JUNE 13-16
2018

CHEMICAL EVOLUTION IN OUR GALAXY
Spectroscopy, Observations and Reactivity

Fonderia n. 1
Area Ex Ilva
Follonica (GR)
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

As a continuation of the first Italian Workshop on Astrochemistry, held in March 2016 at Palazzo Strozzi (Firenze), the focus of this 2nd 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 pre-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 2nd 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 1, 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
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

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 CERNICHARO – 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

15 JUNE 2018

09:00-09:45 NICOLA TASINATO – Scuola Normale Superiore
Computational Tools for Astrochemistry
09:45-10:15 JULIEN BLOINO – 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  **MARCO MENDOLICCHIO** – Scuola Normale Superiore  
*Anharmonicity Effects on the Structural and Vibrational Properties of Molecular Systems of Astrochemical Interest*

13:00-15:30 Lunch & Poster session

**AFTERNOON**

15:30-16:15  **ERNESTO DI MAURO** – University of Rome “La Sapienza”  
*From the one-carbon atom compound formamide to RNA the prebiotic path is continuous*

16:15-16:45  **GIOVANNA COSTANZO** – Istituto di Biologia e Patologia Molecolari, CNR, Rome  
*Non-enzymatic oligomerization of 3’-5’ cyclic ribonucleotides in prebiotic conditions*

16:45-17:15 Coffee Break

17:30-18:30 Visit to the Magma Museum

**16 JUNE 2018**

**MORNING**

09:00-09:45  **IAN R. SIMS** – University of Rennes I  
*Experimental gas-phase reaction kinetics and energy transfer studies for astrochemistry*

09:45-10:15  **ANTONIO J. OCAÑA** – Universidad de Castilla-La Mancha  
*Gas-phase methanal reactivity towards OH radicals at temperatures of the ISM using the CRESU technique*

10:15-11:00  **DANIELA ASCENZI** – University of Trento  
*Building N-containing hydrocarbons via ion-molecule reactions: isomer-selected reactivity of C,H,N+ ions*

11:00-11:30 Coffee Break

11:30-12:00  **V. BARONE – C. CODELLA – C. PUZZARINI**  
*Closing and Poster-Award Ceremony*

**LIST OF PARTICIPANTS**

Sergio Abbate  
Silvia Alessandrini  
Daniela Ascenzi  
Alice Balbi  
Vincenzo Barone  
Luca Bizzocchi  
Julien Blaino  
Giulia Bosi  
Rahma Boussessi  
Paola Caselli  
José Cernicharo  
Giorgia Ceselin  
Claudio Codello  
Laura Calzi  
Giovanna Costanzo  
Ernesto Di Mauro  
Luca Dore  
Cécile Favre  
Ryan Fortenberry  
Giovanna Longhi  
Paola Manini  
Giuseppe Mazzeo  
Alessio Melli  
Marco Mendolicchio  
Alessandra Napolitano  
Antonio Jesús Ocaña Fernández  
Linda Podio  
Simone Potenti  
Cristina Puzzarini  
Sergio Rampino  
Jonathan Rawlings  
Víctor M. Rivilla  
Zoi Salta  
Monica Sanna  
Ian Sims  
Lorenzo Spada  
Silvia Spezzano  
Nicola Tasinato  
Francesca Tonolo  
Lorenzo Zamirri  

Università degli Studi di Brescia
Scuola Normale Superiore
Università di Trento
Scuola Normale Superiore
Max-Planck-Institut für extraterrestrische Physik
Scuola Normale Superiore
Università di Bologna
ICCDM-CNR-Pisa
Max-Planck-Institut für extraterrestrische Physik
IFF-CSIC
Scuola Normale Superiore
INAF, Osservatorio Astrofisico di Arcetri
Università di Firenze
Istituto di Biologia e Patologia Molecolari CNR Roma
Istituto di Biologia e Patologia Molecolari CNR Roma
Università di Bologna
INAF-Osservatorio Astrofisico di Arcetri
University of Mississippi
Università degli Studi di Brescia
Università di Napoli Federico II
Università degli Studi di Brescia
Università di Bologna
Scuola Normale Superiore
Università di Napoli Federico II
University of Castilla - La Mancha
INAF - Osservatorio Astrofisico di Arcetri
Scuola Normale Superiore
Università di Bologna
Scuola Normale Superiore
University College London
INAF-Osservatorio Astrofisico di Arcetri
Scuola Normale Superiore
Scuola Normale Superiore
University of Rennes I
Scuola Normale Superiore
Max-Planck-Institut für extraterrestrische Physik
Scuola Normale Superiore
Università di Bologna
Università di Torino
<table>
<thead>
<tr>
<th>June 13</th>
<th>June 14</th>
<th>June 15</th>
<th>June 16</th>
</tr>
</thead>
<tbody>
<tr>
<td>9:00 – 11:00</td>
<td>Coffee break</td>
<td>11:30 – 13:00</td>
<td>9:00 – 11:00</td>
</tr>
<tr>
<td>Lunch Break</td>
<td>15:30 – 16:45</td>
<td>Coffee break</td>
<td>17:15 – 18:40</td>
</tr>
<tr>
<td>Dinner</td>
<td>21:00 – 22:30</td>
<td>Welcome Dinner</td>
<td>21:00 – 22:30</td>
</tr>
<tr>
<td>Opening</td>
<td>Visit: Magma Museum</td>
<td>Closing</td>
<td>Poster Award ceremony</td>
</tr>
<tr>
<td>V. Barone</td>
<td>E. Di Mauro (invited)</td>
<td>Poster presentations</td>
<td>L. Bizzocchi</td>
</tr>
<tr>
<td>L. Spada</td>
<td>M. Mendolicchio</td>
<td>Registration</td>
<td>J. C. Rawlings (invited)</td>
</tr>
<tr>
<td>L. Dore (invited)</td>
<td>L. Pregnolato (invited)</td>
<td>11:30 – 13:00</td>
<td>J. Cernicharo (invited)</td>
</tr>
<tr>
<td>J. Cernicharo (invited)</td>
<td>L. Colzi</td>
<td>June 15</td>
<td>C. Favre (invited)</td>
</tr>
<tr>
<td>N. Tasinato (invited)</td>
<td>R. Fortenberry (invited)</td>
<td>June 16</td>
<td>D. Ascenzi (invited)</td>
</tr>
<tr>
<td>L. Podio (invited)</td>
<td>J. Bluino</td>
<td>June 16</td>
<td>I. Sims (invited)</td>
</tr>
<tr>
<td>V. Rivilla</td>
<td>C. Favre (invited)</td>
<td>June 16</td>
<td>A. J. Ocaña</td>
</tr>
<tr>
<td>C. Favre (invited)</td>
<td>June 16</td>
<td>June 16</td>
<td>D. Ascenzi (invited)</td>
</tr>
<tr>
<td>June 16</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>June 16</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>June 16</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>June 16</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>June 16</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>