

# Gianangelo Bracco

Associate professor

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## *Education and training*

1982

### **Laurea in Physics**

Study of bidimensional noble gas crystals by means of atomic scattering -  
110/110 cum laude

University of Genova - Genova - IT

1987

### **PhD in Physics**

He inelastic scattering study of surface vibrations

Università di Genova - Genova - IT

## *Academic experience*

2015 - ONGOING

### **Associate professor**

Università di Genova - Genova - IT

2010 - 2012

### **Adjunt professor**

University of Bergen - Bergen - NO

1998 - 2000

### **Visiting Scholar**

Department of Chemistry - Princeton University - Princeton -NJ - US

## *Postgraduate research and teaching activity*

### **PhD committees membership**

PhD Board in Physics, Università di Genova

## *Research interests*

Study of molecular beam properties for application in surface science. This activity started with my master thesis work on He diffraction and PhD thesis on surface phonons and continued until now. The present work is about the possibility to study electronic excitations with molecular beam, in particular hyperthermal beams of Ne. Electronic excitations can be mainly studied with electron energy loss spectroscopies but those

techniques present a limitation in the low energy range due to the tail of the elastic peak that makes difficult to extract information on inelastic structures. Atomic beams, although present a limited energy range, could in principle explore the low energy region complementing the information obtained by electron spectroscopies. On the other hand the range is of interest for the developing of plasmonic devices. In literature there are a few suggestions that such method could detect electronic excitations but in any case the studies were limited to atomic beams at thermal energies without a specific search for those excitations. In the present study hyperthermal beams have been employed and this might help in the coupling with electronic excitations.

Focusing of He atom beams for atom optics and microscopy.

In 2006, I started to investigate atom optics for focusing molecular beams and for developing He atom microscopy with my colleague B. Holst now at the Department of Physics and Technology of Bergen University (Norway). Among other experiments, we performed measurements with a deuterium beam reproducing with a molecular beam the Poisson spot experiment, i.e. the formation of a bright spot behind a circular obstacle, with a matter wave. Most of the activity has been the characterization of a focused He beam by means of a Fresnel zone plate to reach submicron spot size and to design a He atom microscope. This has requested also the simulation of the beam that has been performed by solving the Boltzmann equation with the method of moments. This method initially based on a Lennard-Jones potential was extend by my group to include all the He-He potentials with an analytical expression. A model to predict the intensity of the beam at the focused spot has been recently proposed with a prescription for optimizing the beam parameters and the source geometry, a step necessary to get a He atom microscope working in the best way.

Finally, very recently, I am involved in the activity of the Monte Antola astronomical observatory in the ORSA collaboration, in particular for the observation of gravitational lenses.

### ***Editorial activity***

In the period 2010-2012 Main Editor for Springer Verlag (Heidelberg, Germany) of the volume "Surface Science Techniques" (ISBN-13: 9783642342424), 663 pages, 21 chapters in the Springer Series in Surface Science vol. 51.

### ***Assignments abroad***

2009: Visiting researcher, Department of Physics and Technology -University of Bergen (Norway).

2008: CNR- Short Term Mobility, Department of Physics and Technology-University of Bergen (Norway) for "Test of optical elements for He atom microscopy"

1998-2000: Visiting Scholar, Department of Chemistry, Princeton University (NJ, USA).