

**FM 12:  
Bridging Laboratory Astrophysics and Astronomy**

# FM12: A Focus Meeting on Bridging Laboratory Astrophysics and Astronomy

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Laboratory astrophysics is the Rosetta stone that enables astronomers to understand and interpret the cosmos. The IAU Commission 14, the predecessor of the new IAU Laboratory Astrophysics Commission C. B5 and the AAS Laboratory Astrophysics Division (LAD) decided to coordinate their efforts this summer to hold a joint meeting at the IAU General Assembly.

This joint effort was in the form of a Focus Meeting that helped bridge Laboratory Astrophysics and Astrochemistry with Astronomy by bringing together expert providers and users of laboratory and astronomical data. This multidisciplinary meeting brought together astronomers with theoretical and experimental chemists and physicists to discuss the state-of-the-art research in their respective disciplines and how their combined expertise address important open questions in astronomy and astrophysics. Attendees were encouraged to bring and to discuss their data needs to improve the interpretations of astronomical phenomena.

The Focus Meeting 12, Bridging Laboratory Astrophysics and Astronomy, discussed the strong interplay between astronomy, astrophysics, astrochemistry and planetary science with theoretical and experimental studies of the chemical and physical processes that drive our Universe.

The meeting was divided into seven topical sessions that discussed atomic and molecular data, dust and ices, plasma, nuclear, and particle physics and their application to astronomy and astrophysics/astrochemistry.

Twenty-five invited talks were presented, distributed between eleven in-depth reviews of the field, twelve presentations that focused on recent, hot topics and two summary talks that concluded the meeting. In addition, close to 70 research contributions were presented at the meeting, distributed between 12 oral presentations and 57 posters. A rich discussion resulted from this wide variety of topics as illustrated in the program of the sessions detailed below (Figs. 1, 2).

All presentations were very well received and the meeting ended on a general discussion of the future directions for laboratory astrophysics. Given the current major development of next-generation facilities and projects, Focus Meeting 12 stressed how laboratory studies can best address the needs of astronomy and stimulate new observations and discussed open questions to be solved in the next decade. All the presentations that were made at the meeting are included in the new Proceedings series of the IAU, entitled "Focus on Astronomy."

We'd like to thank all the people who participated and contributed to make this meeting a real success, highlighting the growing importance and recognition of Laboratory

Astrophysics in today's astronomy. We are particularly indebted to the members of the Scientific Organizing Committee who generously contributed with their time and their expertise to the making of this first Laboratory Astrophysics Meeting at an IAU General Assembly.

The editors, Farid Salama, Lyudmila Mashonkina and Steve Federman

Scientific Organizing Committee (SOC) of FM12:

Martin Asplund (Australian National University, Australia)

Beatriz Barbuy (University of Sao Paulo, Brazil)

Paul Drake (University of Michigan, United States)

Steven Federman (University of Toledo, United States), co-Chair

Karlheinz Langanke (GSI Helmholtzzentrum für Schwerionenforschung GmbH, Germany)

Harold Linnartz (Leiden Observatory, the Netherlands)

Xiaowei Liu (Peking University, Kavli Institute for Astronomy and Astrophysics, China)

Lyudmila Mashonkina (Institute of Astronomy RAS, Russia), co-Chair

Tom Millar (Queen's University, United Kingdom)

Evelyne Roueff (Observatoire de Paris, France)

Farid Salama (NASA-Ames Research Center, United States), co-Chair

Daniel Savin (Columbia University, United States)

## References

IAU Atomic and Molecular Data Commission 14, <http://oldwww.inasan.ru/iau14/>

IAU Laboratory Astrophysics Commission C.B5, [http://www.iau.org/science/scientific\\_bodies/commissions/B5/](http://www.iau.org/science/scientific_bodies/commissions/B5/)

AAS Laboratory Astrophysics Division (LAD), <http://lad.aas.org/>

IAU General Assembly, <http://astronomy2015.org/>

Focus Meeting 12, [http://astronomy2015.org/focus\\_meeting\\_12](http://astronomy2015.org/focus_meeting_12)

**FM 12: Bridging Laboratory Astrophysics and Astronomy****Monday, 3 August 2015****FM12.1: Atoms, 10:30 am - 12:30 pm (Session Chairs: Lyudmila Mashonkina and Beatriz Barbuy)**

10:30 am: Farid Salama SOC opening remarks FM12.1.00

10:35 am: Christopher Sneden (Invited Review) Atomic Data for Stellar Nucleosynthesis FM12.1.01

11:05 am: Jelle Kaastra (Invited Review) Atomic processes in optically thin plasmas FM12.1.02

11:35 am: Karin Lind (Invited Topical) Modeling cool star spectra with inadequate input physics FM12.1.03

11:50 am: Michael Murphy (Invited Topical) Quasar searches for variations in fundamental constants: the need for laboratory spectroscopy FM12.1.04

12:05 pm: Natalie Hell (Contributed) K-shell transitions in L-shell ions with the EBIT calorimeter spectrometer FM12.1.05

12:20 pm: Norbert Przybilla (Contributed) Quantitative spectroscopy of hot stars: accurate atomic data applied on a large scale as driver of recent breakthroughs FM12.1.06

**FM12.2: Molecules I, 2:00 pm - 3:30 pm (Session-Chair: Steve Federman)**

2:00 pm: Ewine van Dishoeck (Invited Review) The molecular universe: from astronomy to laboratory astrophysics and back FM12.2.01

2:30 pm: Svetlana Berdyugina (Invited Review) Molecules in Magnetic Fields FM12.2.02

3:00 pm: Leen Decin (Contributed) Evolved stars as complex chemical laboratories – the quest for gaseous chemistry FM12.2.03

3:15 pm: Annemieke Petignani (Contributed) Anharmonicity and infrared bands of Polycyclic Aromatic Hydrocarbon (PAH) molecules FM12.2.04

**Tuesday, 4 August 2015****FM12.3: Molecules II and Dust and Ices I, 10:30 am - 12:30 pm (Session Chair: Harold Linnartz)**

10:30 am: Ralf I Kaiser (Invited Topical) Probing the Formation of Complex Organic Molecules in Interstellar Ices FM12.3.01

10:45 am: James Lyons (Contributed) CO isotopologue ratios in the solar photosphere FM12.3.02

11:00 am: Karin Oberg (Invited Review) Laboratory constraints on ice formation, restructuring and desorption FM12.3.03

11:30 am: Anthony Jones (Invited Review) Interstellar dust: interfacing laboratory, theoretical and observational studies FM12.3.04

12:00 pm: Pascale Ehrenfreund (Contributed) Organics in Space: Results from SPace Exposure Platforms and Nanosatellites FM12.3.05

12:15 pm: Gianfranco Vidali (Contributed) Nitrogen chemistry on dust grains: the formation of hydroxylamine, precursor to glycine FM12.3.06

**FM12.4: Dust and Ices II and Planetary I, 2:00 pm - 3:30 pm (Session Chairs: Gianfranco Vidali and Farid Salama)**

2:00 pm: Adwin Boogert (Invited Topical) Telescope Observations of Interstellar and Circumstellar Ices: Successes of and Need for Laboratory Simulations FM12.4.01

2:15 pm: Takashi Onaka (Invited Topical) AKARI nearInfrared spectroscopy of interstellar ices FM12.4.02

2:30 pm: Dominique Bockelee-Morvan (Invited Review) Comets and Laboratory Astrophysics FM12.4.03

**Figure 1.** Schedule of the Focus Meeting on Bridging Laboratory Astrophysics and Astronomy.

**FM 12: Bridging Laboratory Astrophysics and Astronomy****Tuesday, 4 August 2015****FM12.4: Dust and Ices II and Planetary I, 2:00 pm - 3:30 pm (Session Chairs: Gianfranco Vidali and Farid Salama)**

3:00 pm: Athena Coustenis (Invited Topical) Laboratory and theoretical work in the service of planetary atmospheric research FM12.4.04

3:15 pm: Robert Nelson (Contributed) Laboratory Simulations of Planetary Surfaces: Understanding Regolith Physical Properties from Astronomical Photometric Observations FM12.4.05

**Wednesday, 5 August 2015****FM12.5: Planetary II and Plasma I, 10:30 am - 12:30 pm (Session Chairs: Helen Fraser and Daniel Savin)**

10:30 am: Peter Jenniskens (Invited Topical) Meteorites FM12.5.01

10:45 am: Ella Sciamma-O'Brien (Contributed) The THS: Simulating Titan's atmospheric chemistry at low temperature FM12.5.02

11:00 am: William Fox (Invited Review) Magnetic field generation, Weibel-mediated collisionless shocks, and magnetic reconnection in colliding laser-produced plasmas FM12.5.03

11:30 am: Frederico Fiuza (Invited Topical) Generation of collisionless shock in laser-produced plasmas FM12.5.04

11:45 am: James Drake (Invited Review) The emerging understanding of magnetic reconnection through laboratory experiments, theory and modeling and satellite measurements FM12.5.05

12:15 pm: Michael Hahn (Contributed) Influence of Multiple Ionization on Charge State Distributions FM12.5.06

**FM12.6: Plasma II and Nuclei and Particles I, 2:00 pm - 3:30 pm (Chairs: Lyudmila Mashonkina, Xiaowei Liu)**

2:00 pm: Jan Egedal (Invited Topical) The Wisconsin Plasma Astrophysics Laboratory (WiPAL): A New Experimental User Facility FM12.6.01

2:15 pm: Maëlle Le Pennec (Contributed) Testing stellar opacities with laser facilities FM12.6.02

2:30 pm: Weiping Liu (Invited Review) Progress of Jinping Underground laboratory for Nuclear Astrophysics experiment JUNA FM12.6.03

3:00 pm: Elisabete de Gouveia Dal Pino (Invited Topical) Cherenkov Telescope Array: Unveiling the Gamma Ray Universe and its Cosmic Particle Accelerators FM12.6.04

3:15 pm: Yong-Zhon Qian (Invited Topical) Neutrinos, Nuclei, and Nucleosynthesis: Implications for Chemical Evolution of the Early Galaxy FM12.6.05

**FM12.7: Nuclei and Particles II and Summary, 4:00 pm - 6:00 pm (Session Chairs: Steve Federman and Farid Salama)**

4:00 pm: Kei Kotake (Invited Review) Multi-D Core-Collapse Supernova Models and the Multi-messenger Observables FM12.7.01

4:30 pm: Rubén López-Coto (Contributed) MACHETE: A transit Imaging Atmospheric Cherenkov Telescope to survey half of the VHE gamma ray sky FM12.7.02

4:45 pm: Marie-Lise Dubernet (Invited Topical) Atomic and Molecular Databases, VAMDC (Virtual Atomic and Molecular Data Centre) FM12.7.03

5:00 pm: Beatriz Barbuy (Invited Summary) Summary &amp; outstanding questions FM12.7.04

5:25 pm: Alexander Tielens (Invited Summary) Summary &amp; outstanding questions FM12.7.05

5:50 pm: Farid Salama SOC closing remarks FM12.7.06

**Figure 2.** Schedule of the Focus Meeting on Bridging Laboratory Astrophysics and Astronomy.