DAWN Winter School

Monday 7 February 2022 - Friday 11 February 2022

online

Scientific and Didactic Rationale

The first DAWN Winter School of Astrophysics offers a "toolkit" of practical knowledge and methods complementary to what standard curricula offer, making junior scientists better equipped for their future research. The intended audience are indeed students at the end of their MSc and those who recently enrolled in a PhD programme, before their career would become "hyper-specialized". At the end of the Winter School, participants will be more familiar with
state-of-the-art investigations in the early universe across different wavelengths, and
the most popular observational techniques and computer simulations used in that context;
the art of writing valid proposals and FAIR papers/software;
common risks in the office environment that may affect students' well-being.

These four items are described below. Although each of them might be *individually* addressed in other schools/workshops more in detail, here they are combined together in order to provide a *comprehensive* view. In the daily life at office, the DAWN toolkit shall translate into
critical understanding of a larger variety of scientific talks and papers;
improved communication with astrophysicists with a different background;
ability to perform basic tasks with software and data bases of widespread use in galaxy evolution studies;
deeper knowledge about present challenges in the exploration of the early universe and promising directions for future investigations;
having a list of do's and don'ts while preparing proposals and applications;
awareness of the importance of Open Science, and how to implement it;
strategies to prevent stress and have a healthy work-life balance.

Telescopes and computers: windows on the early universe

Which facilities and survey strategies will prove most effective to pierce the sky from redshift ~3 up to the Epoch of Reionization? What innovations in theoretical models and simulations could help unveil the physical processes underneath those data? And what are the caveats and drawbacks attached?

Lectures in this Winter School combine elements from a theoretical *and* observational perspective, covering a wide range of topics including:
Spectroscopic and photometric data extraction in the optical/near-IR
regime (G. Brammer, L. Christensen)
Measuring redshift and physical properties from spectra and spectral energy distributions (G. Brammer, A. Carnall, E. Curtis-Lake)
Interferometric techniques, far-IR and sub-mm observations, extracting information about galaxy dust and gas (F. Walter, T. Greve, G. Magdis)
The state of the art in computer simulations (A. Pillepich, F. van de Voort)
Pros and cons in transferring Machine Learning techniques into the astrophysical domain (T. Charnock)

Software to investigate galaxy evolution

In parallel with the lectures, a series of interactive tutorials will help students to learn the basic usage of software for
Measuring photometric redshift (EAZY)
Estimating galaxy stellar mass and star formation history (BAGPIPE)
Measuring spectral features (suite of different codes)

Downloading and using data from a cosmological simulation (the Illustris-TNG database)

Career and office-related issues

We planned a 3h seminar addressing how to manage PhD-related stress and find a good work-life balance. The main goals are:
- Identify your own stress indicators and know when to act on them
- Be aware of the causes of stress
- Build a repertoire of stress prevention strategies
- Deep work – establish a work practice without distractions
- Identify your life values and plan accordingly to embrace a work-life balance

Exercises and teamwork will be used during the seminar. **Warning** to Zoom attendees: remote connection may provide only a partial experience compared to in-venue participants.

In addition, we will also talk about career perspectives after the PhD in either academia and the private sector, both listening from experts and in peer-to-peer discussion sessions.

Since these topics concern any field of research, **this Winter School section can be attended also by students from other disciplines** (see the FAQ page).

Soft skills

Complementary to the ability of carrying out scientific investigation, these non-astrophysical skills play a crucial role in tasks like:
Writing a compelling application for grants/fellowships (C. Gall)
Preparing a telescope proposal (J. Fynbo)
Exploiting on-line computational resources and computer clusters (G. Brammer)
Sharing data, software, and results in the most effective and FAIR way (M. Dumontier)

Since these skills can be applied in any field of research, **this Winter School section can be attended also by students from other disciplines** (see the FAQ page).