

FIRST ANNOUNCEMENT

IAU Symposium 261

**RELATIVITY IN FUNDAMENTAL ASTRONOMY:
Dynamics, Reference Frames, And Data Analysis**

27 April - 1 May 2009, Virginia Beach, USA

PRINCIPAL TOPICS:

- Astronomical reference frames in the relativistic framework
- Relativistic modelling of observational data
- Astronomical tests of relativity
- Relativistic dynamical modelling
- Relativity in astrodynamics and space navigation
- Modern observational techniques in fundamental astronomy
- Time measurement and time scales
- Astronomical constants and units of measurements

SCIENTIFIC ORGANIZING COMMITTEE:

Sergei Klioner (co-chair, Germany)	P. Kenneth Seidelmann (co-chair, USA)
Nicole Capitaine (France)	Antonio Elipe (Spain)
Sylvio Ferraz Mello (Brasil)	William Folkner (USA)
Toshio Fukushima (Japan)	Kenneth Johnston (USA)
Michael Kramer (UK)	Francois Mignard (France)
Andrea Milani (Italy)	Wei-Tou Ni (China PR)
Gerard Petit (France)	Michael Soffel (Germany)
David Vokrouhlicky (Czech Republic)	Clifford Will (USA)

LOCAL ORGANIZING COMMITTEE:(from US Naval Observatory)

	Michael Efroimsky (chair)	
John Bangert	George Kaplan	Brian Luzum
Kevin Marvel (AAS)	Demetrios Matsakis	Alice Monet
Sean Urban	William Wooden	Norbert Zacharias

PROCEEDINGS:

The Proceeding of the Symposium will be edited by Sergei Klioner (Germany), P. Kenneth Seidelmann (USA), and Michael Soffel (Germany), and published by Cambridge University Press within 6 months after the Symposium.

LOCAL ARRANGEMENTS:

The Symposium will be held in the Cavalier Hotel (<http://www.cavalierhotel.com/>) at Virginia Beach, a wonderful Atlantic resort in Virginia, USA. The expected special price of the hotel is US\$120 per night.

The registration fee of US \$320 until 31 January 2009, or US \$395 after this date. The expenses covered are conference materials, reception, light refreshments at coffee breaks, and a copy of proceedings.

There will be travel grants from the IAU for some participants.

Further details and information about registration and travel grants are available at <http://www.aas.org/divisions/meetings/iau/>.

AAS DIVISION on DYNAMICAL ASTRONOMY

The Symposium will be held back-to-back and at the same location with the 40th Annual Meeting of the Division on Dynamical Astronomy of the American Astronomical Society. The DDA Meeting is May 2-5. The merger is intended to facilitate a fruitful interaction between the two kindred scientific communities.

SYMPOSIUM SCIENTIFIC RATIONALE:

The tremendous progress in technology, which we have witnessed during the last 30 years, has led to enormous improvements of accuracy in the disciplines of astrometry and time. Considering the growth of accuracy of positional observations in the course of time, we see that during the 25 years between 1988 and 2013 we expect the same gain in accuracy (4.5 orders of magnitude) as that realized during the whole previous history of astrometry, from Hipparchus till 1988 (over 2000 years). Observational techniques like Lunar and Satellite Laser Ranging, Radar and Doppler Ranging, Very Long Baseline Interferometry, high-precision atomic clocks, etc., have made it possible to probe the kinematical and dynamical properties of celestial bodies to unprecedented accuracy. It is clear that for current accuracy requirements astronomical problems have to be formulated within the framework of Einstein's theory of gravity (General Relativity Theory). Many high-precision astronomical techniques have already required the application of relativistic effects, which are several orders of magnitude larger than the technical accuracy of observations. In order to interpret the results of such observations, one has to construct involved relativistic models. Many current and planned observational projects cannot achieve their goals if relativity is not taken into account properly. The future projects will require the introduction of higher order relativistic models.

To make the relativistic models consistent with each other for different observational techniques, to formulate them in the simplest possible way for a given accuracy, and to formulate them in a language understandable for astronomers and engineers who have little knowledge of relativity, are the challenges of a multidisciplinary research field called Applied Relativity. Applied Relativity emerged about 20-25 years ago, around the time of the first and only IAU Symposium devoted to that field, namely IAU Symposium 114 entitled "Relativity in celestial mechanics and astrometry" held in St. Petersburg,

Russia in 1985. This Symposium has the goal to overview and summarize the progress that Applied Relativity has made during the past quarter of a century and to develop the basis for the future of this discipline.

Since 1985 we have seen many changes in the field. The IAU has adopted a number of resolutions, where the standard IAU framework for relativistic modelling was formulated. The IERS Conventions, one of the most important documents containing a set of models used by the International Earth Rotation and Reference Systems Service (IERS), has become consistently relativistic. The impact of this development is far beyond the realm of fundamental astronomy. For example, the standard software libraries like SOFA and NOVAS, which are widely used by the astronomical community, have been influenced significantly by the developments in that field. Astronomical time scales and time transfer algorithms are known to be very sensitive to relativistic effects. Timing observations have the largest ratio between the size of relativistic effects and accuracy. The definitions of astronomical time scales, which are fully consistent with Relativity, were completed in 2006. Also, the dynamical modelling for the solar system (major and minor planets), for deep space navigation, and for the dynamics of Earth's satellites must be consistent with Relativity. Although a lot of effort has been made in these fields, there are many subtle issues, which become obvious from comparisons with models used in different fields. It is one of the goals of this Symposium to facilitate the exchange between astronomers working in different areas.

Since the formulation of General Relativity in 1915, astronomical observations have played a very important role for testing this theory. Three of the four classical tests of General Relativity are based on astronomical observations. The Symposium is expected to bring together both experts interpreting high-accuracy astronomical observations and physicists working in the field of General Relativity. It is expected that within a decade from now the main relativistic parameters will be measured with about 7 digits. Considering that at such a high level of accuracy interpretation of astronomical data becomes increasingly complicated and tricky, discussions among these two communities are highly desirable.

This meeting is expected

- 1) to summarize the advances in Applied Relativity in the past quarter of a century;
- 2) to highlight the astonishing achievements in testing General Relativity and to elucidate the tests to be expected in the near future;
- 3) to facilitate the communication and collaboration between scientists working with high-accuracy data of different kinds by providing a chance to meet at a common scientific meeting;
- 4) to consider and initiate the future developments of Applied Relativity.