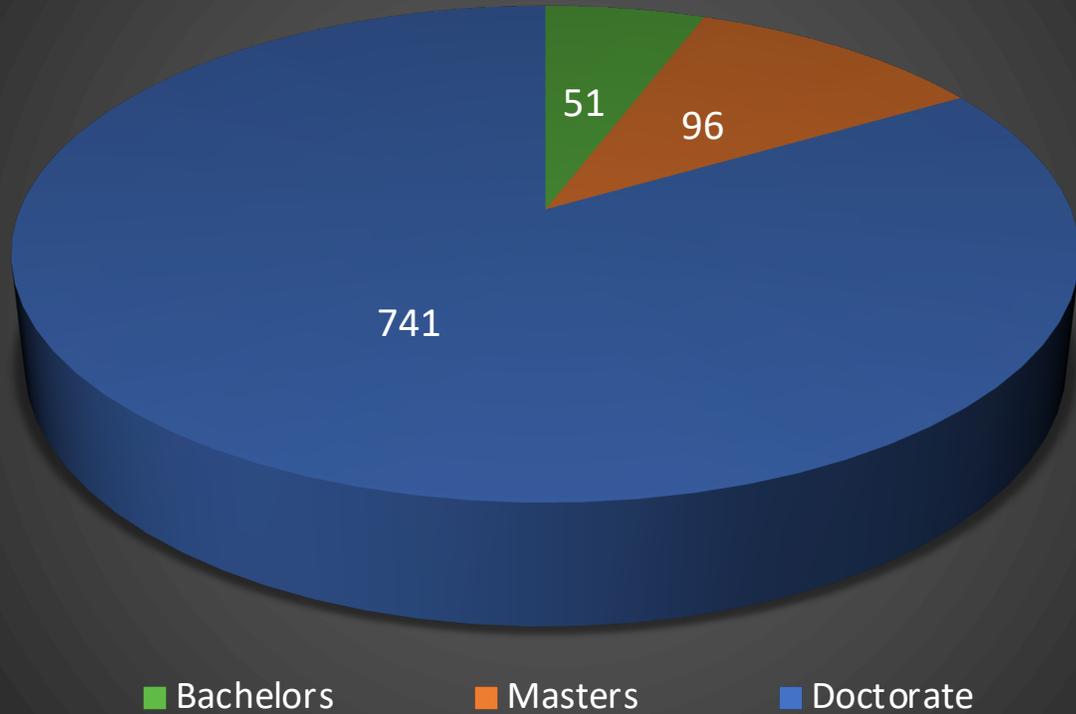


Chart CS-9

A highly educated workforce with over 80% holding PhDs.

Education Level by Center

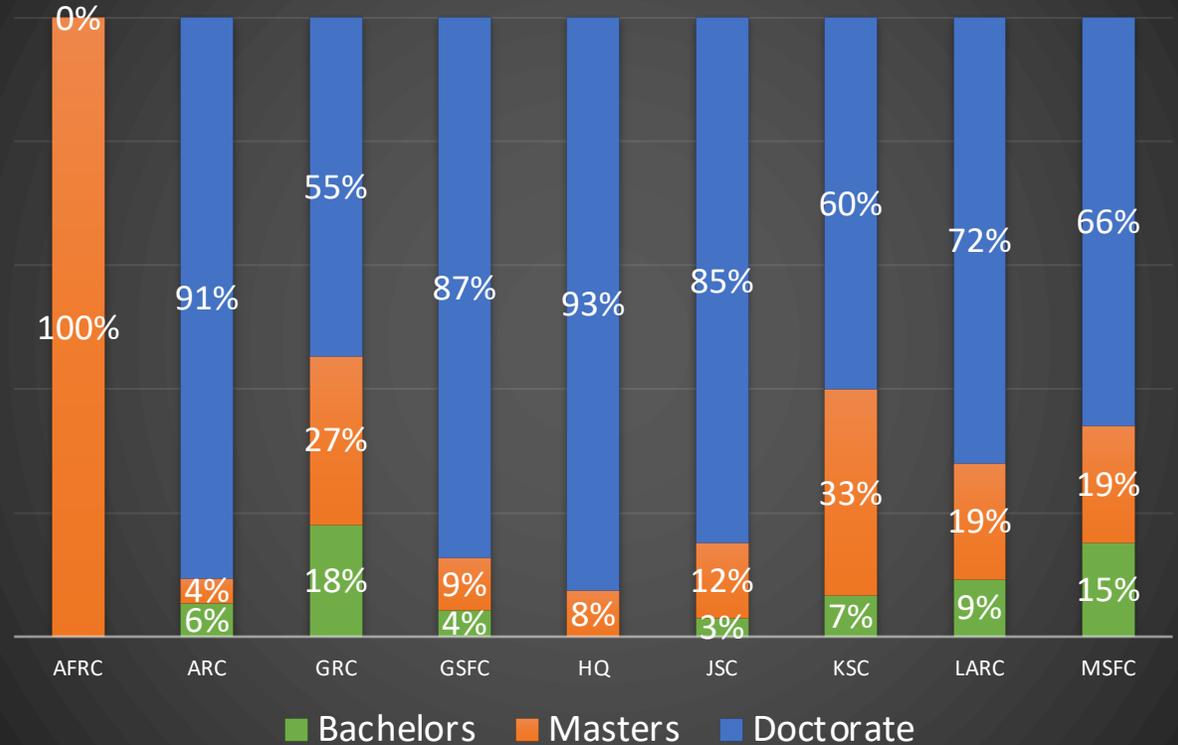
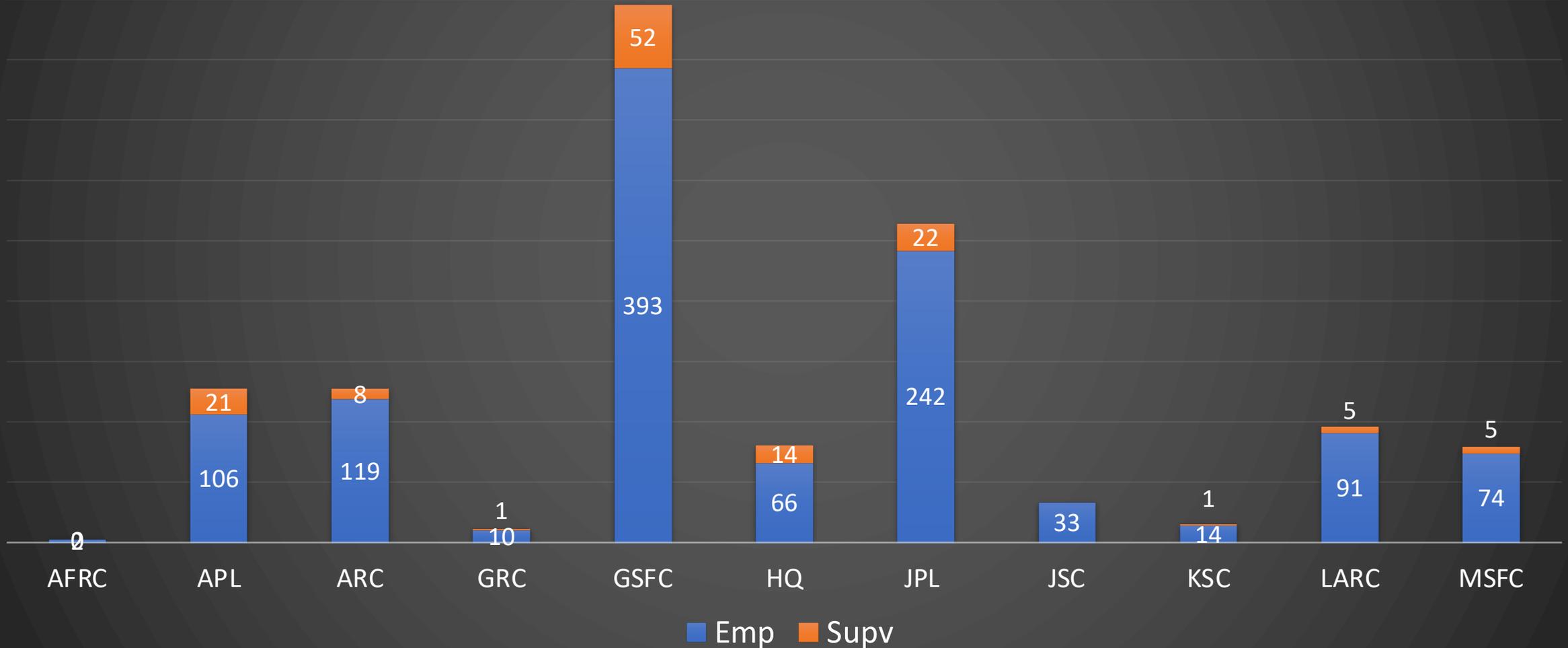


Chart CS-10

Science Workforce by Supervisory Status

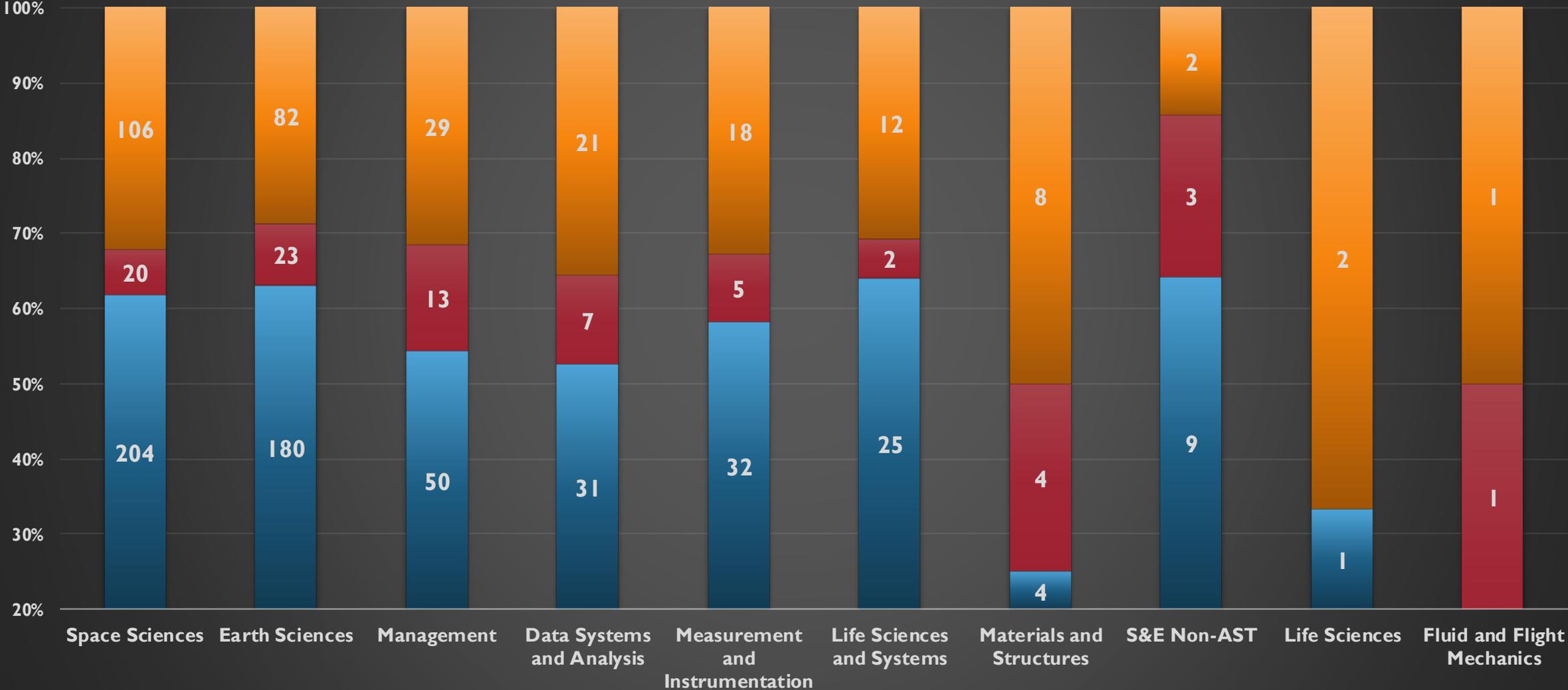


These numbers represent total supervisory headcount and not full-time equivalents (FTE). Many supervisors perform this role in a part-time status while also doing direct science work. Note, this chart does not include ~49 scientists who charge to SSMS and likely serving as supervisors.

Chart CS-11

FY21 Retirement Eligibility by NCC Group

■ Not Eligible ■ Early Out Eligible ■ Regular Eligible



About a third of the science workforce is eligible to retire, which reinforces the need to build bench strength for the next generation of leaders

Chart CS-12

Age Groups by Location

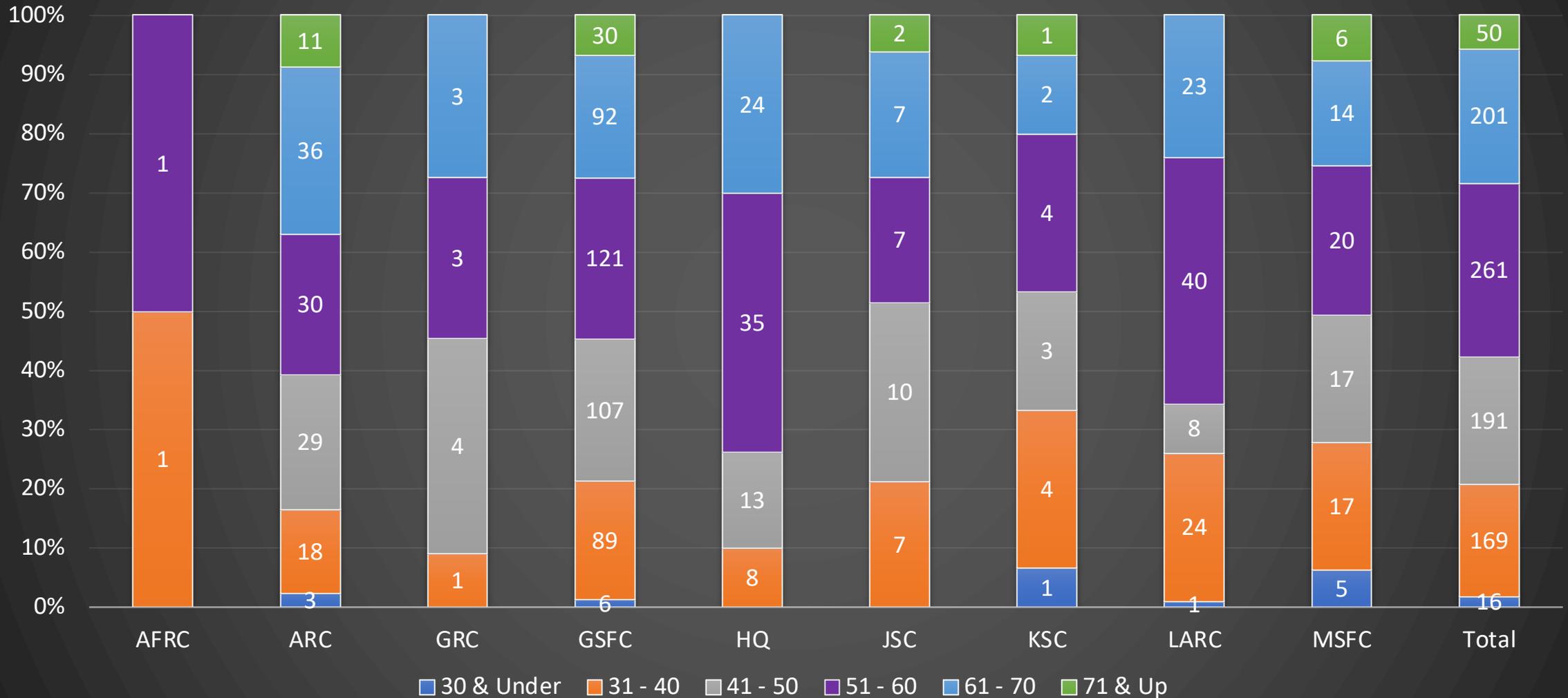


Chart CS-13

The science workforce is fairly well distributed from ages 31 to 70+, with the largest age group in their 50's. An average age was not discernable from this data set.

Demographics of Recent Science Hires

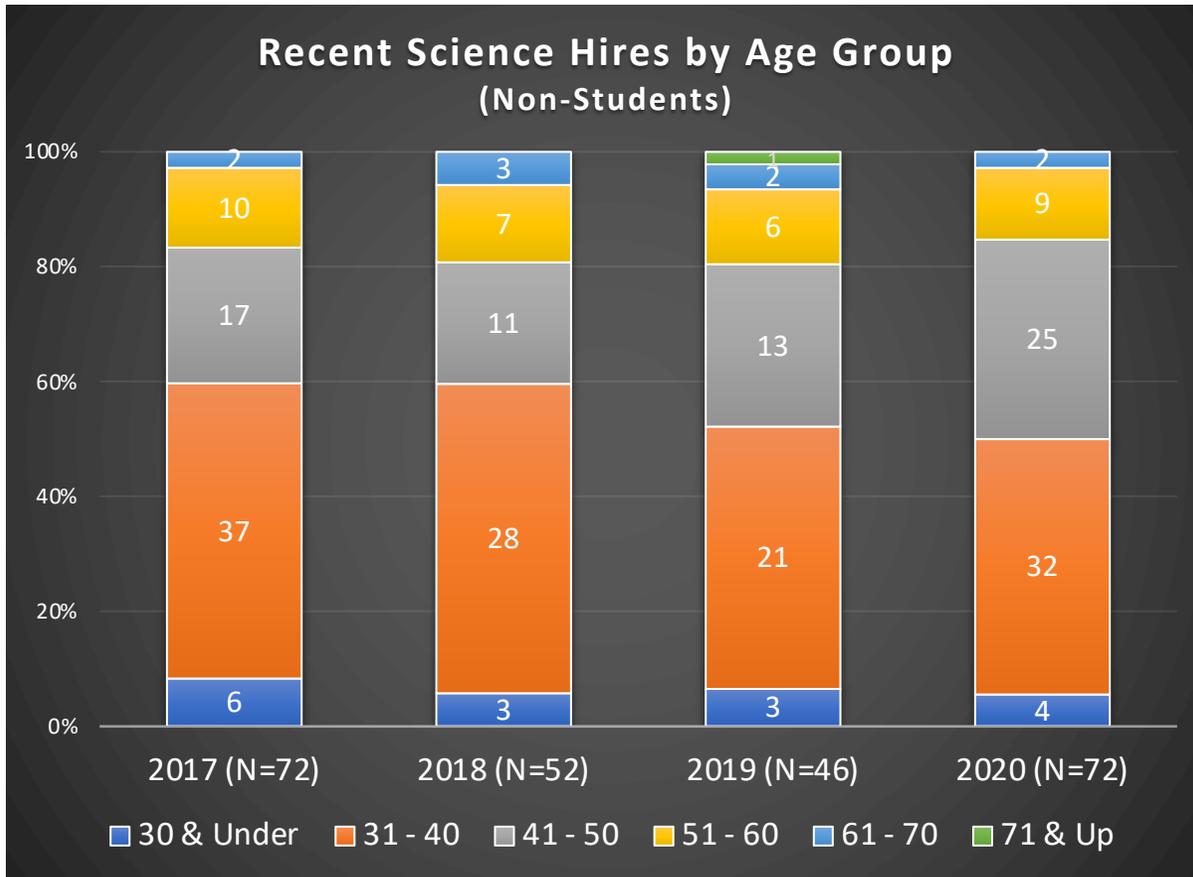


Chart CS-14

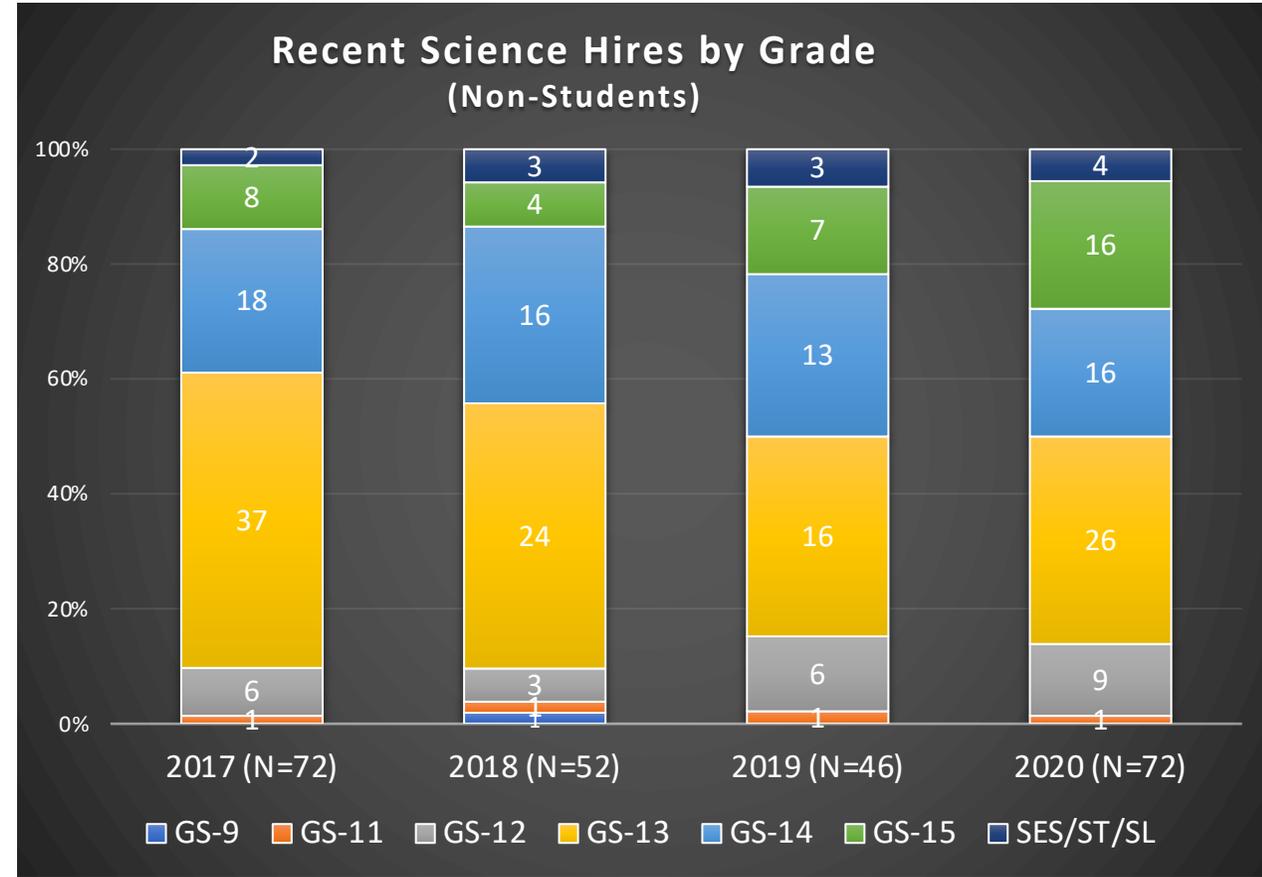


Chart CS-15

Recent science hires tend to be at the GS-13 level and between ages 31 and 40.

Location of Recent Science Hires

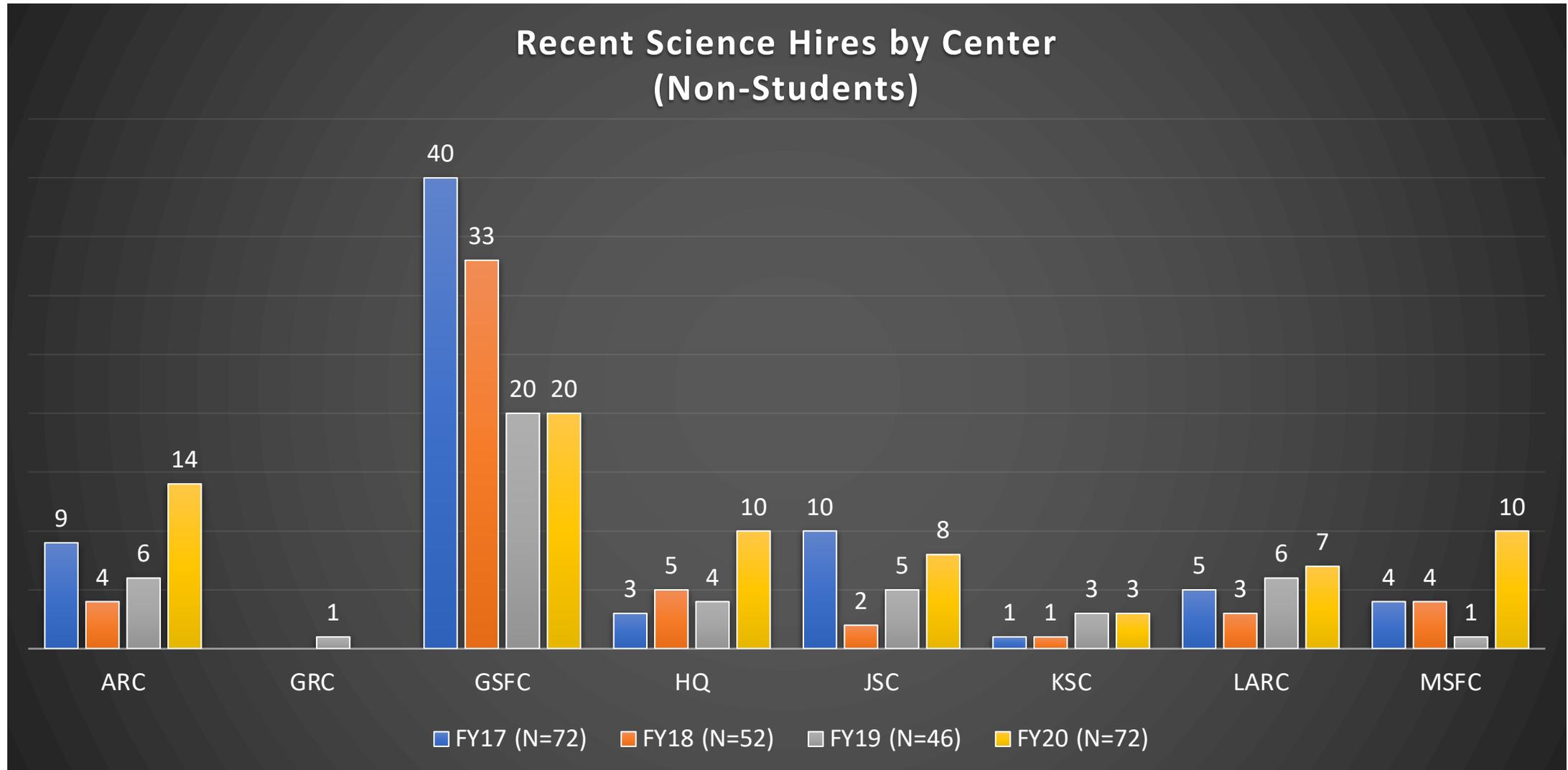


Chart CS-16

Nearly 50% of all new science hires have been at GSFC, which is consistent with its size relative to the rest of the civil servant science workforce.

Career Paths

Career Path - Themes

- The concept of summarizing science roles into specific career tracks was new to most people we interviewed.
 - Many shared that they stumbled into their career path.
- The majority felt that a high-level summary of the career tracks would be useful, especially when engaging early career scientists.
- There was consensus with the Study Team that the five identified career tracks were accurate and that roles were generally aligned to the correct career track.
 - Career tracks are: Line Management, Mission/Instrument, Research, Analysis & Application, Technology Development, and Science Program Management.
- Most agreed that scientists typically perform in more than one career track at any given time.
- Some suggested that the career tracks are not linear, but rather reflect a “spaghetti map.”
- Phase 2 of this study will include the development of an on-line career path tool which will reflect the five career tracks and provide detailed information for each position within each track. For a sample reference, see <https://careerpath.gsfc.nasa.gov/code500/>₃₂

Science Roles by Career Track

These are the key positions that were preliminarily suggested to be included in the online career tool.

Line Management = Supervisory roles, to include section, lab, group, branch, division, or directorate leads and deputies/associates.

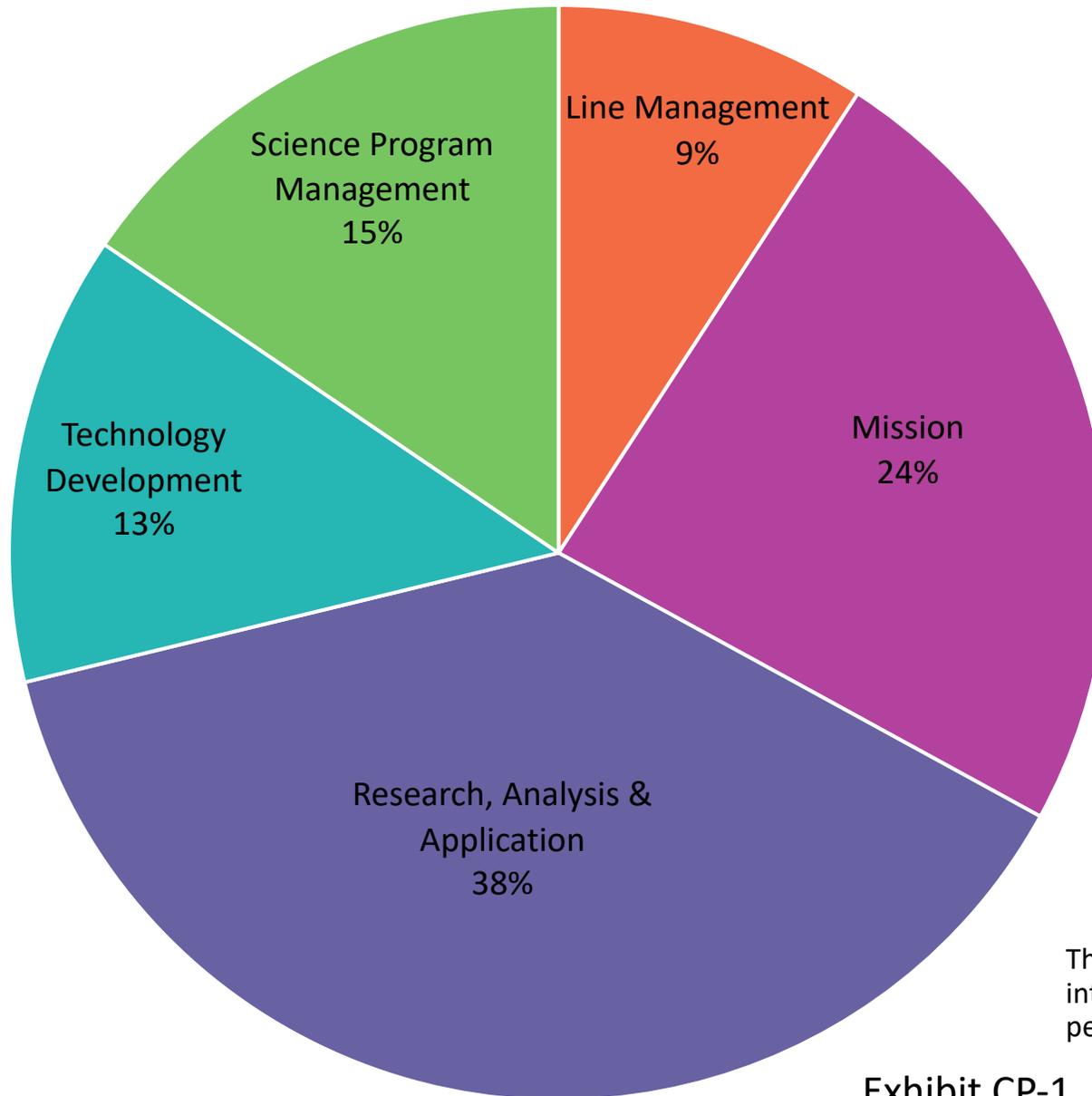
Mission = Roles in support of a spaceflight mission, to include Support Scientist, Scientist Investigator, Staff Scientist, Payload/Instrument Scientist, Science Systems Engineer, Deputy Project Scientist, Project Scientist, and Principal Investigator/Co-PI.

Research, Analysis & Application = Roles include Research Scientist, Research Group Lead, Data Scientist, Instrument Researcher, Data Modeler, Data Modeler Group Lead, Discipline/Portfolio Scientist, and Principal Investigator/Co-PI.

Technology Development = Mission-enabling roles, include Research Scientist, Technologist, Payload/Instrument Scientist, and Principal Investigator/Co-PI.

Science Program Management = Non-supervisory roles, to include Program Officer and Program Scientist within a division of the Science Mission Directorate at NASA HQ or JPL. Chief Scientist roles reside at HQ and some NASA Centers. Program Manager roles reside at some centers.

Estimated Science FTE by Career Track



This data was sourced through a combination of an Oct 2020 internal survey of FTE funding alignment with additional personnel data added to it.

Career Path - Recommendations

CP-1 - Adopt the nomenclature of the five career tracks identified in the NASA science workforce

Description – The following five career tracks were identified as a result of this study:

- Line Management
- Mission
- Research, Analysis, and Application
- Technology Development
- Science Program Management

These tracks should become the common language for career conversations and guidance. Recommend they be incorporated into workforce development strategies and serve as the foundation of the online Career Path tool (see Recommendation CP-2). Further, a one-page graphic depiction of the science career tracks (forthcoming) may be a useful marketing tool for training and other forums. A couple of draft options are being considered.

Benefit: Having common career terminology and understanding allows scientists to be more intentional about their career opportunities and progression. Likely most beneficial for early/mid-career scientists, as well as interns, post-docs, and perspective employees (if posted on-line).

Next Steps: Begin incorporating the career track language into the science community. Use B-Line Express to develop options for a one-page graphic to display career tracks. See possible options at Exhibits CP-2 and 3.

Timeframe: Within about 30 days start to begin incorporating the career tracks into workforce nomenclature .

Exhibit CP-2

Career Track Graphic Option 1

SCIENTIST CAREER TRACK ROADMAP

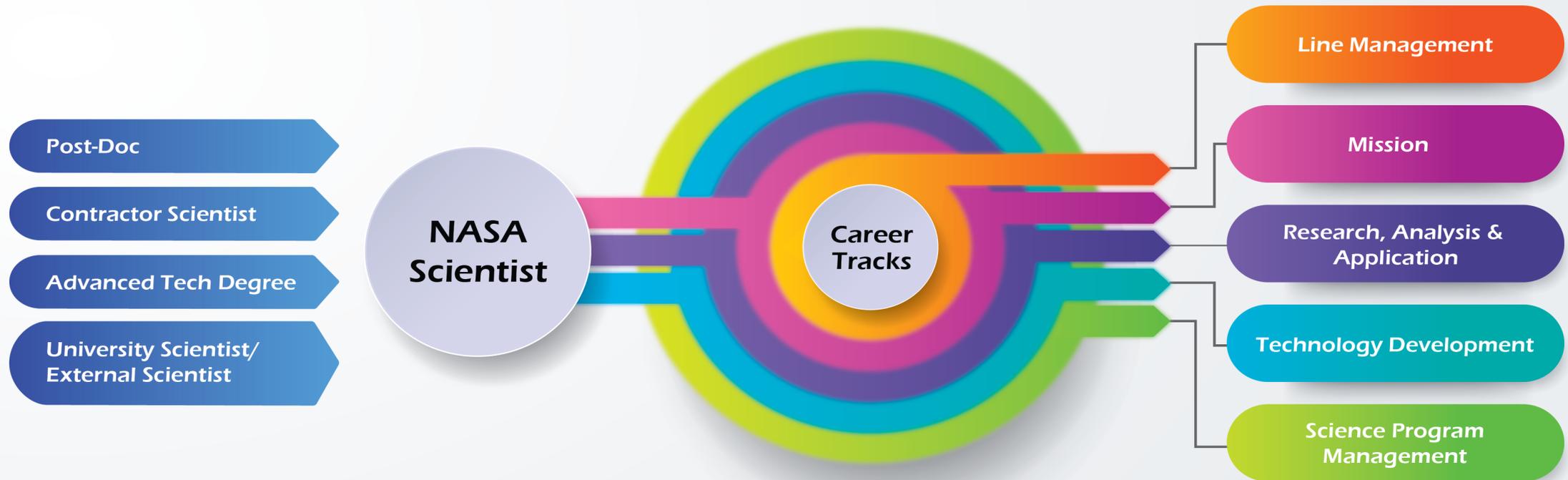


Scientists often perform roles in more than one career track at the same time or may transition between the career tracks over time.

Exhibit CP-3

Career Track Graphic Option 2

SCIENTIST CAREER TRACK ROADMAP



Scientists often perform roles in more than one career track at the same time or may transition between the career tracks over time.

Career Path - Recommendations

CP-2 - Create an on-line career path tool

Description: A web-based tool that lay outs each science career track and the associated key positions within each track. For each position, a summary description will be provided of the roles and responsibilities, ideal competencies and experiences, recommended training for that position, and transition possibilities to other positions.

Benefit: The tool can assist current, and potential, NASA scientists in better navigating their careers. Target audience would be early to mid-career scientists, postdocs, interns, and supervisors. Tool can be used during onboarding, orientation, performance discussions, training, mentoring sessions, etc.

Next Steps: Stand up new team with civil servants and reps from APL & JPL to work with B-Line Express to develop the tool. Team would likely be a blend of workforce personnel, administrative support and first-level science supervisors.

Timeframe: Estimated time for completion is February 2022

Leadership Development

Leadership Development - Themes

- There is no overarching strategy for leadership development specific to NASA scientists.
 - Only a few organizations have development programs specifically targeting scientists
 - Many organizations tap into other existing programs that they feel would be beneficial to scientists
- Becoming accomplished within the science community is generally key to becoming any type of science leader. As result, development of early career scientists focuses on technical achievements, not leadership development.
- At centers where the science presence is small, science leaders struggle to be considered viable candidates within center senior leadership
- Although NASA has high Federal Employee Viewpoint Survey (FEVS) scores with respect to employee development, scientists (1300 job series) consistently score below the NASA average. (See Table LD-1)
- SATERN records reflect that scientists don't participant extensively in training outside of their technical areas, with the exception of supervisory training, which is likely mandatory. (See Table LD-2)

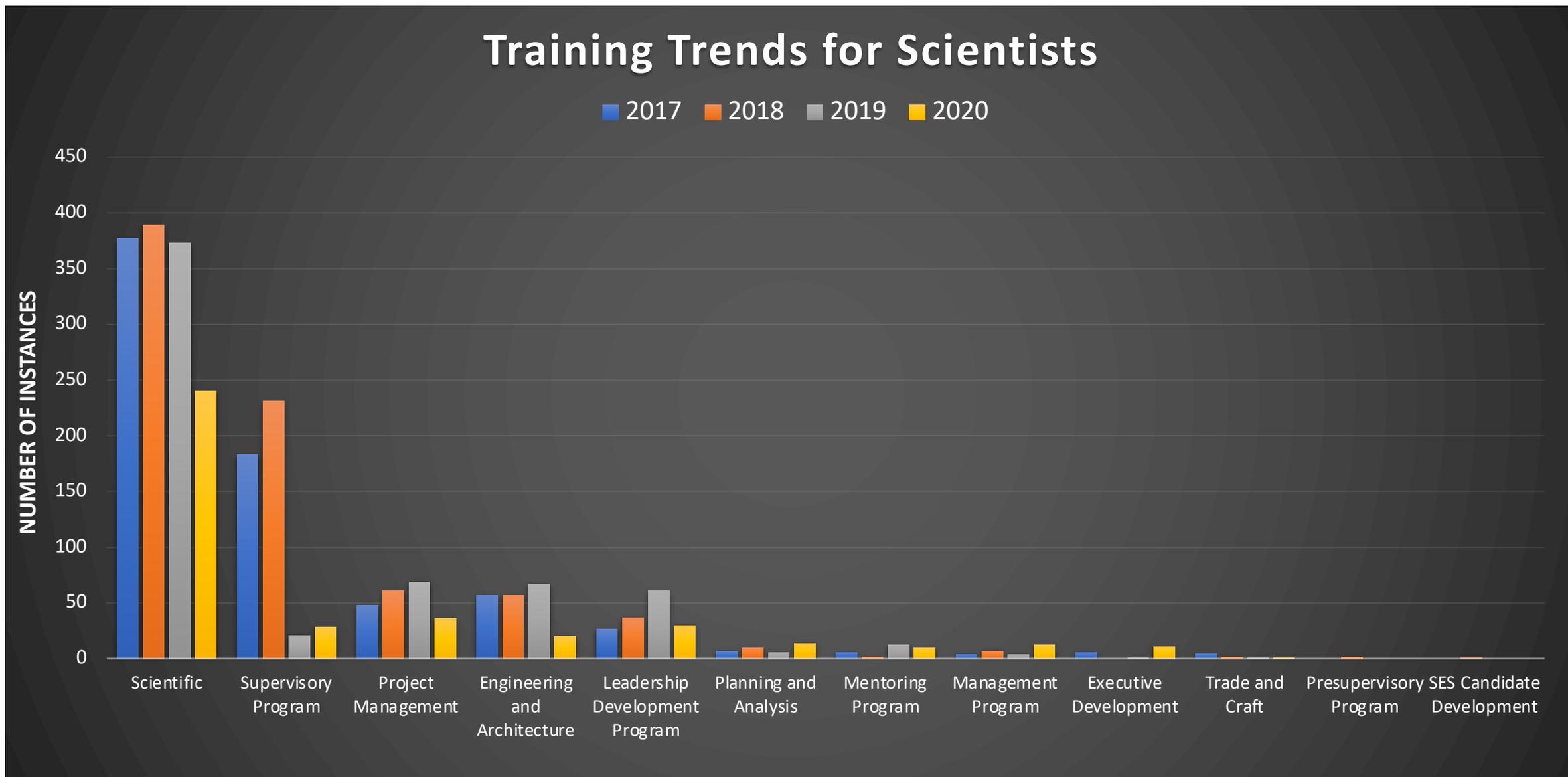
Federal Employee Viewpoint Survey (FEVS)

Trend Data for Employee Development (Table LD-1)

FEVS Questions	13 - Physical Sciences 2017	NASA Avg 2017	13 - Physical Sciences 2018	NASA Avg 2018	13 - Physical Sciences 2019	NASA Avg 2019
Q18) My training needs are assessed.	69.8%	78.3%	71.0%	79.2%	73.7%	81.3%
Q43) My supervisor provides me with opportunities to demonstrate my leadership skills.	78.8%	84.1%	80.4%	84.7%	82.9%	85.9%
Q46) My supervisor provides me with constructive suggestions to improve my job performance.	71.8%	77.5%	71.6%	78.4%	75.6%	79.9%
Q47) Supervisors in my work unit support employee development.	85.1%	86.7%	83.5%	87.1%	87.4%	88.5%
Q68) How satisfied are you with the training you receive for your present job?	67.5%	74.2%	69.2%	74.4%	71.4%	76.3%

Scores reflect the percent of positive responses to each question. The 1300 job series scored below the NASA average for all five questions pertaining to employee development. This job series also had the lowest scores in comparison to the other main job series in NASA for this same time period.

Training Trends for Civil Servant Scientists (Table LD-2)



Data source: SATERN training records for NASA civil servant scientists

Leadership Development – Themes (Continued)

- Many early/mid-career scientists want more development opportunities for mission work, especially in budget formulation and execution, project life cycles and accompanying reviews. They also desire development in soft skills areas, such as communications, team building, and leading through influence.
- The science community is a highly-graded workforce, which would suggest the need for a commensurate level of leadership development. However, most scientists already hold a PhD, which adds to the challenge in encouraging additional training, especially outside of their technical expertise.
- Science organizations require a broad portfolio, including smaller missions, to develop scientists
 - Sometimes obtaining smaller missions is a challenge as used to enable broader science community
- Most Centers/Labs want to enhance leadership skills within their science workforces.

Leadership Development Challenges

- The MAP process pulled CMO funds to HQ, limiting Centers' ability for strategic investments, including leadership development and other Center specific training programs.
 - Agency leadership programs and Center-specific programs were paused over the last several years.
 - In FY21, new leadership offerings will be piloted. In FY22, some legacy leadership development programs will return. Unsure if/when center-specific programs will return.
 - This leaves the workforce feeling like training isn't valued
- Training isn't always emphasized or encouraged within the science workforce, especially for soft skills.
- Competition for training may discourage some scientists from applying due to the effort involved and the lack of assurance of selection.
 - If not selected, they become even more discouraged to apply again.

Leadership Development Challenges (Continued)

- Feedback from early/mid-career scientists, specific to line management:
 - Some have observed line management jobs and find them unappealing.
 - Some do not want to leave pure science work.
 - Belief exists that taking on a management role makes it difficult to return to science.
 - However, some are frustrated about the lack of opportunity to take on a management role. (There is only one supervisory position and that person isn't going anywhere).

Leadership Development – Challenges (Continued)

- Scientists aren't taking on leadership roles early in their careers, either due to lack of opportunity or lack of priority.
 - Often very difficult for early-career scientists to focus on leadership development, as they must spend so much time writing proposals to fund their science.
 - Organizations, especially smaller science centers, struggle to have the right opportunities, at the right time, for developing scientists. Further, the smaller centers often do not have opportunities beyond their branch.
 - Funding for entry-level science proposals can be challenging, which results in limited opportunities to establish expertise and leadership early in one's career.
- At one location, early career scientists complained that there is a lack of transparency with regard to leadership development opportunities.
 - Formal programs are not always advertised and selections appear to be made by invitation only
- At another location, there was no transparency into what is expected of a scientist at various grade levels
 - People expressed that they do not know what they needed to do to get a promotion
 - Further, they were hired in at whatever grade was available, not necessarily at the grade level of their work

Leadership Development – Best Practices

- All organizations in this review have some type of leadership development program for its workforce (not unique to scientists)
 - APL has a comprehensive leadership program called Space Career Leadership Enhancement (See Appendix E) that offers rotations, mentoring cohorts, and technical workshops
 - The Civil Servant programs were paused due to the “mapping” of the human capital function.
- Some organizations tap into existing development programs for Project Management and/or Engineering to further technical knowledge for scientists.
- Several organizations are transparent about sharing all development opportunities and track participation
- Headquarters experience (detail or review panel support) is considered an excellent development opportunity.
- GSFC’s Sciences and Exploration division has an early career group that meets regularly with the division leadership team
- Several organizations have lower/entry level part-time supervisory roles, which provide early exposure to supervision, while allowing for continued science work.
- Successful development programs provide hands-on experience, exposure to leadership roles, opportunities to broaden skills, career exploration, and a larger network.

Leadership Development – Recommendations

LD-1 - Develop a virtual agency-led enhanced orientation for newly hired scientists

Description: Create a short virtual agency science orientation for newly hired scientists. Audience would be a mix of scientists from any center or lab. Content could include an overview of NASA science operations and missions, a summary of science career paths and key leadership roles, a panel of scientists of varying career levels, and some type of break-out session allowing for a peer connection. The orientation should be held at least annually, depending on the number of new hires. Agency data shows an average of 33 civil servant hires per year that are GS-13 and below. Unsure how many early career hires come into the labs.

Benefit: Allow newly hired scientists to be more knowledgeable of career opportunities, and perhaps, more intentional with their career trajectory. Provide them a better understanding of the big picture of NASA science, not just that of their local organization. It would also broaden their network.

Next Steps: Requires a small team to create the format and content, determine the target audience and ideal timing for attendance, and then pilot the initial session. Recommend coordination with centers to identify their orientation practices, as not to overlap or overwhelm. Once created, it shouldn't be too difficult to institutionalize. Modify format/content as needed based on continuous feedback.

Timeframe: The first session could be piloted within six months.

Leadership Development – Recommendations

LD-2 - Develop a virtual series of “Career Opportunities” workshops

Description: Create a series of virtual sessions that showcase key leadership roles, such as Project Scientist, Principal Investigator, Line Management, Program Scientist, etc. The workshops would feature a panel of scientists currently in those positions sharing the key roles and responsibilities, ideal attributes, suggested training or experiences, lessons-learned as well as a Q&A. The target audience would generally be ~GS-13 or GS-14 scientists (and lab equivalent) with ~3 - 5 years of experience, especially those who are ready to transition into roles of increased responsibility. The sessions would be offered at least once a year, depending on demand.

Benefit: Provide a more detailed overview of key science roles, what the positions entail and how to navigate one’s career accordingly. Give more senior scientists an opportunity to help guide and mentor the next generation of science leaders.

Next Steps: Form a small team (could be the same as the orientation team) to develop a common format (regardless of featured role). Determine the roles to showcase and pilot the first session. Modify as necessary based on feedback. Once created, it shouldn’t be too difficult to institutionalize.

Timeframe: The first session could be piloted within a year.

Leadership Development – Recommendations

LD-3 - Develop a rotational program for scientists

Description: Develop and support an agency-wide rotational program as a component of employee development. While the agency currently has a few detail opportunities, typically at Headquarters, it is not fully embracing rotations as a development strategy. It is common for SMD to host several IPA's (Intergovernmental Personnel Act); however, it is uncommon for NASA employees to serve on external IPA assignments. Suggest creating a rotational program across the agency with the potential for opportunities at Headquarters, centers, labs and possibly other external entities, allowing scientists to gain hands-on experience in a new area (i.e. supervision, project work, different discipline or application, program management). Talent Market Place, the agency-wide internal job posting platform, could be used to advertise opportunities. While likely difficult to implement and fund, a structured program would have a high impact on both the individual scientist and the organization.

Benefit: The individual would increase his/her skills, knowledge, and network. The Agency would strengthen its succession capability by increasing its pool of qualified candidates for leadership roles.

Next Steps: Suggest conducting additional research to determine feasibility, interest level, capacity, change management strategy, human capital guidance, funding challenges, etc. Suggest a thorough review of APL's rotational program. The level of effort to create this is high. However, the impact has the potential to be quite high, once it is institutionalized.

Timeframe: This may take extensive time to research, create the structure, and then implement. Estimate at least a year to pilot a structured program.

Leadership Development – Recommendations

LD-4 - Establish entry-level, part-time supervisory roles that are time-limited

Description: Where possible, create lower/entry-level supervisory roles that are part-time (allowing for simultaneous science work) and time-limited (allowing for development opportunities for multiple people). Suggested time frame would be between one and three years. It would be ideal if the candidate lateraled into the role at his/her current grade level. However, temporary promotions would be a possibility. This would be an optional tool for those organizations with the capacity and structure to implement it.

Benefit: Over time, allows multiple people to gain leadership experience without completely giving up direct science work. For the organization, expands succession capability by increasing the pool of candidates with leadership experience.

Next Steps: Currently, many lower level supervisory positions are already part-time (supervision/science split). However, most of these positions are not time-limited. If an organization chooses this strategy, they should review each supervisory role when it becomes vacant and implement accordingly.

Timeframe: This would vary based on the turnover of existing lower-level supervisory positions.

Leadership Development – Recommendations

LD-5 - Partner with OCHCO to review the science development needs and work towards a comprehensive strategy for leadership development for the science community

Description: OCHCO is currently developing a five year strategy for leadership development programs across the agency. This should provide a clearer understanding of the programs that will be offered at the agency and center levels. Further, OCHCO also has a broad knowledge of existing training programs that may be relevant for scientists. Working in partnership, SMD and OCHCO can identify a broad strategy for leadership development in the science community.

Benefit: This will result in a more intentional and strategic approach to developing science leaders.

Next Steps: Begin partnership between SMD, OCS, and OCHCO to assess science community needs, review existing training programs, identify future development programs, and develop comprehensive strategy to address the gaps.

Timeframe: To get started within the next 90 days; then, partnership would be ongoing

Leadership Development – Recommendations

LD-6 - Utilize the Agency's Science Council to share best practices for workforce and leadership development.

Description: Each science organization and/or center has its own development programs and strategies. Due to time constraints, this study only examined a few of them. Sharing best practices across the science community would be useful.

Benefit: May help some organizations improve their development strategies.

Next Steps: Suggest the Science Council facilitate a sharing of best workforce practices on a routine basis. Consider how to include APL in this effort.

Timeframe: This may take about three to six months, depending on priorities of the Science Council.

Project Scientists

Project Scientist – Themes (Roles, Responsibilities & Authority)

- The Project Scientist role is a critical leadership role for NASA missions. The role varies based on the type of mission.
 - For competed missions, the Principal Investigator (PI) is the lead scientist, and the Project Scientist supports the PI. The role of the Project Scientist is typically defined by the PI and documented in the Project Plan.
 - For strategic/flagship (directed) missions, the Project Scientist is the lead scientist and the role is also defined in the Project Plan.
- NASA Space Flight Program and Project Management Requirements (NPR 7120.5E) provides little guidance for defining the roles, responsibilities, and authorities for the Project Scientist.
 - Table PS-1 provides the limited current NASA policy references for the Project Scientist
 - Note, as of February 1, 2021, NPR 7120.5F was in development
- Lacking Agency policy guidance, the science organizations who manage directed strategic missions (GSFC, JPL & APL) have defined the roles, responsibilities and authorities in their own policy documentation.
 - Table PS-2 summarizes the key components of their Project Scientist policies and practices.

Project Scientist - Policy Points of Reference (Table PS-1)

Policy Reference	Content
NPR 7120.5E Chapter 3 Program and Project Management Roles and Responsibilities. Not included in Appendix A Definitions	This chapter highlights the following project support roles. However, a science role is not included in this section: Program Manager, Project Manager, Chief Financial Officer, Chief Engineer, Chief of Safety and Mission Assurance, Chief of Health and Medical Officer and Mission Support Directorate
NPR 7120.5E Appendix H Project Plan Template Chapter 1.4	This is the only place the Project Scientist role is mentioned in the requirements: <i>“Describe the chain of accountability and decision path that outlines the roles and responsibilities of the project manager, program manager, Center Director, principal investigator, and PROJECT SCIENTIST, as appropriate, and other authorities as required per the project's categorization.”</i>
NPR 7120.5 Program and Project Management Handbook	The handbook provides greater clarity to the Project Manager and Systems Engineering roles, but makes minimal reference to the Project Scientist role: <i>“The Project Scientist is a member of the project team; this individual works with the project manger and the scientists working on the project to ensure science needs are being met.”</i> Chapter 3.1
NPR 7120.5F (<i>In draft form as of Feb 1, 2021</i>) Program and Project Management Roles and Responsibilities, Appendix A Definitions	<p>The following definition is now in the appendix of the draft version –</p> <p>Project Scientist. For PI-led competed projects, the project scientist is part of the PI team and works closely with the PI. The project scientist is typically delegated the responsibility to monitor the scientific output of the project and ensure that the project achieves each of its science requirements. For directed projects, there is no mission PI. The project scientist is nominated by the Center and approved by the Mission Directorate and is responsible for a more significant fraction of the project-level management than in a competed project. The project scientist works closely with the project manager and is directly responsible for all science related tasks. Project scientists are primarily associated with SMD projects.</p> <p>Further, GSFC submitted a request to edit 7120.5F by adding a paragraph in Chapter 3.2 describing the role of the project scientist under the role of the project manager.</p>

CURRENT STATE – PROJECT SCIENTIST ROLES, RESPONSIBILITIES, AUTHORITIES & ACCOUNTABILITY – STRATEGIC/FLAGSHIP MISSIONS (Table PS-2)			
Key Factors	GSFC (POLICY)	APL (PRACTICE)	JPL (POLICY)
Reporting Chain	Reports through management chain to SED director	Reports to Space Sector Head	Reports to the same management levels as the PM
Organizational Alignment	Remains in own line organization (Science Dir)	Remains in own line organization (Space Sector Science Branch)	Remains in own line organization
PM Relationship	Partners in mission leadership	Partners in mission leadership	Partners in mission leadership
Accountability	Accountable to Project Office (PM, CSO and MSE) to resolve disagreements, issues, and concerns impacting mission science. Reports intractable disagreements to the Director of the SED.	Not included in written practice	Unclear in written policy
Summary of Responsibilities	Provides the scientific leadership necessary for the scientific success of a project by ensuring that the mission meets the scientific requirements consistent with the approved schedule and budget; acts as the primary science interface between the science community, NASA and GSFC management, and the flight project office; chairs the Science Working Group; oversees the planning for and the implementation of mission operations for science data collection. Leads the science team. Manages Science Working Group and Science Team budget.	Responsible for identifying, defining, and conducting science driven trades and improvements to mission services, products, and processes; leads the Science Working Group; leads the interface between the mission and the scientific community; responsible for developing long-range scientific initiatives	Responsible for the scientific integrity and overall scientific success of the mission, including managing the science team; represents the Scientific Investigators of the mission to the Project and to NASA; and serves as the scientific spokesperson for the Project
Areas of Influence	Leads the development of Level 1 science requirements; flow down of requirements; makes recommendations pertaining to science trades; resolves disagreements, issues, and concerns impacting mission science and budget	Leads the development of Level 1 science requirements; has influence over science budget	Leads the development and flow-down of Level 1 science requirements; has influence over science budget;
Selection Process	Competed to ensure consideration of all scientists with required competencies thus enhancing diversity, equity and inclusion.	Appointed by Space Sector Head	Appointed by Dir Chief Scientist w/ approval of JPL Chief Scientist and concurrence of Dir & Div Mgr.
Required Training	New PS must have mentor and attend specified training within first year	None, but expected to be a technical expert in relevant field. Management training desired.	Expected to be an expert in one or more areas related to the mission science. Management training and/or project experience at some level desired.
Science Research	Engages in active research that pertains to the mission.	No dedicated allocation of funding for scientific research until Phase E.	Can spend up to 50% of funded time on active research pertaining to the mission

Project Scientist - Policy/Practice Observations

- All three organizations recognized the need for some structure for this role
 - JPL and GSFC have developed local written policies, while APL captured their practices in writing.
 - APL expressed some interest in creating policy as a result of this study.
- Each organization established their policy or practice based on their experiences
 - Table PS-2 only reflects the policy/practice for strategic/directed missions. However, each document also identifies the differences for competed/PI-led missions.
- The policies/practices were in general agreement pertaining to the reporting chain, organization alignment, relationship to the Project Manager, overall responsibilities, and areas of influence for strategic missions.
- Differences were typically noted relating to the selection process, the training and development requirements, and the specifics around relevant scientific research.
- Only the GSFC document clearly articulates who the Project Scientist is accountable to for resolving issues and voicing dissenting opinions.

Project Scientist – Themes (Attributes)

- Senior leaders are consistent in what attributes make a good Project Scientist
 - A combination of science expertise, leadership skills, and project experience.

Science expertise

- Needs to be regarded as an expert in the science of the mission
- Science experience can be as a researcher or experimentalist
- Hardware experience is ideal to have, but should at least understand the instrument

Good leadership, management and communication skills

- Demonstrate successful experience leading people
- Capable of making timely science decisions and trades
- Can effectively communicate science internally and externally

Project experience

- Should have project experience commensurate with the mission
- Several avenues to obtain experience – leading internally funded projects or programs, deputy PS, staff scientist, investigation scientist, experiment rep
- Ideally, have some training in project management
- Understanding of the project lifecycle and associated responsibilities

Project Scientist – Themes (Development)

- Much of the development of Project Scientists comes from mentoring, not formal training or development programs.
 - Some wished they had formal project training; much of their development came through “trail by fire” or failures
- In comparison, there are a number of training and development programs for Project Managers and Systems Engineers. Further, certification is required for Project Managers for missions with a lifecycle budget over \$250 million.
 - GSFC’s Systems Engineering (SEED) and Project Manager (FPDP) development programs were benchmarked for this study – see more detail in Appendices F and G. Both development programs are competitively selected and serve as entrance ramps into their respective roles.
- Many senior level focus group participants conveyed little support for a certification or criteria requirement that would mirror the Project Manager or Systems Engineering roles
 - Most felt it would be too prescriptive. Further, they felt the PS role is unique to the science, while the PM or SE role is fairly universal.
- However, most did support developing a training course for Project Scientists.
- Many early/mid-career scientists want more training and development opportunities for mission work, especially in budget formulation and execution, project life cycles and accompanying reviews. They also desire development in soft skills areas, such as communications, team building and leading with influence.
 - In other words, aspiring science leaders are seeking development in the non-science aspects of the PS role.

Project Scientist – Best Practices

- Documenting the roles and responsibilities (R&R's) for the Project Scientist
 - GSFC has a Goddard Procedural Regulation (GPR), unique to the Center, that describes R&R's, along with required training.
 - APL and JPL also have documents that articulate the R&R's for the Project Scientist.
- Funding of deputy project scientist positions to ensure the development and mentoring for future opportunities
 - A less experienced scientist is appointed to the deputy role with a senior person in charge and mentoring him or her
- Tapping into other available training programs to gain necessary project knowledge
 - Project management and/or systems engineering training courses offer content that is applicable for the Project Scientist
 - However, there are only limited opportunities to tap into other training programs
- Providing opportunities, or organizational structure, that allow scientists to engage with engineers to increase knowledge and understanding of hardware

Project Scientist - Challenges

- The agency has policy documents in place for other project leadership roles (Project Manager & Systems Engineer), but not for Project Scientists. The lack of a NASA policy document allows organizations to create their own understanding of the Project Scientist role.
 - At the conclusion of this study, NPR 7120.5F was in draft form and contained a proposed definition of a Project Scientist in Appendix A.
- Currently, there isn't a shared definition of the roles and responsibilities of a Project Scientist (for directed or competed missions). The lack of a common definition can lead to inconsistency in how the role is implemented.
 - Goddard, APL, and JPL each have their own definitions of the roles and responsibilities.
- There is some lack of clarity of roles, responsibilities, authority and accountability for flagship/strategic missions.
- No standardized NASA strategy for developing Project Scientists
 - In comparison, there are several programs designed to develop Project Managers and Systems Engineers (see Appendices F and G for benchmark data on SEED and FPDP)

Project Scientist – Challenges (Continued)

- Some felt there wasn't a strong, or intentionally developed, candidate pool for the Project Scientist role
- Opportunities to get desirable experiences aren't always available
 - Small centers face an even greater challenge with opportunities for development. Further, most of their missions are smaller and mostly competed/PI-led. Therefore, the role of the Project Scientist is somewhat limited.
- Concerns from early/mid-career employees that once you go into project work, one loses his/her science expertise

Project Scientist – Recommendations

PS-1 - Codify the roles and responsibilities of the Project Scientist

Description: Ensure NPR 7120.5F (currently in development) includes a high-level description of the Project Scientist and Principal Investigator roles, authorities, and accountabilities. Also, recommend updating the NPR 7120.5 Handbook to provide greater clarity to the roles, authorities, and accountabilities of the PS and PI for directed and competed missions. This would also be the place to post the ideal attributes of the PS. Table PS-3 reflects the recommended policy content for PS role in strategic/directed missions. The need for policy below the Strategic Mission level should be evaluated. Developing a table similar to Table PS-2 for competed missions would be valuable.

Benefit: Clarifying the roles and governance structure of the PS and PI under specific mission types would reduce both confusion and misinterpretation of roles, authorities or accountabilities.

Next Steps: This would likely be assigned to an SMD representative, but would need support/input from Goddard, JPL and APL

Timeframe: Approximately, a year to draft, review, comment, and publish the updated NPR.

NOTE: At the end of this study, we learned that NPR 7120.5F was in the process of being updated. The draft version contains a high-level definition of a Project Scientist in Appendix A. GSFC submitted an edit to enhance Chapter 3.2 with regards to the Project Scientist role. It is unknown when or if the accompanying handbook will be revised.

Proposed Recommendations for Agency Policy for Project Scientist Roles & Authorities for Strategic/Flagship Missions (Table PS-3)

Key Factors	Recommended Policy Guidance
Summary of Responsibilities	Responsible for the scientific integrity and overall scientific success of the mission, including managing the science team; represents the Scientific Investigators of the mission to the Project and to NASA; and serves as the scientific spokesperson for the Project
Areas of Influence	Development of Level 1 science requirements; flow down of requirements; makes recommendations pertaining to science trades; resolves disagreements, issues, and concerns impacting mission science and budget; leads the Science Team
Accountability	Who is the Project Scientist accountable to and for what?
Selection Process	Selection should consider multiple qualified candidates in a diverse, equitable, and inclusive process
Qualifications	A combination of science expertise, leadership skills, and project experience.
Required Training	Strongly encourage taking the (forthcoming) Project Scientist course (or equivalent); organizations are encouraged to provide training opportunities.
Science Research	Expect Project Scientist to remain current in the science of the mission. However, no specific time allocation or method to be prescribed in policy.
PM Relationship	Partners in mission leadership
Reporting Chain	Not to be prescribed by policy; determined by participating organizations
Organizational Alignment	Typically remains in own line organization; no need to be prescribed by policy

Project Scientist – Recommendations

PS-2 - Wherever possible, ensure a deputy project scientist is funded for missions.

Description: For flagship/strategic missions, recommend the funding of a deputy project scientist. For competed missions, suggest using language in the Announcements of Opportunity (AOs) encouraging the funding for a deputy project scientist. This ensures the development of the next generation of project scientists and expands the pool of experienced candidates for future opportunities.

Benefit: Ensures the development of the next generation of project scientists. Expands the pool of experienced candidates for future opportunities.

Next Steps: Review, and modify if needed, the standard language in Section 5.5 of the AO.

Timeframe: Implement as appropriate for all projects entering Phase A after CY2020.

Project Scientist – Recommendations

PS-3 - Develop a Project Scientist training course

Description: Recommend conducting a DACUM (Developing a Curriculum) exercise to develop a training course specific to the Project Scientist role. The course can be offered as an option for those who aspire to become a project scientist and should be required, within a certain time frame (~one year), of being appointed as a new project scientist. Scientists at JPL and APL should be included in this training.

Benefit: There was universal agreement of the three attributes that make a good project scientist – science expertise, project management experience, and good leadership skills. It is expected that the project scientist comes with the first attribute. However, the other two attributes are not assured. Having such a training course would standardize the knowledge and skills conveyed to each project scientist.

Next Steps: Seek OCHCO support to conduct the DACUM and develop the course. The OCS should take the lead on this.

Timeframe: It would about a year to develop and pilot the course.

Appendices

Agency Science Workforce Study Charter – Phase 1

Issue Statement: The Agency's science workforce has little insight into the varied career paths that are available in the areas of organizational leadership, project science leadership, and technical research and analysis. There are also concerns of an overall lack of understanding and consistency in the workforce development and readiness assessments for key leadership positions. Further, there is a lack of clearly understood roles, accountability and authority within the project science leadership roles, especially for Flagship (multi-billion life cycle cost) missions.

Goal Statements:

- Formalize the career paths available within the NASA science community
- Identify developmental gaps that may impede advancement or limit preparedness for key science positions and career paths
- Identify developmental strategies for key positions that may broaden the scientist's knowledge, skills, and experiences to better prepare them for senior level roles and responsibilities
- Propose communication strategies and mechanisms to ensure career opportunities and development requirements are broadly available for the science workforce

Scope and Boundary Limits:

- Phase 1 will focus on data collection, both qualitative and quantitative, necessary to identify career paths and developmental gaps within the Science community, and to make recommendations for improvement
- There are other on-going workforce studies (such as the NASA FY21 Strategic Workforce Planning Process and the National Academies Diversity and Inclusion Study) that will not be duplicated.
- This project is not intended to interfere with the autonomy of a center or lab to manage its own workforce.

Project Timeframe: Sept 2020 – Jan 2021

Core Leadership:

Karen Flynn/SMD, Senior Champion
 Ellen Gertsen/SMD, Administration Branch
 Leo Gomez/SMD, Administrative Officer
 Lori Simmons/B-Line Express, Consultant and Facilitator
 Nancy Rackley/B-Line Express, Consultant
 Alfred Gamble/OCHCO, HR Business Partner

Team Members:

Dave Draper, Deputy Chief Scientist (OCS)
 Michael New, Deputy AA - Research (SMD)
 Tom Wagner/SMD, Prg. Scientist, Planetary Science
 Jack Kaye/SMD, Prg. Director, Earth Science
 Sharmila Bhattacharya/SMD, Prg. Scientist, Biological & Physical Sciences
 Joe Hill/GSFC, Deputy Director for Science & Exploration Directorate
 Trina Dyal/LaRC, Acting Director, Science Dir
 Dan Ward/OCHCO, Talent Strategist
 Fernan Rodriguez/OCHCO, HR Specialist
 Rich Zurek/JPL, Chief Sci., Mars Prog. Office
 Louise Prockter/APL, Chief Sci., Space Exploration Sector

Agency Science Workforce Study Charter – Phase 1

Project Plan – Through data collection, interviews, and reviews of other materials, the team will provide a current workforce state assessment and accompanying recommendations as follows:

- Science Workforce Current State Assessment, which includes the following:
 - Data breakout of the existing science workforce considering a number of demographic dimensions (age, gender, race and national origin, etc.)
 - Strategies for workforce planning, processes, utilization, and interdependencies
 - Top-level career paths and associated development and readiness needs for key positions within these paths
 - Programmatic leadership roles, accountability and authority and identification of their guiding policy documents
 - Other needed science career path improvements that may arise
- Workforce Strategy Recommendations and top-level Implementation Action Plan for the following areas:
 - Developmental gaps/concerns that may limit preparedness for key science positions and career paths
 - Developmental strategies for all key positions, which may also include certification strategies, where warranted.
 - Communications strategies and mechanisms to ensure career opportunities and development requirements are broadly available for the science workforce, no matter where it resides.

Project Methodology:

- Interviews will be conducted in pairs by the core team with support from the expanded team members, as needed.
- The team members from the science community will serve as the initial interviewees, and may provide additional resources as the project progresses.
- The core team will meet on a bi-weekly basis to review findings and assess work progress. The full team will meet formally about once a month, and informally as needed, to validate findings and offer input.

Assumptions and Constraints:

- Team members are familiar with the science workforce & will devote a portion of their time for the duration of Phase 1
- Decisions will be made by consensus and recommendations shall comply with NASA policy
- Resulting action plan will be tracked/monitored by the SMD Dep. AA for Management organization
- Phase 2 involving development of an online career path tool will likely change the team membership
- The entire project is expected to be completed virtually using audio and video meeting capabilities

Action Plan (Appendix B)

ACTION/TASK	CONTRIBUTING PARTIES	PRIORITY	ESTIMATED COMPLETION DATE	STATUS/COMMENTS
PS-2 Fund Deputy Project Scientist on missions	SMD Divisions/SMD/DAAR (AO Language)	High	Missions entering Phase A after CY2020	Expected for directed missions and encouraged for competed missions
LD-4 Establish Part-Time, Term-limited supervisory roles	SMD/DAAM & Divisions, Centers and Labs in coordination with the Office of the Chief Scientist (OCS) and OCHCO	High	Start in FY22	Preferably an enterprise effort; Some Centers are concerned about the diminishing RDMS funding to accomplish this;
LD-3 Rotational Program	SMD/DAAM & Divisions, Centers/Labs in coordination with the OCS and OCHCO	High	By CY2022	Preferably an enterprise effort
PS-3 Develop Project Scientist course	OCS with SMD/DAAP, DAAR & Divisions in partnership with OCHCO.	High	2 nd Qtr FY22	
LD-5 Partner with OCHCO for overall leadership development strategy and its impact to the science workforce	SMD/DAAM, OCS and OCHCO	High	3 rd Qtr FY21	Timing to coincide with OCHCO's 5 year leadership development strategy

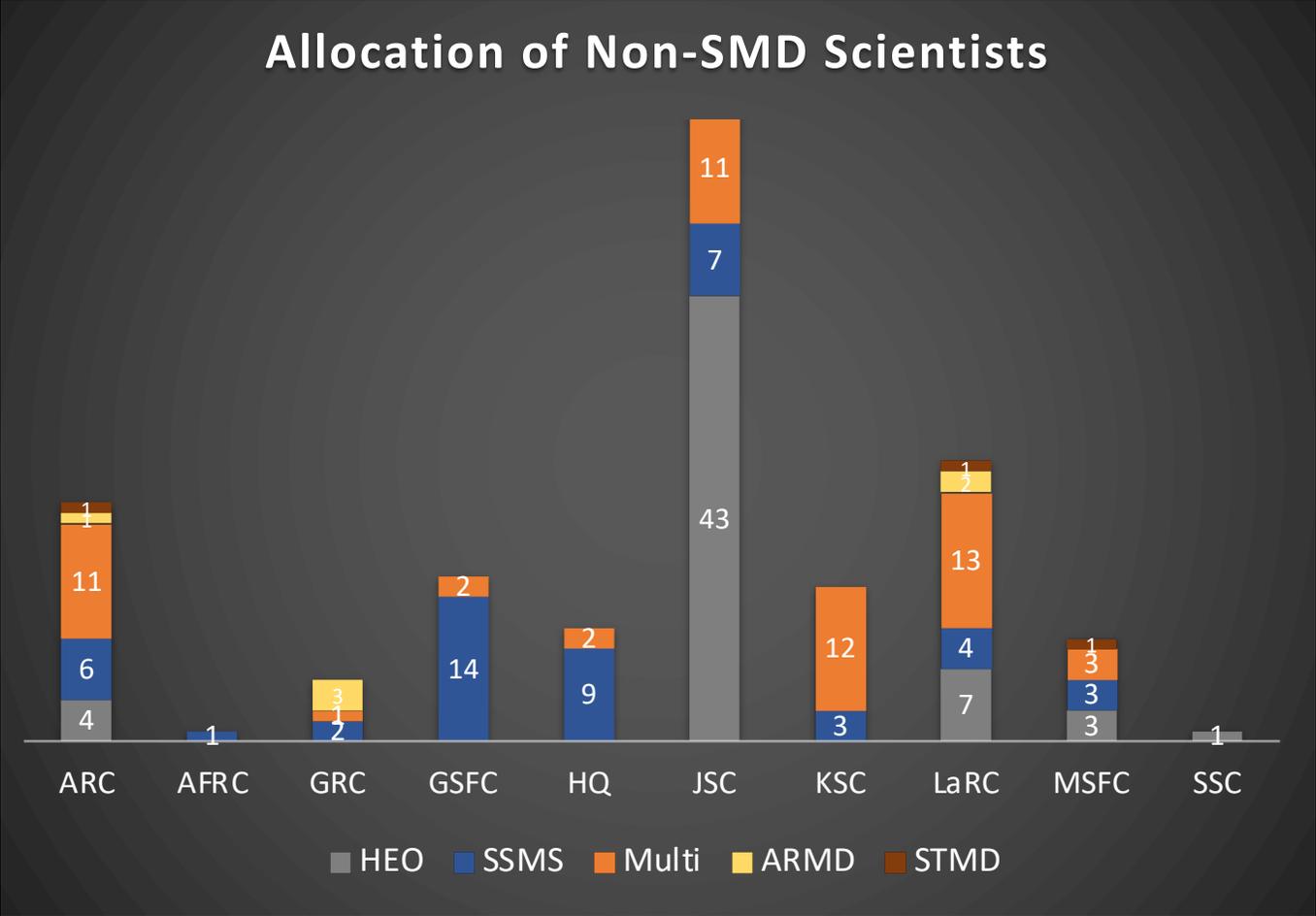
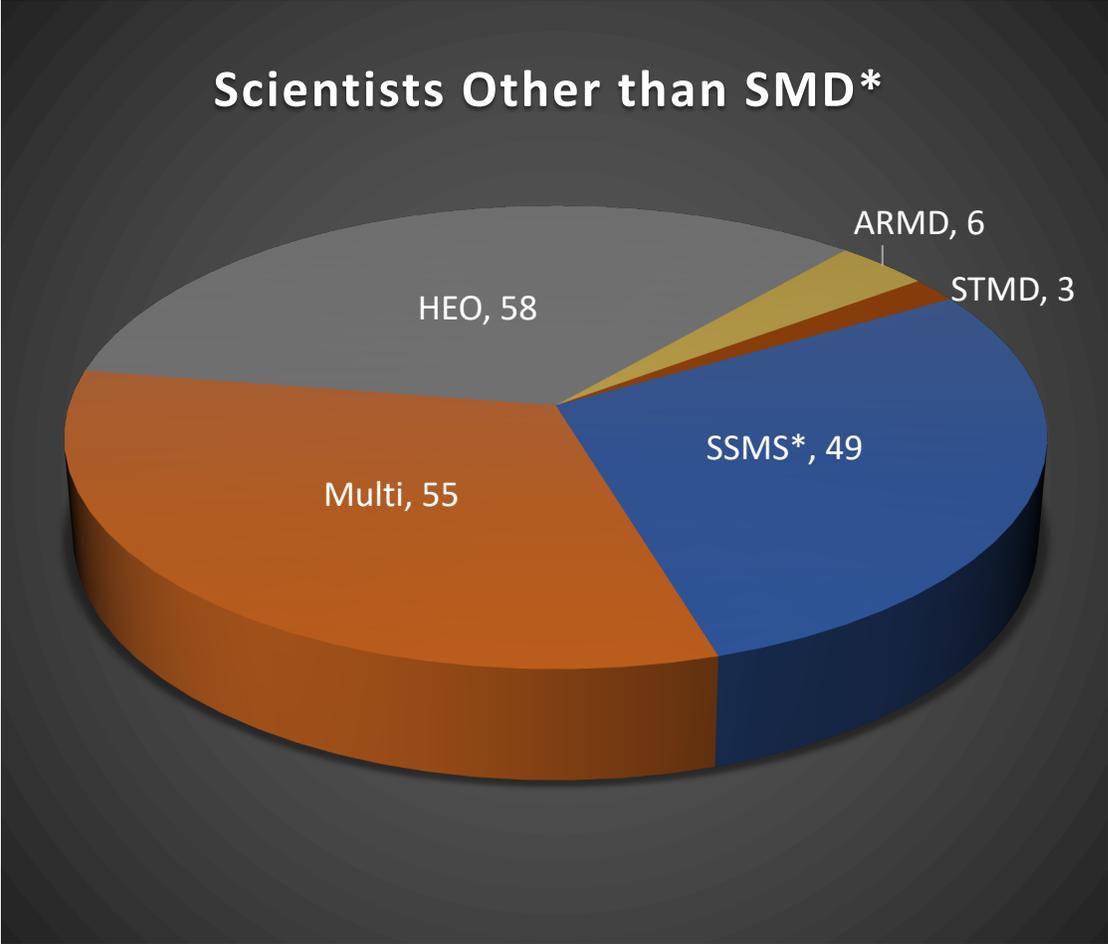
Action Plan (Appendix B Continued)

ACTION/TASK	RESPONSIBLE PARTY	PRIORITY	ESTIMATED COMPLETION DATE	STATUS/COMMENTS
CP-1 Adopt Scientist Career Track Nomenclature	SMD/All, OCS, Centers/Labs, and OCHCO	Medium	3 rd Qtr FY21	
LD-2 Career Opportunities Workshops	SMD/DAAM & Divisions, Centers/Labs, & OCHCO	Medium	1 st Qtr FY22	
CP-2 Develop Science Career Path Tool	SMD/DAAM, OCS, Centers, Labs, OCHCO & B-Line Express	Medium	2 nd Qtr FY22	Contract based out of SMD; tool will be publicly available
LD-1 New Scientist Orientation	SMD/DAAM & Divisions, Centers/Labs, and OCHCO	Medium	1 st Qtr FY22	Estimating one to two offerings per year
PS-1 Codify Project Scientist Policy	SMD/DAAP in coordination with OCE;	Medium	2 nd Qtr FY21	Through NPR 7120.5 updates
LD-6 Share Best Workforce Practices	OCS/Science Council, Centers & Labs	Low/Medium	3 rd Qtr FY21	

Communication Plan (Appendix C)

MESSAGE	MESSENGER	METHOD OR FORUM	TIMEFRAME	STATUS/COMMENTS
SMD Senior Leadership Engagement	L. Simmons + Core Team	SMD Senior Leadership Tag-Up (Tuesday 8am)	Feb TBD	To be scheduled (K. Flynn)
NASA Science Leadership Engagement	L. Simmons + Core Team	OCS Science Council	Feb TBD	To be scheduled (J. Green)
APL Senior Leadership Engagement	L. Simmons + Core Team	TBD	Feb TBD	If needed; prefer to include APL as part of the Science Council, if possible
Follow-up Conversations with Center Science Teams	L. Simmons + Center Reps	TBD	Feb/March TBD	L. Simmons to develop streamlined briefing package
Engagements with Broader Science Community about Opportunities/Tools	SMD Leadership	Town Hall, NSPIRES Message, Community Newsletters, etc	TBD	Not started – Engage with K. Petree and A. Moore

Non-SMD Scientists Appendix D



*Some portion of SSMS scientists may be supporting SMD.

Benchmark – SCALE (APL)

(Appendix E)

- Space Career Leadership Enhancement (SCALE) – APL has a comprehensive leadership development program, created to address succession challenges. Multiple programs fall under the SCALE umbrella:
 - Rotational Program - ~10% of APL's workforce has participated in a rotation. It is a rolling program based on individual requests.
 - Includes both full-time and part-time rotations
 - Often, the rotation is into an entry-level leadership role for broader experience and increased visibility
 - The incumbent is either moved out of the role (if full-time) or augments it (if part-time)
 - Belief that the further one goes from their home base, the greater the learning
 - Strategic Mentoring Cohorts – four cohorts selected annually (Project Management, PS/PI, Technical Leadership, and Line Leadership)
 - Year-long experience featuring rotations, guest speakers, strategic mentoring, and capstone project
 - 8 – 10 participants in each cohort annually
 - Space Exploration Sector University – a series of lectures on various technical topics
- The Managing Executive devotes about 10 – 20% of time to run the SCALE program
- APL routinely surveys their workforce to help customize the program and to evaluate return on investment.

Benchmark – Systems Engineering Education Development (GSFC)

(Appendix F)

- Systems Engineering Education Development program (SEED) provides a pipeline of entry level systems engineers to support GSFC's ongoing mission and instrument pre-formulation, formulation, and implementation efforts. The program includes:
 - Individualized assessments and customized development plans
 - Rotational assignments on direct mission work (at least one year in length)
 - Systems Engineering and Leadership training, including tools, techniques, and methodologies that have practical application as a technical lead
 - Seventeen processes of systems engineering
 - Technical (exposure to disciplines)
 - Role of the systems engineer throughout the project lifecycle (Technical Architect to Technical Authority)
 - Practices, guidelines, case studies, policies, and procedures
 - Agency's overarching policies and procedures
 - Training on budget and schedule management (planning, tracking, and reporting)
 - The Systems Engineering stakeholder community provides mentoring, coaching, lessons-learned, and technical training
 - SEED collaborates with the Office of Human Capital Management for gap analyses, individual assessments, training, coaching, program evaluation, and career planning

Benchmark – Flight Projects Development Program (Goddard)

(Appendix G)

- The Flight Projects Development Program (FPDP) develops highly trained project management technical and business/financial personnel capable of filling critical positions in flight project management through a rigorous and structured program, designed to meet the complex project management needs of the Flight Projects Directorate (FPD).
- FPDP Participants will:
 - Complete a rigorous two-year development program structured within a cohort construct
 - Be assigned both a technical and a financial mentor, ensuring exposure to both sides of project management; work with their mentors to complete an Individual Development Plan (IDP) and “History Map” to determine gaps and optimize work assignments; meet regularly with both mentors
 - Be assigned two one-year long work assignments to fill identified gaps and gain hands-on experience
 - Complete required coursework, including both core and elective courses
 - Participate in four FPDP Workshops and other Development Opportunities
 - Attend various networking activities, which may include the Maryland Space Business Roundtable, critical project reviews, shadowing an FPD PM/Senior Leader, or Goddard Master’s Forum
 - Select, complete, and defend a team Capstone Project
- The FPDP Governance Board, chaired by the Director of FPD and comprised of FPD and Center senior managers, provides participants support, guidance, and expertise on work assignments, mentoring, networking, and the Capstone project.