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# Feeding Compact Objects: Accretion on All Scales

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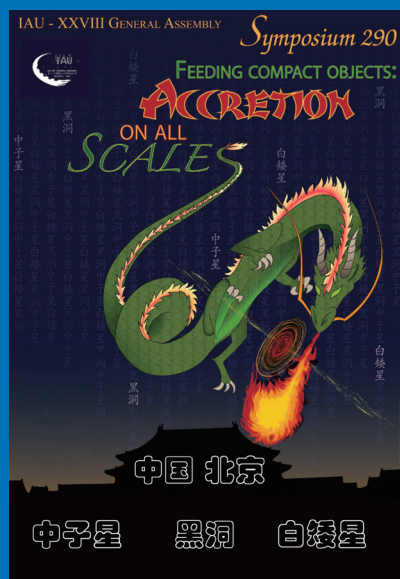
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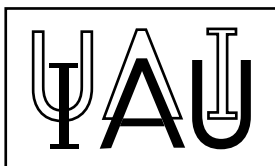
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# FEEDING COMPACT OBJECTS: ACCRETION ON ALL SCALES

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## Preface

The aim of the symposium is to encourage the researchers on the accreting compact objects to go together to discuss the common problems they confront at the different scales, e.g. white dwarf, neutron star, stellar black hole and active galactic nucleus. Also, the meeting is intended to provide opportunity for the communications of scientists from the different backgrounds, including theory, modeling, observation and instrumentation. The principal topics of symposium have been set around the basic phenomena and currently hot focus of accretions and outflows, from which the linkage of various accreting systems can be viewed as a whole.

More than 260 active researchers from 48 countries participated in the symposium, and the papers presented in this proceedings are only part of the contributions that are presented in the symposium (talks or posters), where the recent progress of the accretion phenomena of all kinds of the astronomical objects have been reviewed. Benefit from the high level presentations, the scientists went through far insight in the focused debate and exchange the information based on various backgrounds during the symposium.

We would like to thank all SOC members, whos efforts have made this symposium available and forge the outlook of the symposium, including the selection processes of the review and contributed speakers and constructions of the topics and programme. Thank are also due to the dedications from all the participants, which have promoted the development of the accretion astrophysics. Especially, we deliver the gratitude for the conference services from the Beijing volunteer students, who provide us the convenience and home-like environments and have taken many valuable photos and videos, which would be the significant resources of our future sweet memory.

*Chengmin Zhang, Tomaso Belloni,  
Mariano Méndez & Shuangnan Zhang  
Beijing, China, November 30, 2012*

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## OPENING CEREMONY



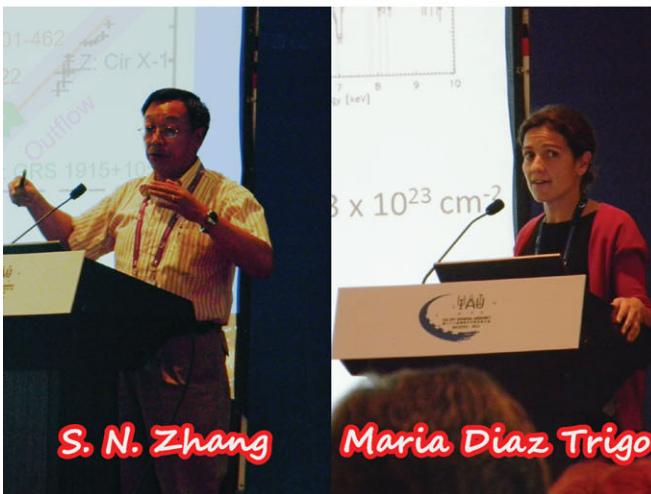
Ian Corbett, IAU General Secretary, addresses the speech at the opening ceremony



Christine Forman (upper left), President of IAU DIV-XI (Space & High energy astrophysics), Elaine M. Sadler (bottom left), President of IAU DIV-VIII (Galaxies & the Universe), and Christopher Corbally (right), President of IAU DIV-IV (Star) present the congratulations to the opening of IAUS290.







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## Scientific Rationale

This decade is seeing an unprecedentedly large number of high-energy space missions covering an energy range from soft X-rays to gamma rays. This, in connection to powerful optical and radio telescopes on the ground, provides the best set of tools to study accreting compact objects. While for a long time the focus has been on high-energy emission from the accretion flow, it is now clear that the accretion process on all scales is intimately connected to the ejection of powerful jets and that these two phenomena must be studied together. For AGN the association with jets was known, but the long time scales involved did not allow a detailed study of the connection between accretion and ejection. In the past two decades, the discovery of jet emission from X-ray binaries has opened the way to the study of these phenomena in real time, down to time scales as short as hours or minutes. This led to an increasing number of multi-wavelength campaigns which, although difficult to set up, yield the necessary broad-band view. As both the accretion and ejection processes depend on the properties of the system in the close vicinity of the compact object, their properties are expected to be independent of the nature of the system on larger scales. The fundamental properties of accretion are expected to be the same for all these objects, after some basic scaling laws are taken into account. The presence of these scaling laws indicate that it should be possible to identify basic properties that link together systems of widely different mass, from AGN to X-ray binaries to cataclysmic variables.

The so-called fundamental plane of AGN and black-hole binaries, which links the radio and X-ray flux of accreting objects over more than 10 orders of magnitude has provided the first strong link. Neutron-star binaries have been added, although they appear to be under-luminous in radio. Spectral-wise, the use of basic hardness indicators have led to a proposed unified picture that links the ejection of fast relativistic jets to the changes in the properties of the accretion flow, providing the first evidence of a direct real-time connection between accretion and ejection. This picture, originally developed for black-hole binaries, has been extended to neutron-star binaries and AGN, and recently to cataclysmic variables, where only a few observations of this type are available. On the side of variability, the mass scaling properties have been long hidden because of the effects due to changes in mass accretion rate, but they have now been discovered: black-hole binaries and AGN do display properties that can be scaled with mass, while neutron-star binaries present slight differences most likely related to their peculiarities (mass, magnetic field).

The symposium aims at connecting the lines of research on different classes of objects by bringing together scientists from parallel fields. The main emphasis will be given to common aspects across systems. Different approaches to the measurement of fundamental parameters such as black hole masses and angular momenta will be discussed and compared. These are inevitably linked to accretion models and most likely to the hitherto unknown mechanism for the ejection of relativistic jets, which is ubiquitous and seems to be inhibited only by the presence of a strong ordered magnetic field.