

INSIGHTS FROM INSIGHT: STRATEGIES FOR ADVANCING EARLY-CAREER RESEARCHER INCLUSION IN PLANETARY SCIENCE MISSIONS. B. Fernando¹, I. J. Daubar², A. G. Marusiak³, M. Baker⁴, C. Newman⁵, J.C.E Irving⁶, M. P. Panning⁷, W. B. Banerdt⁷, S. Stanley⁸, ¹Department of Physics, University of Oxford (benjamin.fernando@physics.ox.ac.uk), ²Department of Earth, Environmental and Planetary Sciences, Brown University, ³Jet Propulsion Laboratory, California Institute of Technology, ⁴Center for Earth and Planetary Studies, Smithsonian National Air and Space Museum, ⁵Aeolis Research, ⁶School of Earth Sciences, University of Bristol, United Kingdom, ⁷Jet Propulsion Laboratory, California Institute of Technology, ⁸Department of Earth and Planetary Sciences, Johns Hopkins University

Introduction: Planetary science missions are very much a generational effort. Forty-two years passed between the first successful deployment of a seismometer on Mars (Viking 2 in 1976) and the second (InSight in 2018); with a host of variously unsuccessful efforts in the intervening time.

Half-century timescales such as this necessitate the onboarding and training of new early-career researchers (ECRs) along the way, such that the expertise and knowledge necessary to operate high-cost international missions can be maintained.

However, doing this is not without its challenges. With the possible exception of the Mars Exploration Program, there are often ‘gaps’ of many years or decades until the next mission relevant to a particular field of planetary science, making retention and skill-building challenging.

For new ECRs joining such teams, especially those not from institutions commonly associated with planetary science missions, developing a sense of belonging can be hard. Conversely, for team leadership with limited budget and capacity, effective onboarding is clearly also a challenge.

After more than four years on Mars and a number of grassroots initiatives to improve our recruitment, inclusion, and representation of ECRs, the InSight mission has come to an end.

This abstract will present the final update to the InSight team’s efforts [1], most of which have been grassroots, to improve our recruitment, inclusion, and representation of ECRs. These are grouped into three themes; covering team behaviours and standards, procedures to encourage more equitable contributions, and broadening participation.

We also present critical evaluation of our initiatives, acknowledging that they are in no way perfect and do not ‘solve’ deep-rooted issues of inequality in planetary science.

Behaviours, standards and procedures:

1. Space to talk: a D&I working group – in 2020, the mission instituted the formation of a diversity and inclusion working group whose role was to provide a forum for discussion of issues [2]. The D&I working group was convened at equal status with other science groups, and met monthly. Evaluation: the D&I

working group was successful in developing a code of conduct and served as a ‘reporting point’ for those witnessing or experiencing inappropriate behaviour. However, buy-in and attendance from the wider team were at times limited meaning that toward the end of the mission the group had relatively little capacity for action. Suggestion: implementing such a group at the start of a mission, and assigning a clearer set of responsibilities to it may help to alleviate this.

2. A Code of Conduct – one of the first actions of the D&I working group was to establish a Code of Conduct (CoC), along the lines of those used by other missions [3]. This document set out the minimum expectations for behaviour, and all team members were required to abide by it. Evaluation: whilst there was agreement within the team that codification of expected standards was useful; the rare cases where enforcement was required proved to be more challenging and relied on issues being flagged explicitly to the D&I group co-chairs or the PI. Suggestion: PIs, project scientists, and Co-Is could be offered training on conflict resolution. Bystander intervention training could be offered as a norm.

Valuing contributions equally

3. ECR groups – in order to provide a more unified voice for junior researchers, an ECR grouping was established whose co-chairs were invited to team leadership meetings to feed in on relevant issues. Examples of such issues included how to timetable team meetings (e.g. whether immediately subsequent to conferences to reduce travel costs, or separately to reduce caring burdens), and what format team socials should take to be most inclusive. Evaluation: the group met (and continues to meet) regularly. At in-person meetings dedicated time for the ECRs to meet with PIs was appreciated. The virtual equivalent (via Gather Town) was moderately successful. Suggestion: it may be appropriate to consider establishing a small discretionary fund to support ECRs on future missions – for example with childcare costs at meetings, to enable networking events in person, etc.

4. Team meetings – a deliberate shift was made during the course of the mission to move from fewer keynote-

length talks from PIs/Co-Is toward shorter lightning/flash talks with slots open to all members of the team; with poster slots added to make up for the reduced speaking length. Evaluation: feedback from the team was overwhelmingly positive and the feeling was that ECRs were a particular beneficiary. At the penultimate science team meeting, policies of inviting the first two questions to be from ECRs and offering real-time ‘acronym busting’ via Slack were also well-received. Suggestion: copying these ideas would be simple and is likely to increase ECR engagement.

5. Co-chair rotations – to give ECRs experience of mission leadership, most of the InSight science theme groups established a pattern of rotating co-chairs (every 18-24 months), with one co-chair being an ECR who was also invited to team leadership meetings. Evaluation: this exercise provided ECRs with valuable experience of mission planning and organisation. Suggestion: this idea appears effective, but care should also be taken to ensure that doing so does not unintentionally shift extra administrative burdens onto already minoritised groups.

Broadening participation and engagement

6. Showcasing the team – having recognised that a barrier to diverse recruitment and representation is a lack of showcased role models, various internet and social media platforms (InSight’s, JPL’s, and the NASA Mars Channel) showcased the range and breadth of team member backgrounds and experiences through the latter part of the mission. The individuals featured often reported positive engagement from their own communities as a result of this increased visibility. Evaluation: whilst successful, this collaboration was on a somewhat ad-hoc basis which made maintaining it challenging during co-chair rotations and job transitions. Suggestion: future missions should build into their communications plan activities involving showcasing the diversity of their team members as well as their science.

7. InSightSeers: an observers program – building off initiatives inspired by Europa Clipper, the team established an ‘observers’ program wherein ECRs external to the team could attend science team meetings and contribute to discussions [4]. This program ran five times, four of these virtually and the final time in-person in London and supported financially by JPL and the UK Space Agency. Evaluation: Feedback from InSightSeers across all five iterations was positive, and a more comprehensive evaluation framework is now being developed. In-person attendance was clearly more engaging, offering the InSightSeers a chance to take part more thoroughly in social activities, informal discussions, and

networking. A number of InSightSeers have published papers referencing the mission since taking part, or got back in touch to explain that the program inspired their choice of further study. Suggestion: future missions should build into project budgets the option for regular, in-person observers’ attendance at their team meetings. Ongoing initiatives by Psyche and Dragonfly may also provide useful inspiration. *See also Morris, J. R. InSight Seers: Peering Into Invited Student Participation Of STM25 at this conference.*

Next steps With the InSight mission now over, our focus has moved toward sharing our experiences in the hope that they will be useful to other missions. In this run-down period, we hope to more robustly evaluate the effectiveness of InSightSeers, in collaboration with other missions’ observer programs if possible.

We have identified two areas where we were not able to have an impact on ECR inclusion, but future missions may be able to. These are:

1. Onboarding – for those ECRs joining the team part way through the mission, learning the mission ropes and procedures can be challenging. Learning points range from how to join mailing lists and when to share papers before submission; through to how to access data and use model repositories. Future missions may like to consider a more formal onboarding procedure, with mandatory induction sessions (for example, the day before every team meeting). These could include workshops on bystander training (as done by Dragonfly) or might include physically signing to agree to the Code of Conduct.

2. Pathways through to participating scientist – for Discovery-class missions such as InSight, the number of participating scientist (PS) calls is limited. Nonetheless, this career stage has been identified as a crucial point in the transition from ECR to fully independent researcher. For ECRs joining the mission after the final PS call, opportunities for direct advancement are limited. Future missions may like to explore whether further PS calls, or informally equivalent setups, might be possible.

It is worth emphasising that in our experience, the measures which proved effective in increasing ECR inclusion also made the mission a more welcoming and productive environment for everyone to work in – highlighting that such changes are of benefit to the wider team as well.

[1] Fernando, B. et al (2022) Nature Astronomy, doi.org/10.1038/s41550-022-01861-2

[2] Marusiak, A. G. et al (2022), LPSC #1545.

[3] Diniega, S. et al (2020), LPSC #2482

[4] Daubar, I. J. et al (2022), LPSC #2146