The Planet Hunting project comprises two main sub-projects: (1) Leading and executing a direct imaging survey for circumbinary planets (SPOTS), and (2) participation in the commissioning and first science use of the SPHERE ZIMPOL direct imaging facility at ESO's VLT in Chile. As described in the mid-term report, both the observing schedule of SPOTS and the commissioning of SPHERE were delayed during the first year for reasons outside the Fellow's influence, necessitating some re-structuring of the project plan. As a result, the first year was chiefly invested into completing and publishing an in-depth direct-imaging study of the LkCa 15 protoplanetary disk (Thalmann et al. 2014, *A&A* 566, A51) and writing a survey description paper for SPOTS focusing on the science case (Thalmann et al. 2014, *A&A* 752, A91).

In contrast, the second year saw a windfall of data in both sub-projects:

(1)
SPOTS was granted 40 hours of observing time on the newly available SPHERE IRDIS planet-finder facility, covering 40 new exploratory targets as well as several follow-up targets to complete the previous NaCo-based stage of the survey. These observations have been ongoing throughout spring and summer 2015 and are coming to a close this fall. While evaluation, follow-up, and publication of these new data will take at least one more year, one instantly publishable discovery has been made. Publication of the NaCo-based survey is planned over the course of late 2015 and early 2016. A previously unknown disk structure was imaged around the close binary AK Sco, which is used as a benchmark system in stellar astrophysics. A Letter describing these findings is currently in preparation, with plans for submission in October 2015. Due to the Fellow's involvement in several other projects, he has delegated these publications to two collaborators (Ruben Asensio Torres; Markus Janson).

(2)
The commissioning, science verification, and early guaranteed time observations (GTO) for the new SPHERE instrument (including the ZIMPOL and IRDIS sub-instruments) took place in late 2014 and early 2015. The Fellow took active part in all of these stages, including a trip to Paranal for the 3rd commissioning run in August 2014 as a ZIMPOL specialist, a successful science verification proposal executed in February 2015, and another trip to Paranal in March 2015 as the designated observer for a GTO run. All of these observing runs yielded a wealth of interesting data making use of the SPHERE instrument's groundbreaking performance. The Fellow is involved in a number of papers that have been published or are in preparation on the basis of these data, including:

- Science verification observations of LkCa 15 with the ZIMPOL polarimeter, confirming the findings of the 2014 paper and revealing the inner disk in scattered light for the first time. Led by Fellow. Thalmann et al. (2015), *ApJ Letters* 808, 41.
- Science verification observations of MWC 758 with ZIMPOL, revealing new structures inwards of the known spiral arms. Fellow contributed to data reduction and interpretation. Benisty et al. (2015), *A&A* 578, L6.
- Commissioning data on AU Microscopii, revealing large-scale wave-like disk features that can be traced over time scales up to 4 years and appear to be moving outwards at unbound speeds. No comparable phenomenon is known from other targets or from theoretical predictions, making the interpretation challenging. Fellow contributed to observations on Paranal, data reduction, and co-led the paper writing (second author). The paper has been **accepted for publication in *Nature***, and is expected to be released in the coming weeks (Boccaletti et al., in press). A preview of the results has been presented at the Spirit of Lyot conference in June 2015.

Apart from these two main projects, the Fellow has also contributed to third-party projects, including a high-contrast imaging pilot survey with the Spitzer spacecraft (Janson et al. 2015, *A&A* 574, 120) and the imaging discovery of a Kuiper-belt analog with the GPI facility (Currie et al. 2015, *ApJ Letters* 807, 7).

Outreach summary

In addition to the outreach activities presented in the mid-term report, the Fellow presented an invited talk at the «Exoplanets with JWST-MIRI» conference in Heidelberg in September 2014, reported on the ETH SPHERE team's direct imaging activities at the PlanetS NCCR meeting in Anzère in January 2015, and contributed a talk on his LkCa 15 results to the «Spirit of Lyot» conference in Montréal in June 2015. During his school teaching experience (see below), he delivered an introduction to exoplanets to highschool students.

Furthermore, a press release is planned for the publication on AU Mic later this year, for which the fellow has prepared materials. The release is being co-ordinated between the European Southern Observatory (ESO) and a number of institutes, including the Host Institute. Given the nature of the publication, the release is expected to receive widespread media attention.

Researcher training activities summary

As in the previous year, the Fellow has participated in teaching assistance duties at the Department of Physics at the ETH Zürich, where the host institute is located. The duties involved supervising students at four advanced laboratory experiment workplaces over the course of a semester and coaching weekly exercise sessions for students of the Physics II lecture. The Fellow has also co-supervised a PhD student, Natalia Engler, together with her thesis advisor Hans Martin Schmid. In particular, he was responsible for introducing her to the trade of high-contrast imaging. Furthermore, the Fellow has attended three more didactic lecture courses at the University of Zürich in order to improve his teaching skills. Finally, the Fellow has taught a total of 27 lessons of physics at school during three weeks in May 2015 (cf. reduced workload on the time sheet) in order to gain pratical experience with teaching.

Project Management

After initial setbacks outside the Fellow's control required falling back onto alternative projects in the first year, both original sub-projects have regained their traction and produced a large volume of interesting data in the second year. The acquisition of 40 hours of SPHERE observations for the SPOTS is in full swing at the time of writing, and arrangements have been made to ensure the analysis and publication upon completion. The commissioning, science verification, and early GTO with SPHERE ZIMPOL has produced a plethora of results that are currently being published by various SPHERE consortium members, with the Fellow being involved in most of them. Due to the high workload of these projects, the Fellow has only had time to lead one first-author paper in this term (rather than the projected two). However, one of these projects is a very high-profile result (AU Mic), which the Fellow co-led together with the first author (A. Boccaletti). Given that the impact of this publication should greatly exceed a typical first-author paper, the Fellow deemed this a worthy investment of project time.

The Fellow has been granted an extension beyond the time frame of the Marie Curie IEF by the host institute to complete the ongoing projects and to continue to support ZIMPOL observations.