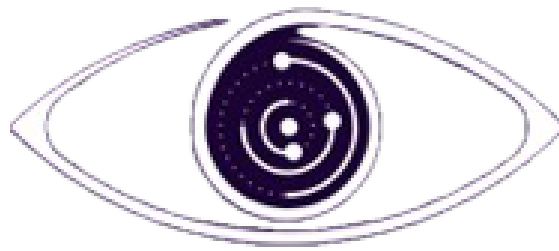


# **ORP International School - Observing with Adaptive Optics**



## **Report of Contributions**

Contribution ID: 5

Type: **not specified**

## **The ELT, how to build an adaptive telescope**

*Monday 30 September 2024 09:00 (1h 30m)*

**Presenter:** Dr SPYROMILIO, Jason (ESO)

**Session Classification:** Class

Contribution ID: 6

Type: **not specified**

## **Imaging through the atmosphere**

*Monday 30 September 2024 11:00 (1h 30m)*

**Presenter:** Dr BUSONI, Lorenzo (Istituto Nazionale di Astrofisica (INAF))

**Session Classification:** Class

Contribution ID: 7

Type: **not specified**

## **Wavefront sensors**

*Monday 30 September 2024 14:30 (1h 30m)*

**Presenter:** Dr BOND, Charlotte (STFC UKRI)

**Session Classification:** Class

Contribution ID: 8

Type: **not specified**

# Fundamentals of Control Theory and Wavefront Reconstruction

*Tuesday 1 October 2024 09:00 (1h 30m)*

This lecture provides an introduction to wavefront reconstruction and dynamic control in adaptive optics (AO) systems. We will explore the key principles, including the application of inverse-problem theory to wavefront reconstruction and optimal/sub-optimal control to real-time DM correction, such as feedback loops, control matrix techniques, and optimization strategies to compensate for atmospheric turbulence. The focus will be on practical algorithms including examples and test cases. By the end of the lecture, participants will gain a foundational understanding of how adaptive optics systems are designed and controlled to achieve high-resolution imaging in ground-based telescopes.

**Presenter:** Dr CORREIA, Carlos (Universidade do Porto)

**Session Classification:** Class

Contribution ID: 9

Type: **not specified**

## AO system design

*Tuesday 1 October 2024 11:00 (1h 30m)*

This lecture provides an introduction to the design of AO systems: how to specify wavefront sensors, wavefront correctors, AO control systems, and implementation errors based on performance requirements, such as residual wavefront error and sky coverage, and observing conditions, such as atmospheric turbulence and observatory-induced disturbances. The lecture will show how residual errors can be broken down into an error budget that can be used to optimize the design. We will focus on single-conjugate AO systems, exploring both NGS AO and LGS AO, and discussing the pros and cons and each modality.

**Presenter:** Dr VERAN, Jean-Pierre (NRC-HAA)

**Session Classification:** Class

Contribution ID: **10**

Type: **not specified**

## **Image deconvolution in astronomy: PSF reconstruction, PSF modeling & fitting**

*Tuesday 1 October 2024 14:30 (1h 30m)*

**Presenter:** Dr FETICK, Romain (LAM)

**Session Classification:** Class

Contribution ID: 11

Type: **not specified**

## **Beyond SCAO: Wide Field AO**

*Wednesday 2 October 2024 09:00 (1h 30m)*

**Presenter:** Dr NEICHEL, Benoit (LAM)

**Session Classification:** Class



Contribution ID: 12

Type: **not specified**

## **Photometry and astrometry with AO assisted observations**

*Wednesday 2 October 2024 11:00 (1h 30m)*

**Presenter:** Dr FIORENTINO, Giuliana (Istituto Nazionale di Astrofisica (INAF))

**Session Classification:** Class

Contribution ID: 13

Type: **not specified**

## Search for Habitable Exoplanets with the ELT and the role of Adaptive Optics

*Wednesday 2 October 2024 14:30 (1h 30m)*

The lecture will present the current understanding of habitable exoplanets and discuss how high-contrast direct imaging using the Extremely Large Telescope (ELT) can enhance this knowledge. To achieve this, a specialized instrument must meet certain requirements. I will introduce a potential design for such an instrument, referred to as the Planetary Camera and Spectrograph (PCS). A key feature of PCS is an optimized eXtreme Adaptive Optics (XAO) system, integrated with coronagraphy and speckle suppression techniques, aimed at delivering high contrast on the order of  $1e-8$  at angular separations of a few tens of milliarcseconds. I will detail these subsystems, explain the necessary specifications, and outline our research and development efforts to demonstrate how these requirements can be achieved.

**Presenter:** Dr KASPER, Markus (ESO)

**Session Classification:** Class

Contribution ID: 14

Type: **not specified**

## **IFU spectroscopy with AO assisted observations**

*Thursday 3 October 2024 09:00 (1h 30m)*

**Presenter:** Dr CRESCI, Giovanni (Istituto Nazionale di Astrofisica (INAF))

**Session Classification:** Class

Contribution ID: 15

Type: **not specified**

## **The development of an AO system for a VLT instrument: from science cases to commissioning**

*Thursday 3 October 2024 11:00 (1h 30m)*

This lecture outlines the process of designing an AO system for VLT, beginning with top-level requirements and covering the steps up to commissioning. The development experience of the UT4 instrument ERIS will be used as an example, highlighting challenges, solutions, and lessons learned.

**Presenter:** Dr RICCARDI, Armando (Istituto Nazionale di Astrofisica (INAF))

**Session Classification:** Class

Contribution ID: 16

Type: **not specified**

## **Imaging Extended Objects / Asteroids with AO/SPHERE**

*Thursday 3 October 2024 14:30 (1h 30m)*

**Presenter:** Dr VERNAZZA, Pierre (LAM)

**Session Classification:** Class