

Second Circular – Workshop of the International Space Science Institute (ISSI)

Star Formation

20-24 May 2019

Conveners

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The Workshop web site :

<http://www.issibern.ch/workshops/starform/>

The Context of the Workshop

The International Space Science Institute (ISSI) is holding a series of Workshops on physics of astrophysical objects ranged from dwarf stars and black holes of stellar mass to clusters of galaxies and supermassive black holes. The workshop series follow the ISSI Workshops held in 2010-2018 which covered our contemporary knowledge about physics of relativistic winds and jets, gamma-ray bursts, tidal disruption events, supernovae and clusters of galaxies. Magnetic fields of different scales, turbulence and particle acceleration processes in cosmic plasmas were also covered in the series. The present Workshop intends to a wide and deep discussion of the physics of star formation – the subject which is in the hearth of astrophysics of galaxies and the galaxy clusters. The Workshop will review the multi-wavelength observations and modeling of star formation with the aim to understand the physical processes in molecular clouds, the formation of protostars, the initial mass distribution, star clustering and the star-formation histories of galaxies. Attention will be given to the first star formation problem and the starburst phenomena.

Objectives of the Workshop

The ISSI Workshop is devoted to an in-depth examination of complex astrophysical phenomena of star formation via multi-wavelength observations and modeling. From their birth to their death, stars are playing a major role in the chemical evolution of the matter and the energy budget of galaxies via their radiation, their wind, and the supernovae. The complex interplay of physical processes from gas dynamics and cosmochemistry to nuclear physics leading to the formation of protostars in molecular clouds and then their MHD and radiative feedback on the cloud are

subject of a great current interest. Despite the great progress of the multi-wavelength sensitive observations and high performance modeling a number of the fundamental issues remain enigmatic yet. This is because the star formation process has a multi-scale nature with a strong non-linear feedback by radiation, MHD flows and non-thermal particles.

The amount of data on star formation obtained recently with the Herschel, HST, Gaia, XMM-Newton, Chandra and Fermi space telescopes with the ground based VLBI, LOFAR, ALMA, VLT and H.E.S.S. observatories is growing fast. The missions have produced large and high quality data bases. The forthcoming missions ATHENA, JWST, SPICA, EUCLID and the others will uncover new phenomena in star formation. We will discuss these data and perspective in the view of the current and new developing models.

Among the fundamental issues to study are:

The role of gravity in the formation and evolution of molecular clouds. The nature of supersonic and magnetized turbulence in the giant molecular clouds. The role of stellar feedback (supernovae, HII regions, winds) in regulating star formation. The radiation transfer, magnetic fields and gas ionization by cosmic rays. The role of radiation feedback, jets and magnetic fields in star clusters. The origin of the stellar initial mass function and how universal it is across various environments. The origin of first stars and the star formation rate across the cosmic evolution.

These and other aspects of the observations and physics of star formation and related phenomena will be discussed in the workshop and presented in the ISSI Book.

The Workshop will cover the following main themes:

The main goal of the proposed ISSI Workshop is to discuss the state of the art of the research and future prospective of studies of star formation. Following discussions by the Conveners, it is proposed that the Workshop will cover the following main themes:

- **Molecular cloud populations and cluster progenitors**
- **The physics of gravitational collapse**
The formation of disks the role of magnetic braking and non-ideal MHD processes
- **Physical processes over star formation: stellar feedback, magnetic fields, turbulence, energetic particles**
The role of stellar feedback (supernovae, HII regions, winds) in regulating star formation
Energetic particles in protostellar and protoplanetary disks
The stellar initial mass function
- **Star clusters**
Formation and Fragmentation of clusters
The role of radiation feedback in clusters, jets and magnetic fields
Supernovae in star clusters
- **The first stars and cosmology**

The formation process of the first stars and how it differs from present day star formation
What is the multiplicity expected?

Presentations by those attending will be structured around the above headings. This list, subject to discussion and assessment at the Workshop, should become the set of chapter headings for the ISSI book. **All of those attending will be expected to contribute to one or more of the chapters.**

Product

Following the Workshop, its output will be published as a volume in the Space Science Series of ISSI by Springer, in parallel with the publication of the papers as a topical collection in Space Science Reviews. It is expected that a total of about 8 sections and between 10 and 15 review style and quality papers, submitted to the usual refereeing process will be published in the book. Papers will be based on talks presented at the Workshop and will reflect the discussions that will be held among the participants during the Workshop.

Location

The Workshop will be held at the International Space Science Institute, Hallerstrasse 6, 3012 Bern, Switzerland.

Attendance

This will be by invitation only with ~ 40 - 45 participants maximum including early career research scientists.

Early career research scientists

Under its special program for supporting early career research scientists, ISSI invited four early career scientists, within two years of their PhD, to take full part in the Workshop.

Funding

ISSI will provide the subsistence costs (hotel and a per diem to cover meals) to all participants but not the travel costs. This refers only to the participants; in case they bring their partners or families, they will need to pay for the additional cost of the accommodation. There will be no registration fee for the Workshop.

Travelling to Bern

Bern can be reached easily from two international airports: Zurich (ZRH), Basel and Geneva (GVA). Direct intercity trains to Bern depart every half hour from inside the airport buildings; see www.rail.ch for detailed departure times. The travel time is ~1.5 hours from Zurich airport and ~2 hours from Geneva airport. For passengers coming from Basel Euroairport, there is a shuttle bus from the airport to Basel SBB railway station. Direct intercity trains to Bern depart from Basel SBB every half hour. The travel time from Basel Euroairport to Bern is ~1.5 hours.

Bern is connected to many European cities by fast intercity trains (e.g. TGV Paris-Bern in 4.5 hours, or Frankfurt-Bern 5 hours). Timetable information of trains within and around Switzerland can be found at www.rail.ch. Also check out our website www.issibern.ch/ for a few more travel tips such as links to city maps of Bern, weather forecasts, tourist information etc:

Hotel Reservations

A block booking has been made in city center hotels for the Workshop. All participants at the workshop are requested to contact the workshop secretary, Alexandra Lehmann (Tel. +41-31-631-4896, email: Lehmann@issibern.ch), to indicate their arrival and departure dates and times, as well as any special requests they may have (e.g. double room). Please note that all hotel reservations have to be made by the ISSI Secretariat. The invitation letters for visas etc can be obtained from the ISSI Secretariat. A confirmation will be returned within a few days.

Schedule

Invitations and the Second Circular:	20 December 2018
Registration deadline:	1 April 2019
Final program:	1 May 2019
Hotel deadline:	20 April 2019
Workshop:	20–24 May 2019