

Curriculum vitae et studiorum of Valentina D'ODORICO

- **birth date and place:** February 26, 1970, Padua, Italy
- **nationality:** Italian
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EDUCATION

- **Laurea degree in Physics cum laude** obtained at the University of Padua, in June 16, 1995, with thesis on *Cosmological Implications of the Lyman α forest studies*, supervisors Prof. Francesco Lucchin and Prof. Stefano Cristiani, Astronomy Department, University of Padua, Prof. Sabino Matarrese, Physics Department, University of Padua
- **PhD in astrophysics** obtained at the International School for Advanced Studies (SISSA/ISAS) of Trieste, in October 29, 1999, with thesis on *Quasar Absorption Spectra: Probes of the Baryonic Gas at High Redshift*, supervisors Prof. Luigi Danese, SISSA Trieste, and Prof. Stefano Cristiani, Astronomy Department, University of Padua
- **Schools attended during the PhD studies:**
 1. PhD National School *Cosmology and InfraRed Astronomy*, Asiago, Italy, October 1995;
 2. *ESO/HP 5th Summer School in Astrophysical Observations*, St. Michel l'Observatoire, France, July 1996;
 3. International School of Particle Physics, 3rd Course: *Generation of Large-Scale Cosmological Structures*, Erice, Italy, November 1996;
 4. PhD National School *Cosmology and New Telescopes*, Asiago, Italy, September 1997

ACADEMIC POSITIONS

- **December 2008 - present** Researcher at INAF - Trieste Astronomical Observatory.
- **July 2006 - June 2008** 'Assegno di ricerca' at INAF - Trieste Astronomical Observatory, research project *The intergalactic medium as a probe of cosmological investigation*. Supervisor: Prof. Stefano Cristiani.
- **February 2004 - June 2006** INAF post-doc fellowship at the Trieste Observatory, research project *Galactic structures at high redshift and their influence on the intergalactic medium*. Supervisor: Prof. Stefano Cristiani.
- **April 2003 - January 2004** 'Assegno di ricerca' at the International School for Advanced Studies (SISSA-ISAS) of Trieste, research project *High redshift radio quasar*. Supervisors: Prof. Annalisa Celotti and Prof. Luigi Danese.
- **March 2002 - February 2003** 'Assegno di ricerca' at the Trieste Astronomical Observatory, research project *Spectroscopic study of stars and other cosmological objects at low metallicity*. Supervisor: Prof. Paolo Molaro.
- **March 2000 - February 2002** Marie Curie post-doc fellowship at the Institut d'Astrophysique de Paris (France), in the context of the European programme *Improving the Human Research Potential & the Socio-economic Knowledge Base*. Supervisor: Prof. Patrick Petitjean.
- **November 1999 - February 2000** 'Contratto d'opera' at the Trieste Astronomical Observatory, research project *Chemical abundances; Cosmology; Chemical evolution; Planetary nebulae; Nucleosynthesis; Halo stars; Supernovae*. Supervisor: Prof. Paolo Molaro.

RESEARCH INTERESTS

My research interests relate to Cosmology and the high-redshift Universe. In particular, my studies are focussed on the processes of structure formation and evolution, the interactions between galaxies and the intergalactic medium and the history of star formation. Absorption lines observed in spectra of high redshift bright sources (mainly quasars but also GRB) are the main investigation tool I use. Most of these lines are due to the Lyman- α resonant transition in neutral hydrogen and arise in the fluctuations of the intergalactic medium (IGM). At the considered redshifts, $z \sim 2 - 3$, the IGM contains most of the baryons and constitutes a gas reservoir for galaxy formation. In turn, galaxies affect the physical status of the IGM through the process of star formation, enriching it with metals and ionizing it.

In particular, I work on:

- Clustering properties of absorbers

Correlation function of Lyman- α and C IV absorbers along single lines of sight; transverse correlation function of Lyman- α absorbers in spectra of close quasar pairs; transverse correlation function of Lyman limit systems associated with virialized objects in groups and pairs of quasars and identification of large scale structures; correlation functions along single lines of sight and across close pairs of lines of sight of the transmitted flux in the Lyman- α forest.

- Chemical properties of absorbers

Ionisation status, metallicity and chemical abundances of absorbers associated with the quasar environment determined from observations as a test of models of joint-evolution of quasars and their spheroidal hosts; chemical abundances in primordial galaxies traced by Lyman limit and damped Lyman- α systems and determination of the star formation history at high redshift; chemical enrichment of the IGM through the study of metal absorptions in close quasar pairs.

- Statistical properties of absorbers

Number density as a function of redshift; distribution in column density and Doppler parameter of the Lyman- α forest lines; size and geometry of Lyman- α absorbers statistically determined from the analysis of coincident absorbers in spectra of quasar pairs at different angular separations.

- Interplay between galaxies and the IGM

Feedback processes and characteristics of galactic winds through the comparison between Lyman- α and metal absorptions along single and multiple lines of sight with the position and characteristics of the galaxies identified in the same field.

- Advanced methods in data analysis

Development of new concepts related, in particular, to the analysis of spectroscopic data obtained with new generation instruments at very high resolution and stability.

OBSERVATIONAL ACTIVITY

- Principal and Co-Investigator of ESO NTT and VLT observational campaigns from 1999 to the present;
- Guest observer at ESO observational facilities in Chile: NTT sept-oct 1999; VLT sept 2000, oct 2001, aug 2002, oct 2009.

TEACHING ACTIVITY

- Co-tutor of the degree thesis of A. Mikosch, at the Trieste University (2006)
- Co-supervisor of the PhD thesis of F. Saitta, at the Trieste University (2005-2008)
- Co-tutor of the master thesis (laurea specialistica) of C. Cremaschini, at the Trieste University (2008)
- Co-tutor of the master thesis (laurea specialistica) of M. Cappetta, at the Trieste University (2008)
- Lectures on “Metals in the IGM” at the Trieste University (2010)

GRANTS and FUNDED RESEARCH PROJECTS

- **PRIN MIUR 2007** “Diffuse baryons across cosmic epochs”, P.I. Prof. Stefano Borgani
- **PRIN INAF 2006** “The metallicity evolution through the cosmic ages”, P.I. Dr. Roberto Maiolino.
- **PRIN INAF 2005** “Ultra-deep multi-wavelength surveys to constrain galaxy formation scenarios”, P.I. Prof. Stefano Cristiani.
- **PRIN Cofin 2002** “Nucleosynthesis in the early Universe: from primordial nucleosynthesis to first stars”, P.I. Prof. Paolo Molaro.
- **Cofin INAF 2002** “Cosmological evolution of galaxies and their active nuclei”, P.I. Prof. Stefano Cristiani.
- **Funding ASI 2001** “HST observations: the connection between galaxies and the inter-galactic medium”, P.I. Prof. Stefano Cristiani.

INTERNATIONAL COLLABORATIONS

International Projects

- **Member of the Italian Instrument Science team** of the instrument X-shooter at the ESO VLT. This high-efficiency spectrograph operates at intermediate resolution ($R \gtrsim 5000$) with a spectral range from the UV to the K' band (0.3-2.5 μm). It is the ideal instrument to observe quasars at $z \gtrsim 6$, close to the hydrogen re-ionisation epoch and groups of quasars with small angular separations. The observation of groups of quasars provides information on the 3-D matter distribution at high redshift and constraints on the Cosmological parameters (in particular, Ω_Λ , by mean of the Alcock-Paczyński test).
- **Member of the Instrument Science team and P.I. of the Data Analysis work package** for the feasibility study of CODEX, a very high resolution and stability spectrograph ($R \geq 100000$) for the European ELT. The main experiment for which CODEX is conceived is the challenging measurement of the cosmic acceleration at intermediate redshift ($z \sim 3 - 5$). The evaluation of the cosmic acceleration will be made possible by the measure of the shift of the Lyman- α forest absorption lines in quasar spectra on a time scale of 20 or more years.
- **Member of the Instrument Science team and P.I. of the Data Analysis work package** for the feasibility study of the ESPRESSO (Echelle Spectrograph for PREcision Super Stable Observations) spectrograph that will be the precursor of CODEX at the VLT.
- **Member of the Science team** of the ESO Large Programme “The Cosmic Evolution of the Inter-galactic Medium” (P.I. J. Bergeron, IAP, France). In this framework 18 high resolution (~ 45000) and high signal-to-noise ratio (~ 50) quasar spectra have been observed with the VLT UVES spectrograph.

Referee for international journals

- Astronomy & Astrophysics
- Monthly Notices of the RAS
- Nature

PUBLICATIONS

23 publications on refereed journals.