



# the International Relativistic Astrophysics Ph.D. Erasmus Mundus Joint Doctorate Program

IRAP PhD

Following the successful scientific space missions by the European Space Agency (ESA) and the European Southern Observatory (ESO) in Chile, as well as the high energy particle activities at CERN in Genève, we have initiated a Ph.D. programme dedicated to create a pool of scientists in the field of relativistic astrophysics. After taking full advantage of the observational and experimental facilities mentioned above, the students of our programme are expected to lead the theoretical developments of one of the most active fields of research: relativistic astrophysics.

This program provides expertise in the most advanced topics of mathematical and theoretical physics, and in relativistic field theories, in the context of astronomy, astrophysics and cosmology. It provides the ability to model the observational data received from the above laboratories. This activity is necessarily international as no single university can have a scientific expertise in such a broad range of fields.

**We announce two calls: one with a deadline on 19 February 2012, sponsored by Erasmus Mundus, and the other with a deadline on 30 September 2011. The Erasmus Mundus program has a very competitive salary as well as comprehensive benefits.**

The Institutions participating in the IRAP PhD are: the international organization ICANet as coordinating institution and the University of Nice Sophia Antipolis as the host Institution; the Albert Einstein Institute, Potsdam; the Brazilian Center for Physics Research (CBPF) and ICRA Brasil; the Free University of Berlin; Indian Centre for Space Physics, Kolkata; Observatoire de la Côte d'Azur, Nice; Shanghai Astronomical Observatory, China; University of Ferrara, Italy; University of Rome, la Sapienza, Italy; University of Savoie, Annecy, France; University of Stockholm, Sweden, Tartu Observatory, Estonia. The Final Ph.D. degree will be jointly delivered by the Academic Institutions participating in the program.

**We encourage applications from the best candidates worldwide, independent of nationality, gender or background.**

**The Courses:** Each student will have to follow 180 hours of courses during the three years of the Ph.D. program. There is also a possibility to follow courses from other Physics, Mathematics, Astronomy and Astrophysics Ph.D. programs in each participating institution, after approval by the Faculty. Courses can be chosen from the following list:

#### VERY HIGH ENERGY PHENOMENA IN ASTROPHYSICS

Felix AHARONIAN  
Dublin Institute for Advanced Studies and  
Max Planck Institute für Kernphysik

#### COSMOLOGICAL SINGULARITY

Vladimir BELINSKI - ICANet

#### RELATIVISTIC EFFECTS IN ASTROPHYSICS

Carlo Luciano BIANCO  
SAPIENZA Università di Roma and ICANet

#### OBSERVERS AND OBSERVABLES IN BLACK HOLE SPACETIMES

Donato BINI - CNR and ICANet

#### ACCRETIONS ON BLACK HOLES

Sandip Kumar CHAKRABARTI  
S.N. Bose National Centre and Indian  
Centre for Space Physics

#### PARTICLE PHYSICS APPLIED TO ASTROPHYSICS

Pascal CHARDONNET  
University of Savoie and ICANet

#### GENERAL RELATIVITY

Thibault DAMOUR - IHES and ICANet

#### SUPERNOVAE AND GRBS

Massimo DELLA VALLE  
Osservatorio Astronomico di Capodimonte  
and ICANet

#### LARGE SCALE STRUCTURE

Jaani EINASTO - Tartu Observatory and ICANet

#### TOPICS IN COSMOLOGY AND PARTICLE ASTROPHYSICS

Li Zhi FANG  
University of Arizona and ICANet

#### X/GAMMA-RAY INSTRUMENTATION

Filippo FRONTERA  
University of Ferrara

#### HIGH ENERGY ASTROPHYSICS: X-RAYS CLUSTERS

Riccardo GIACCONI - ICANet

#### ON THE KERR SOLUTION

Roy KERR - ICANet



#### RELATIVISTIC FIELD THEORY

Hagen KLEINERT  
Freie Universität Berlin and ICANet

#### BOUNCING COSMOLOGY

Mario NOVELLO - CBPF Brazil and ICANet

#### BKL COSMOLOGY AND HIDDEN SYMMETRIES IN GRAVITY

Hermann NICOLAI  
Max-Planck-Institut für Gravitationsphysik  
(Albert Einstein Institut)

#### THE HIGH-ENERGY GAMMA-RAY UNIVERSE

Marco TAVANI  
INAF-IASF Roma and Università di Roma  
"Tor Vergata"

#### SPECTRAL TIMING FROM BLACK HOLE SOURCES

Lev TITARCHUK  
University of Ferrara

#### SINGULARITIES AND GENERAL RELATIVITY

Kjell ROSQUIST - Stockholm University

#### BLACK HOLES AND FUNDAMENTAL PHYSICS

Remo RUFFINI  
SAPIENZA Università di Roma and ICANet

#### RELATIVISTIC KINETIC THEORY

Gregory VERESHCHAGIN  
SAPIENZA Università di Roma and ICANet

#### STRONG COUPLING QED AND ELECTRON-POSITRON PLASMA

She-Sheng XUE  
SAPIENZA Università di Roma and ICANet

#### THEORIES ON GAMMA-RAY BURSTS

Bing ZHANG  
University of Nevada Las Vegas

#### X-RAY ASTROPHYSICS

Shuangnan ZHANG  
Institute of High Energy Physics – Chinese  
Academy of Science

#### The Faculty

Giovanni Amelino-Camelia  
SAPIENZA Università di Roma  
Vladimir Belinski  
SAPIENZA Università di Roma and ICANet  
Carlo Luciano Bianco  
SAPIENZA Università di Roma and ICANet  
Donato Bini  
CNR – Istit. per Applicaz. del Calcolo “M. Picone”  
Sandip Kumar Chakrabarti  
Indian Centre For Space Physics, India  
Pascal Chardonnet (Erasmus Mundus Coordinator)  
Université de Savoie  
Christian Cherubini  
Università “Campus Biomedico” di Roma  
Pierre Couillet  
Université de Nice - Sophie Antipolis  
Thibault Damour  
IHES, Bures-sur-Yvette  
Jaani Einasto  
Tartu Observatory  
Simonetta Filippi  
Univ. “Campus Biomedico” di Roma and ICANet  
Sergio Frasca  
SAPIENZA Università di Roma  
Filippo Frontera  
Università di Ferrara  
Yipeng Jing  
Shanghai Astronomical Observatory  
Hagen Kleinert  
Freie Universität Berlin  
Gian Luca Lippi  
Université de Nice Sophia-Antipolis  
Francois Mignard  
Observatoire de la Côte d'Azur  
Hermann Nicolai  
Max Planck Inst. for Gravitational Physics, Potsdam  
Mario Novello  
Brazilian Centre For Physics Research, Brazil  
José Pacheco  
Observatoire de la Côte d'Azur  
Kjell Rosquist  
Stockholm University  
Remo Ruffini (Director)  
SAPIENZA Università di Roma and ICANet  
Farrokh Vakili  
Observatoire de la Côte d'Azur  
Gregory Vereshchagin  
SAPIENZA Università di Roma and ICANet  
She Sheng Xue  
SAPIENZA Università di Roma and ICANet  
Shuangnan Zhang  
Institute of High Energy Physics – Chinese Academy of Science

#### The Host Institution for the call of 2012-2015

is the Université de Nice-Sophia Antipolis;  
Grand Château 28 Avenue Valrose 21 - B.P.  
2135 - 06103 NICE CEDEX 2

#### Applications and Fellowships:

In 2012-2015, 13 positions will be available.  
In the call of February 19, 2012, nine fellowships  
will be available within the ERASMUS MUNDUS  
program, with full economical support.  
See <http://www.irap-phd.org> or <http://www.irap-phd.eu>.  
In the call of September 30, 2012 four additional  
fellowships will be available: two with full financial  
support.  
See <http://www.icra.it> and <http://www.icranet.org>.

#### For further Information

please contact:  
Pina.Barbaro@unice.fr;  
chardonnet@lapp.in2p3.fr;  
secretariat-iraphd@icra.it;

