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Report on the ESO workshop

A Decade of ESO Wide-field Imaging Surveys

held at ESO Headquarters, Garching, Germany, 16–20 October 2023

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A decade of targeted wide-field imaging at ESO was coming to an end in early 2023, when the near-infrared imager VIRCAM at the Visible and Infrared Survey Telescope for Astronomy was decommissioned. Shortly before, in October 2022, the optical wide-field imager OmegaCAM at the VLT Survey Telescope had become a hosted telescope after many years of being an ESO-operated optical survey machine. The two instruments were largely dedicated to public imaging surveys, which have amassed a total of nearly 60 000 hours of telescope time. To commemorate these milestones, ESO organised a five-day workshop in October 2023 to review the legacy left by these instruments, to summarise the variety of scientific impacts that the imaging surveys have had on a wide range of research topics in astronomy, and to encourage new ideas from/within the community to enlarge the exploitation of the high-quality VIRCAM and OmegaCAM survey data.

Introduction

The Visible and Infrared Survey Telescope for Astronomy (VISTA; Emerson et al., 2004) and the VLT Survey Telescope (VST; Arnaboldi et al., 1998), were designed to host wide-field imagers enabling efficient observations of large portions of the southern sky with high sensitivity and sub-arcsecond spatial resolution. VIRCAM, the infrared camera installed on VISTA, was mostly dedicated to 13 public surveys[1], and has amassed over 40 000 hours of science data over 13 years. Similarly, the optical imager OmegaCam on the VST spent about 15 000 hours acquiring data for three public surveys[2] and Guaranteed Time Observations for large programmes between 2011 and 2022. Large collaborative survey teams stood behind each of the public surveys, that targeted many of the fundamental questions in contemporaneous astrophysics, ranging from the nature of dark energy to the universality of the stellar initial mass function. ESO, for its part, had set in place mechanisms and procedures to manage these public surveys and to ensure their legacy value and their usefulness to the astronomical community at large. All raw data from these surveys became public in the ESO Science Archive immediately and processed data and catalogues provided by each survey team are available via the ESO Science Archive Facility. The main goals of the workshop were to further advance science cases, create international collaborations among research groups and encourage new ideas from/within the community to enlarge the exploitation of the high-quality VIRCAM and OmegaCAM survey data and, last but not least, to promote the usage of the archival data from these facilities.

The programme

Approximately 110 participants (around 65% attended in person) gathered during the week in October 2023 to listen to inspiring talks and to engage in lively discussions (Figure 1). The workshop programme[3] was split into Galactic and extragalactic scientific fields between the morning and afternoon sessions of each day of the workshop. The topics ranged from Galactic star formation, the structure of the Milky Way, stellar populations of the Galactic plane, transient and variable objects and exploring stellar populations in the Magellanic Clouds to studying dark energy, investigating galaxy evolution and the evolution of galaxy clusters, baryonic

Figure 1. Conference photo.

acoustic oscillations, and mass assembly in the very first galaxies. Sessions were introduced by one or two invited overview talks describing a public survey connected to each specific research topic. Contributed talks were intertwined with the overview talks, spanning a near-complete range of science cases and environments. The legacy value of several public surveys was showcased through many scientific findings presented in various contributed talks.

On the third day of the workshop the programme featured invited and contributed talks that outlined the synergy of the VIRCAM/OmegaCAM legacy with the new generation of wide-field imaging and spectroscopic facilities and missions, for example, Euclid, the 4-metre Multi-Object Spectrograph Telescope (4MOST), the Wide-field Spectroscopic Telescope (WST) and the Multi-Object Optical and Near-infrared Spectrograph (MOONS). In addition, ESO's plans for future surveys were presented, which are largely focused on spectroscopic public surveys carried out, for example, with exisiting Very Large Telescope (VLT) instruments such as the *K*-band Multi-Object Spectrograph (KMOS) — see the recent Call for Letters of Intent[4]. The 'future surveys' session was followed by a Wednesday afternoon session that concentrated on how to potentially exploit the VIRCAM and OmegaCAM survey data and to promote the usage of the archival data from these facilities. Specific talks were given to explain the content and use of the Cambridge Astronomical Survey Unit / Wide-Field Astronomy Unit and ESO science archives that encouraged the attendees and others to download the data from the public surveys (especially Phase 3 data) for their own science. In addition, a hands-on presentation showed how to navigate step-by-step through the ESO Science Archive. This and most of the talks during the week were recorded and are available in a special YouTube Channel[5]. The interested reader may also view the slides made available by the workshop participants on Zenodo[6].

An important part of the workshop during the week was the ESO Archive Booth. This was a 'helpdesk' stand in the auditorium foyer set up by the ESO archive science group for public survey team

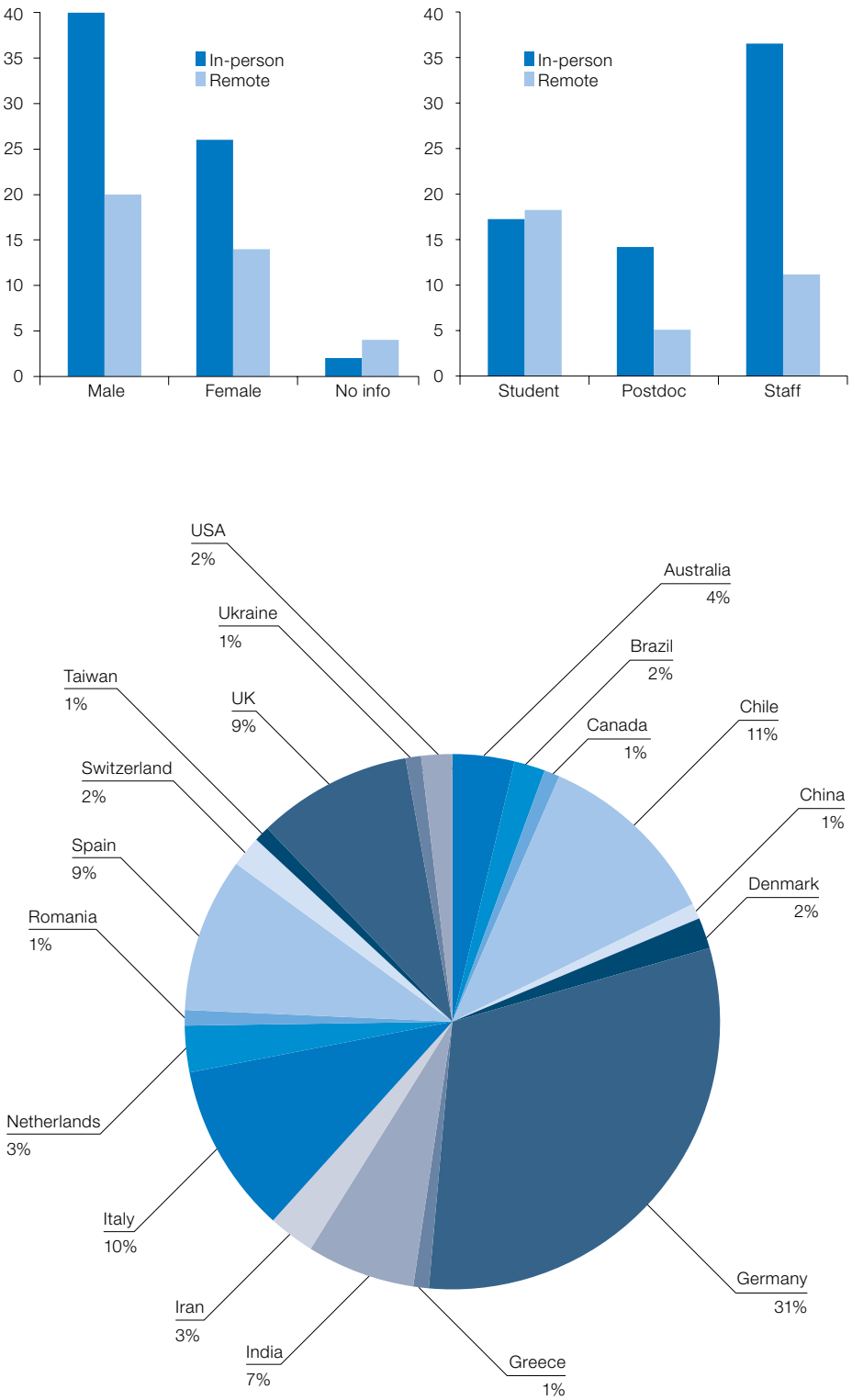

Figure 2. Top: Demographic distributions of the gender (left) and career stage (right) of the participants, split up into in-person (blue) and remote (light blue) participants. Bottom: Overview of the home countries of all participants.

members and users in the community who were interested in publishing/using data to/from the ESO Science Archive. It turned out that this service was extremely well received, in particular among the public survey team members who could use this opportunity to effectively discuss in person outstanding matters and issues with the publication of survey data. Also, after the hands-on talk on Wednesday afternoon there was an increased interest from the workshop participants in the activities at the archive booth. Moreover, for those colleagues who prefered specific help in hands-on tutorials or had specific questions, for example about accessing data from a specific public survey, arrangements for one-to-one sessions in the week(s) following the workshop could be made.

Demographics

The workshop had a good number of participants, with 69 in-person and 38 remote attendees. The Scientific Organising Committee (SOC) agreed that each public survey PI would be invited to nominate a person from their team to give an overview talk of their public survey. In doing so the PIs were encouraged to nominate a young researcher and/or female speaker. This worked out for roughly 30% of the surveys. Once all the workshop registrations were received, there was a perfect match between requested talks and available talk slots, such that the SOC happily agreed to accept all the contributed talks and asked the one student who had only registered for a poster to convert their poster into a short talk. The resulting representation from the community in terms of gender was 40/60 (female/male), which is a bit higher than the female/male distribution among the invited speakers (around 33% female), and also higher than the ratio for the contributed talks (around 35% female).

Attendees came from all over the world, with the following percentages (see also Figure 2):

- 68% Europe (Germany, Italy, UK, Switzerland, Ukraine, Spain, the Netherlands, Greece, Romania, Denmark);
- 3% North America (US, Canada);
- 12% Asia (India, China, Taiwan, Iran);
- 13% South America (Chile, Brazil);
- 4% Australia.

Thanks to the well-balanced budget, it was also possible to provide generous financial support to a few young researchers and students.

Concluding remarks

As the workshop was intented to emphasise the legacy of a decade of ESO wide-field imaging surveys and to promote the ongoing scientific exploitation of these surveys, we wish to highlight once again that the main access point to the data products is the ESO Science Archive[7]. As demonstrated by the interest in the workshop and the activities within the community, survey data are rich and have enormous potential for discoveries in every niche of astronomical research.

Acknowledgements

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References

Emerson, J. P. et al. 2004, The Messenger, 117, 27
Arnaboldi, M. et al. 1998, The Messenger, 93, 30

Links

[1] VISTA surveys: https://www.eso.org/sci/observing/PublicSurveys/sciencePublicSurveys.html#VISTA
[2] VST surveys: https://www.eso.org/sci/observing/PublicSurveys/sciencePublicSurveys.html#VST
[3] Workshop programme: https://www.eso.org/sci/meetings/2023/surveys
[4] KMOS Call for Letters of Intent: https://www.eso.org/sci/observing/PublicSurveys/KMOSloicall.html
[5] Workshop YouTube channel: https://www.youtube.com/@WFIS_at_ESO
[6] Workshop slides on Zenodo: https://zenodo.org/communities/surveys2023/
[7] ESO Science Archive: http://archive.eso.org/cms.html

ESO Acknowledgements: Flickr user hdahle70

This image from the Wide-Field Imager on the MPG/ESO 2.2-metre telescope shows the starry skies around a galaxy cluster named PLCKESZ G286.6-31.3. The cluster itself is difficult to spot initially, but shows up as a subtle clustering of yellowish galaxies near the centre of the frame.