



**JUNE 13-16  
2018**

Fonderia n. 1  
Area Ex Ilva  
Follonica (GR)

LABORAZIONE A CURA DEL SERVIZIO COMUNICAZIONE E RELAZIONI ESTERNE | SNS

## **CHEMICAL EVOLUTION IN OUR GALAXY** Spectroscopy, Observations and Reactivity



## SCIENTIFIC ORGANIZING COMMITTEE

**Vincenzo Barone, Chair**

Scuola Normale Superiore

**Cristina Puzzarini, Co-chair**

Università di Bologna

**Claudio Codella**

INAF – Osservatorio Astrofisico  
di Arcetri

## LOCAL ORGANIZING COMMITTEE

**Alberto Baiardi**

ETH Zurich

**Serena Bolici**

Segretario generale, Coordinatore attività Comune di Follonica

**Elisa Guidi**

Scuola Normale Superiore

**Sergio Rampino**

Scuola Normale Superiore

**Monica Sanna**

**Scientific secretary**

Scuola Normale Superiore

As a continuation of the first Italian Workshop on Astrochemistry, held in March 2016 at Palazzo Strozzi (Firenze), the focus of this 2<sup>nd</sup> edition is still the synergy between astronomers and chemists to comprehend the chemical complexity and evolution in our Galaxy. The unprecedented performances offered by new observational facilities, from cm-wavelengths to the THz window, are indeed revolutionizing the census of the chemical complexity in space. Specifically, interstellar Complex Organic Molecules (iCOMs) have been observed in all the evolutionary stages leading to the formation of stars (from cold starless cores to proto-stars and proto-planetary disks). Thanks to the great advances in the modeling of gas-phase and surface chemistry through laboratory works as well as quantum chemistry calculations, we now have new tools to investigate the formation routes of iCOMs in space, building blocks of pre-biotic molecules such as amino-acids and sugars.

The previous workshop has sown seeds that led to encouraging collaborations within the framework of two joint national projects on astrochemistry, namely “STARS in the CHAOS” and “GENESIS-SKA”. The main goal of the 2<sup>nd</sup> Italian Workshop on Astrochemistry is to bring once again together astrophysicists and chemists working on observations, theoretical models, and laboratory experiments to present their recent advances, to discuss about the open questions, and to plan further future collaborations.

The workshop will be focused on the topics:

- Observations of interstellar complex molecules
- Kinetics and molecular spectroscopy
- Computational and Laboratory Reactivity
- Prebiotic Chemistry

Organized in Collaboration with the Municipality of Follonica (a maritime town in the province of Grosseto), the workshop will take place in the unique environment of a former Ilva Foundry in Follonica, recently restored and with spaces destined to the Scuola Normale Superiore.

## INVITED SPEAKERS

### *Public Outreach*

**Paola Caselli**, Max-Planck-Institut für extraterrestrische Physik, Germany

### *Observations*

**José Cernicharo**, Instituto de Ciencia de Materiales de Madrid, Spain

**Cécile Favre**, INAF - Osservatorio Astrofisico di Arcetri, Italy

**Linda Podio**, INAF - Osservatorio Astrofisico di Arcetri, Italy

### *Reactivity*

**Daniela Ascenzi**, Università degli Studi di Trento, Italy

**Ernesto di Mauro**, Sapienza Università di Roma, Italy

**Jonathan C. Rawlings**, University College London, UK

**Ian Sims**, University of Rennes I, France

**Luca Dore**, Università di Bologna, Italy

**Ryan C. Fortenberry**, Georgia Southern University, USA

**Silvia Spezzano**, Max-Planck-Institut für extraterrestrische Physik, Germany

**Nicola Tasinato**, Scuola Normale Superiore, Italy

The II Italian Workshop on Astrochemistry could be organized thanks to the financial support of:

- Dipartimento di Chimica “Giacomo Ciamician”
- INAF – Osservatorio Astrofisico di Arcetri
- Scuola Normale Superiore

## 13 JUNE 2018

- 16:00-16:45 Registration
- 16:45-17:15 Coffee break
- 17:15-17:30 **CRISTINA PUZZARINI** – University of Bologna  
*Opening*
- 17:30-18:00 **VINCENZO BARONE** – Scuola Normale Superiore  
*The Interuniversity Center STAR*
- 18:00-18:30 **CLAUDIO CODELLA** – INAF, Osservatorio Astrofisico di Arcetri, Firenze  
*The GENESIS-SKA project*
- 19:30-20:45 **WELCOME DINNER**
- 21:00-22:30 **PAOLA CASELLI** – Max-Planck-Institut für extraterrestrische Physik, Garching  
Outreach talk: *Dalle nubi interstellari alla vita sulla Terra*

## 14 JUNE 2018

### MORNING

- 09:00-09:45 **LINDA PODIO** – INAF, Osservatorio Astrofisico di Arcetri, Firenze  
*Chemical complexity from protostars to planet-forming disks*
- 09:45-10:15 **VICTOR RIVILLA** – INAF, Osservatorio Astrofisico di Arcetri, Firenze  
*First ALMA maps of HCO, the precursor of complex organic molecules, towards the Solar-like protostellar system IRAS16293-2422*
- 10:15-11:00 **CÉCILE FAVRE** – INAF, Osservatorio Astrofisico di Arcetri, Firenze  
*Complex organic molecules towards star-forming regions: direct interaction between astronomical observations and spectroscopy*
- 11:00-11:30 Coffee Break
- 11:30-12:15 **JOSÉ CERNICHARD** – ICMM-CSIC, Madrid  
*Broad band high resolution rotational spectroscopy for cold plasma diagnosis: application to interstellar chemistry*
- 12:15-12:35 **LAURA COLZI** – INAF, Osservatorio Astrofisico di Arcetri, Firenze  
*Nitrogen fractionation in high-mass star-forming cores across the Galaxy*
- 12:35-13:00 Poster presentations

- 13:00-15:30 Lunch & Poster session

### AFTERNOON

- 15:30-16:15 **SILVIA SPEZZANO** – Max-Planck-Institut für extraterrestrische Physik, Garching  
*High Resolution Spectroscopy of Unstable Species at the Centre for Astrochemical Studies*
- 16:15-16:45 **LUCA BIZZOCCHI** – Max-Planck-Institut für extraterrestrische Physik, Garching  
 *$^{14}\text{N}/^{15}\text{N}$  ratio measurements in prestellar cores with  $\text{N}_2\text{H}^+$ : new evidences of  $^{15}\text{N}$ -antifractionation*
- 16:45-17:15 Coffee Break
- 17:15-18:00 **JONATHAN C. RAWLINGS** – University College London  
*Extreme Chemical Processes in Interstellar Clouds and Cometary Comae*
- 18:00-18:20 **SIMONE POTENTI** – Scuola Normale Superiore  
*The interstellar odyssey of PAHs: an experimental and computational challenge*
- 18:20-18:40 **LORENZO ZIMIRRI** – University of Torino  
*Computer simulations of interstellar silicates: energetic and spectroscopic characterization of forsterite nanoparticle models*
- 21:00-22:30 Social Dinner

## 15 JUNE 2018

### MORNING

- 09:00-09:45 **NICOLA TASINATO** – Scuola Normale Superiore  
*Computational Tools for Astrochemistry*
- 09:45-10:15 **JULIEN BLOIND** – Scuola Normale Superiore  
*Importance of anharmonicity for the study of IR signatures in astrochemistry*
- 10:15-11:00 **RYAN FORTENBERRY** – Georgia Southern University  
*Quantum Chemistry and Spectroscopy: A Match Made in the Heavens*
- 11:00-11:30 Coffee Break
- 11:30-12:15 **LUCA DORE** – University of Bologna  
*Submillimeter-wave spectroscopy for astrochemistry*
- 12:15-12:35 **LORENZO SPADA** – Scuola Normale Superiore/University of Bologna  
*Prebiotic molecules from in silico experiments to laboratory spectroscopy toward space: cyanomethanimine as a case study*

12:35-12:55	<b>MARCO MENDOLICCHIO</b> – Scuola Normale Superiore <i>Anharmonicity Effects on the Structural and Vibrational Properties of Molecular Systems of Astrochemical Interest</i>
13:00-15:30	Lunch & Poster session
15:30-16:15	<b>ERNESTO DI MAURO</b> – University of Rome “La Sapienza” <i>From the one-carbon atom compound formamide to RNA the prebiotic path is continuous</i>
16:15-16:45	<b>GIOVANNA COSTANZO</b> – Istituto di Biologia e Patologia Molecolari, CNR, Rome <i>Non-enzymatic oligomerization of 3'-5' cyclic ribonucleotides in prebiotic conditions</i>
16:45-17:15	Coffee Break
17:30-18:30	Visit to the Magma Museum

## AFTERNOON

## 16 JUNE 2018

09:00-09:45	<b>IAN R. SIMS</b> – University of Rennes I <i>Experimental gas-phase reaction kinetics and energy transfer studies for astrochemistry</i>
09:45-10:15	<b>ANTONIO J. OCAÑA</b> – Universidad de Castilla-La Mancha <i>Gas-phase methanol reactivity towards OH radicals at temperatures of the ISM using the CRESU technique</i>
10:15-11:00	<b>DANIELA ASCENZI</b> – University of Trento <i>Building N-containing hydrocarbons via ion-molecule reactions: isomer-selected reactivity of <math>C_2H_2N^+</math> ions</i>
11:00-11:30	Coffee Break
11:30-12:00	<b>V. BARONE – C. CODELLA – C. PUZZARINI</b> <i>Closing and Poster-Award Ceremony</i>

## MORNING

## LIST OF PARTICIPANTS

<b>Sergio Abbate</b>	Università degli Studi di Brescia
<b>Silvia Alessandrini</b>	Scuola Normale Superiore
<b>Daniela Ascenzi</b>	Università di Trento
<b>Alice Balbi</b>	Scuola Normale Superiore
<b>Vincenzo Barone</b>	Scuola Normale Superiore
<b>Luca Bizzocchi</b>	Max-Planck-Institut für extraterrestrische Physik
<b>Julien Bloino</b>	Scuola Normale Superiore
<b>Giulio Bosi</b>	Università di Bologna
<b>Rahma Boussessi</b>	ICCOM-CNR-Pisa
<b>Paola Caselli</b>	Max-Planck-Institut für extraterrestrische Physik
<b>José Cernicharo</b>	IFF-CSIC
<b>Giorgia Ceselin</b>	Scuola Normale Superiore
<b>Claudio Codella</b>	INAF, Osservatorio Astrofisico di Arcetri
<b>Laura Colzi</b>	Università di Firenze
<b>Giovanna Costanzo</b>	Istituto di Biologia e Patologia Molecolari CNR Roma
<b>Ernesto Di Mauro</b>	Istituto di Biologia e Patologia Molecolari CNR Roma
<b>Luca Dore</b>	Università di Bologna
<b>Cécile Favre</b>	INAF-Osservatorio Astrofisico di Arcetri
<b>Ryan Fortenberry</b>	University of Mississippi
<b>Giovanna Longhi</b>	Università degli Studi di Brescia
<b>Paola Manini</b>	Università di Napoli Federico II
<b>Giuseppe Mazzeo</b>	Università degli Studi di Brescia
<b>Alessio Melli</b>	Università di Bologna
<b>Marco Mendolicchio</b>	Scuola Normale Superiore
<b>Alessandra Napolitano</b>	Università di Napoli Federico II
<b>Antonio Jesús Ocaña Fernández</b>	University of Castilla - La Mancha
<b>Linda Podio</b>	INAF - Osservatorio Astrofisico di Arcetri
<b>Simone Potenti</b>	Scuola Normale Superiore
<b>Cristina Puzzarini</b>	Università di Bologna
<b>Sergio Rampino</b>	Scuola Normale Superiore
<b>Jonathan Rawlings</b>	University College London
<b>Victor M. Rivilla</b>	INAF-Osservatorio Astrofisico di Arcetri
<b>Zoi Salta</b>	Scuola Normale Superiore
<b>Monica Sanna</b>	Scuola Normale Superiore
<b>Ian Sims</b>	University of Rennes I
<b>Lorenzo Spada</b>	Scuola Normale Superiore
<b>Silvia Spezzano</b>	Max-Planck-Institut für extraterrestrische Physik
<b>Nicola Tasinato</b>	Scuola Normale Superiore
<b>Francesca Tonolo</b>	Università di Bologna
<b>Lorenzo Zamirri</b>	Università di Torino

	June 13	June 14	June 15	June 16
9:00 – 11:00		L. Podio (Invited) V. Rivilla C. Favre (Invited)	N. Tasinato (Invited) J. Bloino R. Fortenberry (Invited)	I. Sims (Invited) A.J. Ocaña D. Ascenzi (Invited)
Coffee break				
11:30 – 13:00		J. Cernicharo (Invited) L. Colzi Poster presentations	L. Dore (Invited) L. Spada M. Mendolicchio	Closing Poster-Award ceremony
Lunch Break		LUNCH & Poster session		
15:30 – 16:45	Registration	S. Spezzano (Invited) L. Bizzocchi	E. Di Mauro (Invited) G. Costanzo	
Coffee break				
17:15 – 18:40	Opening V. Barone C. Codella	J. C. Rawlings (Invited) S. Potenti L. Zimirri	Visit: Magma Museum	
Dinner	Welcome Dinner	Social Dinner		
21:00 – 22:30	P. Caselli <i>Outreach talk</i>			