

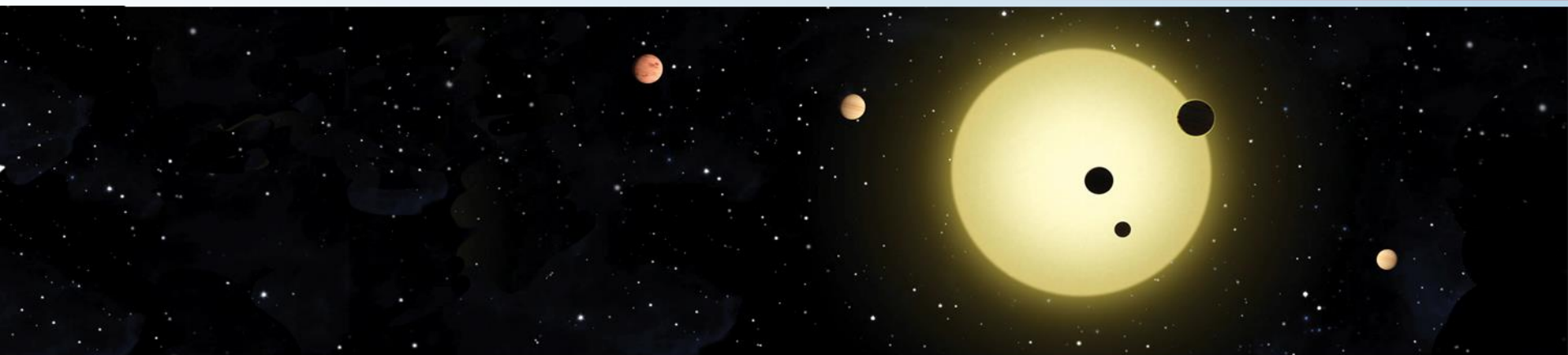
TESS Follow Up

PLATO Mission Conference 2017

September 7, 2017 – University of Warwick

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Harvard-Smithsonian Center for Astrophysics



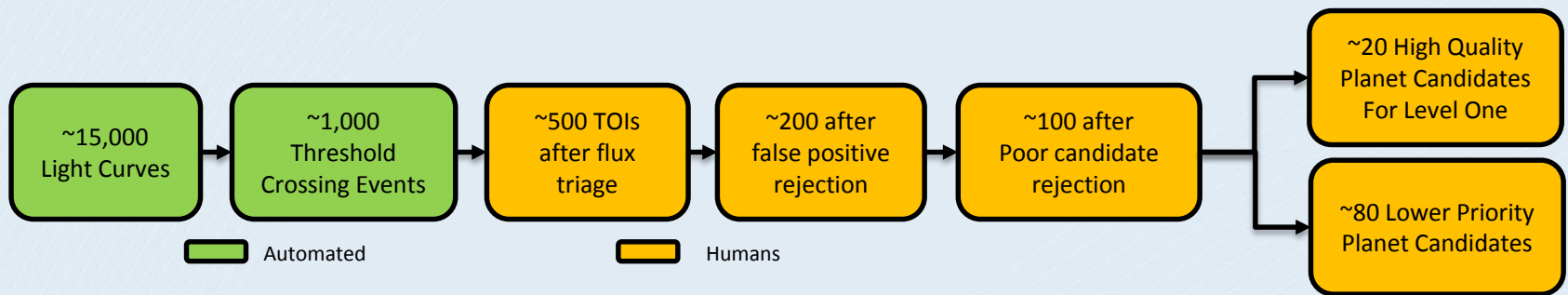
- ◆ Located at SAO and MIT in Cambridge MA
 - *Dave Latham, Director of Science, TSO lead at SAO*
 - *Sara Seager, Deputy Director of Science, TSO lead at MIT*
- ◆ TESS Science Office roles
 - *Prepare TESS Input Catalog (TIC) and Candidate Target List (CTL)*
 - *Identify TESS Objects of Interest (TOI)*
 - *Orchestrate TESS Follow-up Observing Program (TFOP)*
- ◆ TIC documents all known persistent sources of light
 - *TESS magnitudes, positions, stellar parameters as available*
 - *Used by TSO and Guest Investigators to select candidate targets*
 - *Used by the mission pipeline for data products*
- ◆ TIC-5 and CTL-5 available at MAST to support GI proposals
 - *Based on 2MASS supplemented by Gaia DR1: ~0.5 billion entries*

| Priority | Target Source/Type | # per mission | # per sector | From |
|----------|--------------------|---------------|------------------|-----------|
| 1 | Brightest Stars | 10,000 | 400 (average) | TSO |
| 2 | Asteroseismology | 20,000 | 750 (allocation) | TASC |
| 3 | Planet Search | 110,000 | ~11,000* | TSO |
| 4 | Guest Investigator | 40,000 | 1,500 | GI Office |
| 5 | PI Discretionary | 40,000 | 1,500 | PI |
| Total | | 220,000 | ~15,000 | |

* Assumes ~7,000 targets in pole camera to meet BSR2

My guess is that targets will be selected in the order of the above lists.
 If a target has already been selected, it will not be charged to a later list.
 My advice to GI proposers: List ALL the targets you hope to study.
 If they are already selected for the Planet Search, you won't be charged.
 Be sure to explain that this is what you have done

- ◆ These numbers are the highest I expect **per sector**;
- ◆ the average will be about **half**.



- ◆ Only TOIs from the 2-min targets considered here
- ◆ Total targets for Level One: $10 \times 26 \text{ sectors} = \sim 260$
- ◆ Total other candidates: ~ 1000 from 2-min
- ◆ Many more from FFIs

- ◆ Following the example of very successful Kepler WGs
- ◆ Organized by WG leads
- ◆ Charters developed by the WG members
- ◆ Participation of experts from the community is solicited
 - *Target Star Selection WG*
 - *Simulations WG*
 - *Open Cluster Survey WG*
 - *Atmospheric Characterization WG*
 - *Habitability WG*
 - *Non-exoplanet Science WG*
 - *Follow-up Observing Program WG*
- ◆ WG members invited to participate in Science Team meetings

Charter of the TESS Follow-up Observing Program Working Group

Version 10, July 23, 2017

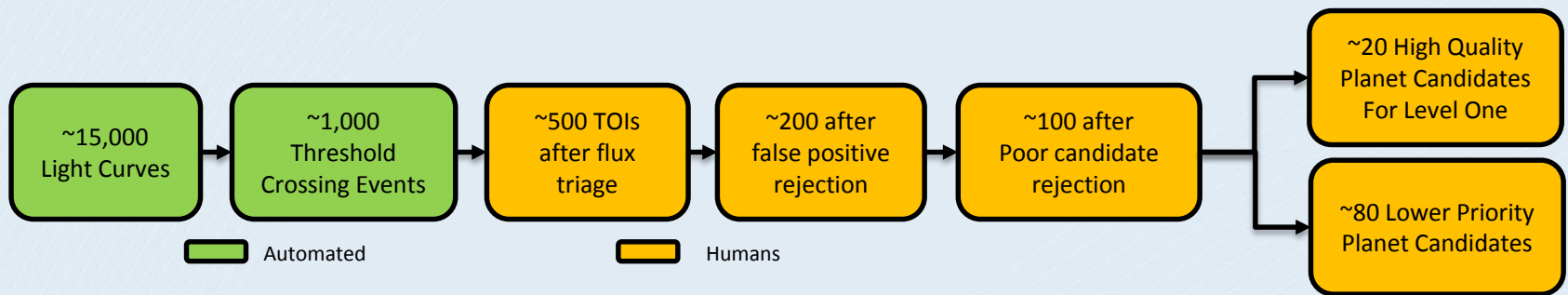
Goal

The primary goal of the TESS Follow-up Observing Program (TFOP) Working Group (WG) is to provide follow-up observations that will facilitate achievement of the Level One Science Requirement to measure masses for 50 transiting planets smaller than 4 Earth radii.

A secondary goal of the TFOP WG is to foster communication and coordination both within the TESS Science Team and with the community at large in order to minimize wasteful duplication of observations and analysis. We operate under the guiding principle that efficient use of limited resources and increased opportunity for collaboration should improve the quality *and* quantity of scientific output. Although the primary focus of the TFOP WG is to achieve the Level One Science Requirements, any science coming out of TESS can also be served.

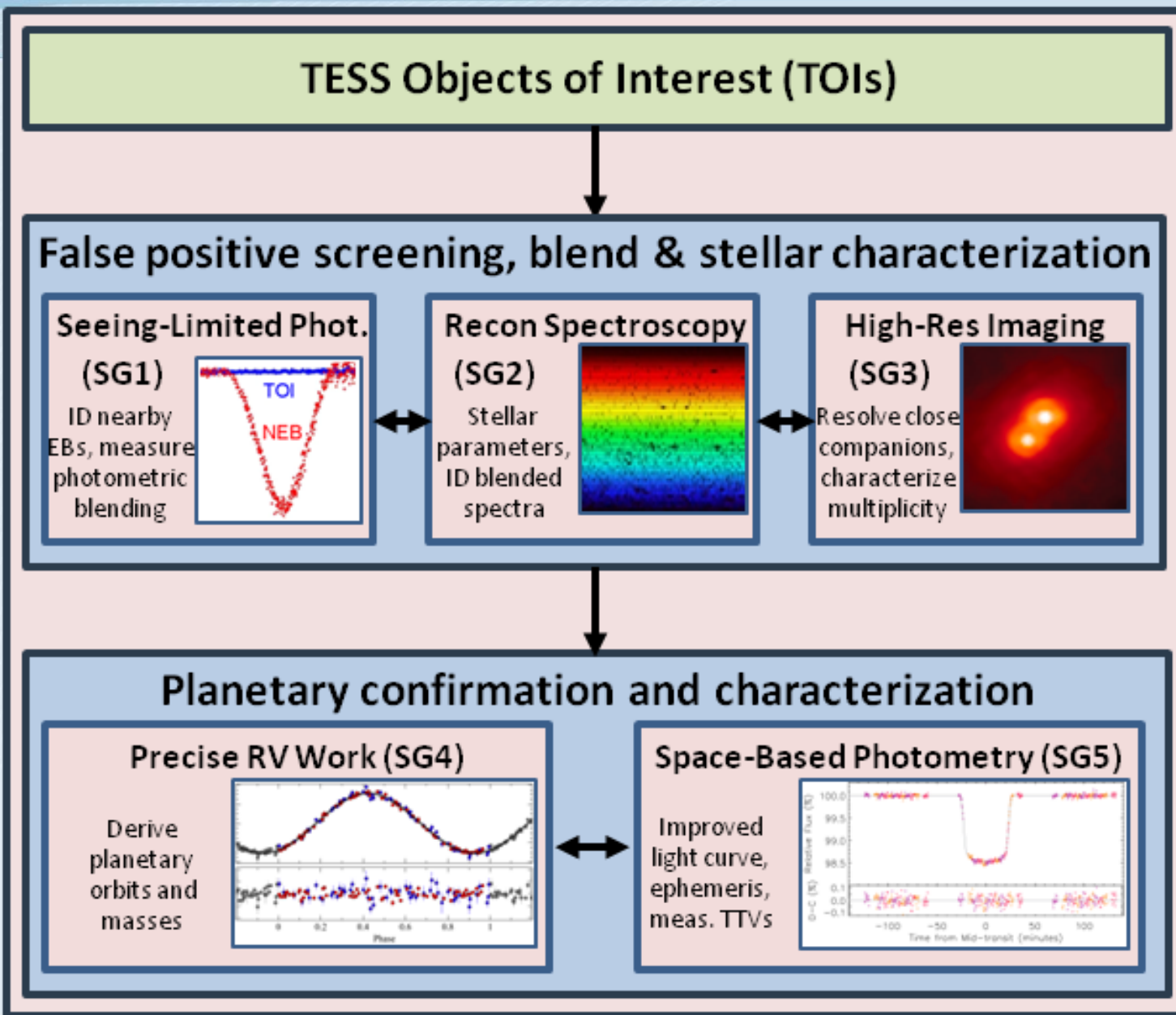
- ◆ All follow-up observations funded by TESS uploaded to MAST
- ◆ NExScI funded by HQ to support community follow-up
- ◆ ExoFOP-TESS a repository for all follow-up results
 - *Funded results pulled from MAST*
- ◆ Tools to encourage coordination and collaboration
 - *TFOP WG members (TESS team + community) and everyone else*
- ◆ ExoFOP-TESS development coordinated with TSO and TFOP
 - *Led by Jessie Christiansen and David Ciardi at NExScI*

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- ◆ SG1 – Seeing-limited Photometry, Dr. Karen Collins Lead
 - *Identify nearby eclipsing binaries contaminating the TESS aperture*
 - *Refined photometry of contaminating sources for better planet radii*
- ◆ SG2 – Recon Spectroscopy, Dr. Sam Quinn Lead
 - *Identify astrophysical false positives*
 - *Provide improved stellar parameters*
- ◆ SG3 – High-resolution Imaging, Dr. David Ciardi Lead
 - *Identify very close companions contaminating the TESS aperture*
- ◆ SG4 – Precise Radial Velocity Work, Dr. David Latham Lead
 - *Orbital solutions and planetary masses for small planets*
- ◆ SG5 – Space-based Photometry, Dr Diana Dragomir Lead
 - *Confirm/improve light curves for small planets, better radii*
 - *Extend the TESS photometric ephemeris for future work*
 - *Transit time variations*
- ◆ Steering Committee
 - *SG Leads + Sara Seager, Ian Crossfield, Jessie Christiansen*



Conduct and Working Group Policies

Joining the TFOP WG is considered a statement of intention to abide by the conduct and policies set forth herein, and to contribute to the tasks outlined above.

Collaboration and coordination – both within the TESS Science Team and with the greater community – will be paramount to the success of the TFOP and the TESS mission. TFOP WG members will therefore make good faith efforts to coordinate the planning of observations and to share TOI-related data and results by uploading to ExoFOP-TESS in a timely manner. Members further agree to protect all intellectual property shared at meetings (in person, or via phone/video) or on the web and through email.

In some cases the data and results obtained by TFOP WG members may have restrictions that prevent uploading to a website available to the open public. One example might be products from collaborations or institutions where there are prior agreements that constrain open public release until certain conditions (such as publication) are met. Another example might be preliminary results from Precise Radial Velocity Work, where data need to be accumulated until a definitive orbit can be derived. Negotiations are underway with NExSci for the option for TFOP WG members to password-protect data and derived products for some proprietary period. These data and products would then only be viewable by other authorized members of the TFOP WG until the expiration of the proprietary period. Use of this option should be governed by guidelines in the charters for Sub Groups.

needed. Individuals with the desire and ability to contribute to the TFOP WG can apply to become a TFOP WG member. Applications should be sent to the chair(s) of the appropriate Sub Group(s) and will be reviewed by the Steering Committee. Applications must contain:

- A statement that the applicant agrees to abide by the TFOP WG charter.
- A summary of the applicant's scientific background, research interest and expertise, and expected/planned contribution to the TFOP WG,
- The facilities available to the applicant for follow-up work, and the Sub Group(s) of interest.

- ◆ To review the draft TFOP WG Charter and Publication Policy
 - *Send an email request to dlatham@cfa.harvard.edu*