Preface

Extremely large telescopes (ELT) are the future corner stone of the ground-based astronomy for the next 25 years. They aim at solving many of the most exciting and fundamental questions of today's astrophysics: the formation of the first galaxies, of stars, of planets, etc. These goals will be achieved only if these giant telescopes are coupled with efficient adaptive optics (AO) systems allowing them to really reach their unprecedented angular resolution.

Three projects of extremely large telescope are now in development worldwide: the Giant Magellan Telescope (GMT), gathering US, Australian and Korean institutions, the Thirty Meter Telescope (TMT), gathering Canadian, US, Japanese and Chinese institutions, and the European Extremely Large Telescope (E-ELT). The studies undergone to built these telescopes and their instrumentation were (and are still) facing the same challenge: to develop AO systems able to overcome the specific technical constraints related to the new type of telescopes (primary mirror segmentation, required number of actuators, high-performance large detectors, computational issues for control, etc…). With the requirement to have access to a large part of the sky, these new telescopes will make use of artificial laser guide stars, which, here again, brings specific issues such as cone effects, unmeasured low order modes, large spot elongation, etc. In addition, new types of AO systems to be developed will be optimized with respect to the observational constraints (very good image quality, or correction over a large field of view, or correction toward specific directions over the largest possible field of view, etc).

In this context, PHASE organized in June 2009 the first international conference about adaptive optics for the extremely large telescopes. PHASE stands for “Partenariat Haute résolution Angulaire Sol Espace” and is a partnership signed between Observatoire de Paris, ONERA, CNRS and Université Paris Diderot — Paris 7. It involves the High Angular Resolution team of ONERA, as well as LESIA and GEPI of Observatoire de Paris and aims at putting together the knowledge and the technical resources of these French laboratories in the field of high angular resolution. PHASE is about to gather two new French laboratories, LAM (Marseille) and LAOG (Grenoble).

The goal of this conference was to gather the international AO specialists, to share and exchange around subjects and specificities related to the applications of AO on giant telescopes. Before the conference itself, a welcome cocktail has been organized on June 22nd in the famous “salle Cassini” at Observatoire de Paris. While the participants were registering, the conference was introduced by the conference chairs, T. Fusco and Y. Clénet, and by the Presidents of Observatoire de Paris and ONERA, D. Egret and D. Maugars respectively.

The conference itself took place during four days, from June 23rd to June 26th, in the large Amphitheatre Buffon of Université Paris Diderot — Paris 7. The talks and posters were organized in nine different sessions:

- Astrophysical needs and high level requirements for AO on ELTs,
- AO systems and instrumental concepts,
- AO simulations
- Laser guide stars,
- Wave front sensing,
- Real-time control,
- Deformable mirrors,
- AO simulations,
- Post processing, Pathfinders.

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The conference was a great success: during these four days were presented 63 oral talks and 40 posters and 183 registered participants attended the conference.

Apart from the high scientific interest of the different talks and posters, the success of this first AO for ELT conference was also ensured by the public conference on adaptive optics that P. Léna gave at the Palais de la Découverte on June 23rd and by the beautiful and sunny cruise on the river Seine that was organized on June 24th for the conference dinner.

In the following, the reader will find 90 papers corresponding to almost all the oral and poster presentations. They are the state-of-the-art in the field of adaptive optics for the extremely large telescopes!

Given the success of this first event, a second conference should be organized in 2011, probably in North America, the idea being to alternatively hold the conference in Europe and North American every other year.

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