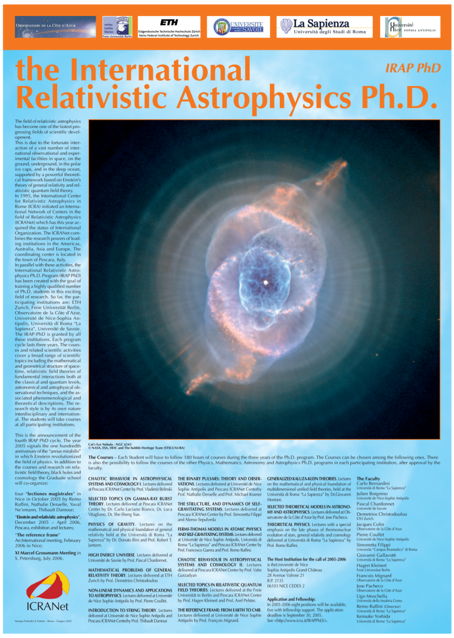
Enclosure 6



the International Relativistic Astrophysics Ph.D.

IRAP PhD

The field of relativistic astrophysics has become one of the fastest progressing fields of scientific development.

This is due to the fortunate interaction of a vast number of international observational and experimental facilities in space, on the ground, underground, in the polar ice caps, and in the deep ocean, supported by a powerful theoretical framework based on Einstein's theory of general relativity and relativistic quantum field theory.

In 1995, the International Center for Relativistic Astrophysics in Rome (ICRA) initiated an International Network of Centers in the field of Relativistic Astrophysics (ICRANet) which has this year acquired the status of International Organization. The ICRANet combines the research powers of leading institutions in the Americas, Australia, Asia and Europe. The coordinating center is located in the town of Pescara, Italy.

In parallel with these activities, the International Relativistic Astrophysics Ph.D. Program (IRAP PhD) has been created with the goal of training a highly qualified number of Ph.D. students in this exciting field of research. So far, the participating institutions are: ETH Zurich, Freie Universität Berlin, Observatoire de la Côte d'Azur, Université de Nice-Sophia Antipolis, Università di Roma "La Sapienza", Université de Savoie. The IRAP-PhD is granted by all these institutions. Each program cycle lasts three years. The courses and related scientific activities cover a broad range of scientific topics including the mathematical and geometrical structure of spacetime, relativistic field theories of fundamental interactions both at the classical and quantum levels, astronomical and astrophysical observational techniques, and the associated phenomenological and theoretical descriptions. The research style is by its own nature interdisciplinary and international. The students will take courses at all participating institutions.

This is the announcement of the fourth IRAP PhD cycle. The year 2005 signals the one hundredth anniversary of the "annus mirabilis" in which Einstein revolutionized the field of physics. In addition to the courses and research on relativistic field theory, black holes and cosmology the Graduate school will co-organize:

four "**lectiones magistrales**" in Nice in October 2005 by Remo Ruffini, Nathalie Deruelle, Yuval Ne'emann, Thibault Damour;

"**Einstein and relativistic astrophysics**", December 2005 – April 2006, Pescara, exhibition and lectures;

"**The reference frame**"
An International meeting, February 2006 in Nice;

XI Marcel Grossmann Meeting in S. Petersburg, July 2006.

Cat's Eye Nebula - NGC 6543
© NASA, ESA, HEIC and The hubble Heritage Team (STSCI/AURA)

The Courses – Each Student will have to follow 180 hours of courses during the three years of the Ph.D. program. The Courses can be chosen among the following ones. There is also the possibility to follow the courses of the other Physics, Mathematics, Astronomy and Astrophysics Ph.D. programs in each participating institution, after approval by the faculty.

CHAOTIC BEHAVIOR IN ASTROPHYSICAL SYSTEMS AND COSMOLOGY I. Lectures delivered at Pescara ICRANet Center by Prof. Vladimir Belinski

SELECTED TOPICS ON GAMMA-RAY BURST THEORY. Lectures delivered at Pescara ICRANet Center by Dr. Carlo Luciano Bianco, Dr. Luca Vitagliano, Dr. She-Sheng Xue.

PHYSICS OF GRAVITY. Lectures on the mathematical and physical foundation of general relativity held at the Università di Roma "La Sapienza" by Dr. Donato Bini and Prof. Robert T. Jantzen.

HIGH ENERGY UNIVERSE. Lectures delivered at Université de Savoie by Prof. Pascal Chardonnet.

MATHEMATICAL PROBLEMS OF GENERAL RELATIVITY THEORY. Lectures delivered at ETH Zurich by Prof. Demetrios Christodoulou

NON-LINEAR DYNAMICS AND APPLICATIONS TO ASTROPHYSICS. Lectures delivered at Université de Nice Sophie Antipolis by Prof. Pierre Coullet.

INTRODUCTION TO STRING THEORY. Lectures delivered at Université de Nice Sophie Antipolis and Pescara ICRANet Centerby Prof. Thibault Damour

THE BINARY PULSARS: THEORY AND OBSERVATIONS. Lectures delivered at Université de Nice Sophie Antipolis and Pescara ICRANet Centerby Prof. Nathalie Deruelle and Prof. Michael Kramer

THE STRUCTURE, AND DYNAMICS OF SELF-GRAVITATING SYSTEMS. Lectures delivered at Pescara ICRANet Center by Prof. Simonetta Filippi and Alonso Sepulveda

FERMI-THOMAS MODELS IN ATOMIC PHYSICS AND SELF-GRAVITATING SYSTEMS. Lectures delivered at Université de Nice Sophie Antipolis, Università di Roma "La Sapienza" and Pescara ICRANet Center by Prof. Francesco Guerra and Prof. Remo Ruffini.

CHAOTIC BEHAVIOUR IN ASTROPHYSICAL SYSTEMS AND COSMOLOGY II. Lectures delivered at Pescara ICRANet Center by Prof. Vahe Gurzadyan

SELECTED TOPICS IN RELATIVISTIC QUANTUM FIELD THEORIES. Lectures delivered at the Freie Universität in Berlin and Pescara ICRANet Center by Prof. Hagen Kleinert and Prof. Axel Pelster.

THE REFERENCE FRAME: FROM EARTH TO CMB. Lectures delivered at Université de Nice Sophie Antipolis by Prof. François Mignard.

GENERALIZED KALUZA-KLEIN THEORIES. Lectures on the mathematical and physical foundation of multidimensional unified field theories, held at the Università di Roma "La Sapienza" by Dr.Giovanni Montani.

SELECTED THEORETICAL MODELS IN ASTRONOMY AND ASTROPHYSICS. Lectures delivered at Observatoire de la Côte d'Azur by Prof. Jose Pacheco.

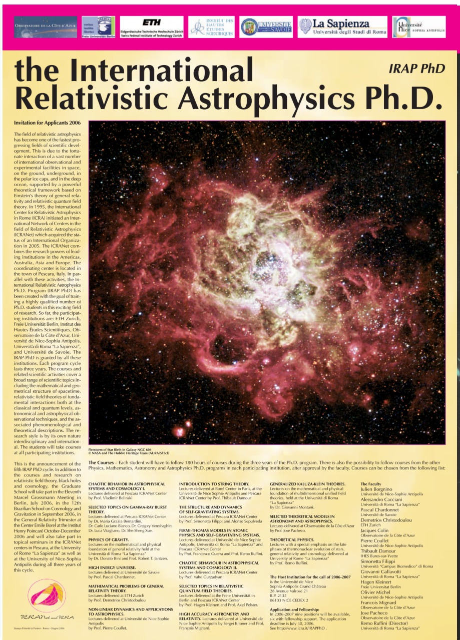
THEORETICAL PHYSICS. Lectures with a special emphasis on the late phases of thermonuclear evolution of stars, general relativity and cosmology delivered at Università di Roma "La Sapienza" by Prof. Remo Ruffini.

The Host Institution for the call of 2005-2006
is theUniversité de Nice
Sophia Antipolis Grand Château
28 Avenue Valrose 21
B.P. 2135
06103 NICE CEDEX 2

Application and Fellowship:
In 2005-2006 eight positions will be available, five with fellowship support. The application deadline is September 30, 2005.
See <http://www.icra.it/IRAPPhD/>.

The Faculty
Carlo Bernardini
Università di Roma "La Sapienza"
Julien Borgnino
Université de Nice-Sophie Antipolis
Pascal Chardonnet
Université de Savoie
Demetrios Christodoulou
ETH Zurich
Jacques Colin
Observatoire de la Côte d'Azur
Pierre Coullet
Université de Nice-Sophie Antipolis
Simonetta Filippi
Università "Campus Biomedico" di Roma
Giovanni Gallavotti
Università di Roma "La Sapienza"
Hagen Kleinert
Freie Universitat Berlin
Francois Mignard
Observatoire de la Côte d'Azur
Jose Pacheco
Observatoire de la Côte d'Azur
Ugo Moschella
Università della Insubria Como
Remo Ruffini (Director)
Università di Roma "La Sapienza"
Kensuke Yoshida
Università di Roma "La Sapienza"

Stampa Palombi & Partner - Roma - Giugno 2005



the International Relativistic Astrophysics Ph.D.

IRAP PhD

Invitation for Applicants 2006

The field of relativistic astrophysics has become one of the fastest progressing fields of scientific development. This is due to the fortunate interaction of a vast number of international observational and experimental facilities in space, on the ground, underground, in the polar ice caps, and in the deep ocean, supported by a powerful theoretical framework based on Einstein's theory of general relativity and relativistic quantum field theory. In 1995, the International Center for Relativistic Astrophysics in Rome (ICRA) initiated an International Network of Centers in the field of Relativistic Astrophysics (ICRANet) which acquired the status of an International Organization in 2005. The ICRANet combines the research powers of leading institutions in the Americas, Australia, Asia and Europe. The coordinating center is located in the town of Pescara, Italy. In parallel with these activities, the International Relativistic Astrophysics Ph.D. Program (IRAP PhD) has been created with the goal of training a highly qualified number of Ph.D. students in this exciting field of research. So far, the participating institutions are: ETH Zurich, Freie Universität Berlin, Institut des Hautes Études Scientifiques, Observatoire de la Côte d'Azur, Université de Nice-Sophia Antipolis, Università di Roma "La Sapienza", and Université de Savoie. The IRAP-PhD is granted by all these institutions. Each program cycle lasts three years. The courses and related scientific activities cover a broad range of scientific topics including the mathematical and geometrical structure of spacetime, relativistic field theories of fundamental interactions both at the classical and quantum levels, astronomical and astrophysical observational techniques, and the associated phenomenological and theoretical descriptions. The research style is by its own nature interdisciplinary and international. The students will take courses at all participating institutions.

This is the announcement of the fifth IRAP PhD cycle. In addition to the courses and research on relativistic field theory, black holes and cosmology, the Graduate School will take part in the Eleventh Marcel Grossmann Meeting in Berlin, July 2006, in the 12th Brazilian School on Cosmology and Gravitation in September 2006, in the General Relativity Trimester at the Center Emile Borel at the Institut Henry Poincaré October-December 2006 and will also take part in topical seminars in the ICRANet centers in Pescara, at the University of Rome "La Sapienza" as well as at the University of Nice-Sophia Antipolis during all three years of this cycle.

Firestorm of Star Birth In Galaxy NGC 604
© NASA and The Hubble Heritage Team (AURA/STScI)

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Lectures delivered at Pescara ICRANet Center
by Prof. Vladimir Belinski

SELECTED TOPICS ON GAMMA-RAY BURST THEORY.
Lectures delivered at Pescara ICRANet Center
by Dr. Maria Grazia Bernardini,
Dr. Carlo Luciano Bianco, Dr. Gregory Vereshaghin,
Dr. Luca Vitagliano, Dr. She-Sheng Xue.

PHYSICS OF GRAVITY.
Lectures on the mathematical and physical foundation of general relativity held at the Università di Roma "La Sapienza"
by Dr. Donato Bini and Prof. Robert T. Jantzen.

HIGH ENERGY UNIVERSE.
Lectures delivered at Université de Savoie
by Prof. Pascal Chardonnet.

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Lectures delivered at Université de Nice Sophie Antipolis
by Prof. Pierre Coullet.

INTRODUCTION TO STRING THEORY.
Lectures delivered at Borel Center in Paris, at the Université de Nice Sophie Antipolis and Pescara ICRANet Center by Prof. Thibault Damour

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Lectures delivered at the Freie Universität in Berlin and Pescara ICRANet Center
by Prof. Hagen Kleinert and Prof. Axel Pelster.

HIGH ACCURACY ASTROMETRY AND RELATIVITY. Lectures delivered at Université de Nice Sophie Antipolis by Sergei Klioner and Prof. François Mignard.

GENERALIZED KALUZA-KLEIN THEORIES.
Lectures on the mathematical and physical foundation of multidimensional unified field theories, held at the Università di Roma "La Sapienza"
by Dr. Giovanni Montani.

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28 Avenue Valrose 21
B.P. 2135
06103 NICE CEDEX 2

Application and Fellowship:
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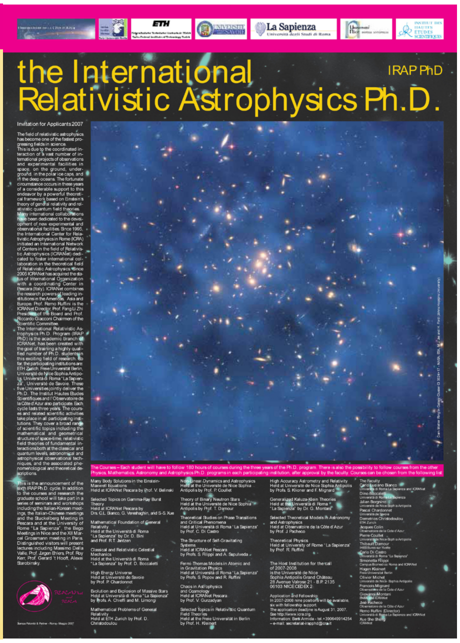
See http://www.icra.it/IRAPPhD .

The Faculty
Julien Borgnino
Université de Nice-Sophie Antipolis
Alessandro Cacciani
Università di Roma "La Sapienza"
Pascal Chardonnet
Université de Savoie
Demetrios Christodoulou
ETH Zurich
Jacques Colin
Observatoire de la Côte d'Azur
Pierre Coullet
Université de Nice-Sophie Antipolis
Thibault Damour
IHES Bures-sur-Yvette
Simonetta Filippi
Università "Campus Biomedico" di Roma
Giovanni Gallavotti
Università di Roma "La Sapienza"
Hagen Kleinert
Freie Universitat Berlin
Olivier Michel
Université de Nice-Sophie Antipolis
Francois Mignard
Observatoire de la Côte d'Azur
Jose Pacheco
Observatoire de la Côte d'Azur
Remo Ruffini (Director)
Università di Roma "La Sapienza"

Stampa Palombi & Partner - Roma - Giugno 2006



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IRAP PhD

Invitation for Applicants 2007

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This is due to the coordinated interaction of a vast number of international projects of observations and experimental facilities in space, on the ground, underground, in the polar ice caps, and in the deep oceans. The fortunate circumstance occurs in these years of a considerable support to this endeavor by a powerful theoretical framework based on Einstein's theory of general relativity and relativistic quantum field theories.

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This is the announcement of the sixth IRAP Ph.D. cycle. In addition to the courses and research the graduate school will take part in a series of seminars and workshops including the Italian-Korean meetings, the Italian-Chinese meetings and the Stuckelberg Meeting in Pescara and at the University of Rome "La Sapienza", the Bego Meetings in Nice and the XII Marcel Grossmann meeting in Paris. Distinguished visitors will present lectures including Massimo Della Valle, Prof. Jürgen Ehlers, Prof. Roy Kerr, Prof. Gerard 't Hooft, Alexei Starobinsky.

Dark Matter Ring In Galaxy Cluster Cl 0024+17 - NASA, ESA, M. J. Jee and H. Ford (Johns Hopkins University)

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Selected Topics on Gamma-Ray Burst Theory
Held at ICRANet Pescara by
Drs. C.L. Bianco, G. Vereshaghin, and S-S. Xue

Mathematical Foundation of General Relativity
Held at the Università di Roma
"La Sapienza" by Dr. D. Bini
and Prof. R.T. Jantzen

Classical and Relativistic Celestial Mechanics
Held at the Università di Roma
"La Sapienza" by Prof. D. Boccaletti

High Energy Universe
Held at Université de Savoie
by Prof. P. Chardonnet

Evolution and Explosion of Massive Stars
Held at Università di Roma "La Sapienza"
by Profs. A. Chieffi and M. Limongi

Mathematical Problems of General Relativity
Held at ETH Zurich by Prof. D. Christodoulou

Non-Linear Dynamics and Astrophysics
Held at the Université de Nice Sophia Antipolis by Prof. P. Coullet

Theory of Binary Neutron Stars
Held at the Université de Nice Sophia Antipolis by Prof. T. Damour

Theoretical Studies on Phase Transitions and Critical Phenomena
Held at Università di Roma "La Sapienza"
by Prof. C. Di Castro

The Structure of Self-Gravitating Systems
Held at ICRANet Pescara
by Profs. S. Filippi and A. Sepulveda

Fermi-Thomas Models in Atomic and in Gravitation Physics
Held at Università di Roma "La Sapienza"
by Profs. S. Popov and R. Ruffini

Chaos in Astrophysics and Cosmology
Held at ICRANet Pescara
by Prof. V. Gurzadyan

Selected Topics in Relativistic Quantum Field Theories
Held at the Freie Universität in Berlin
by Prof. H. Kleinert

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Generalized Kaluza-Klein Theories
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Theoretical Physics
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The application deadline is August 31, 2007.
See http://www.icra.org.
Information: Berti Armida - tel.+390649914254
– e-mail: secretariat-irapphd@cra.it

The Faculty
Carlo Luciano Bianco
Università di Roma La Sapienza and ICRANet
Dino Boccaletti
Università di Roma La Sapienza
Julien Borgnino
Université de Nice-Sophia Antipolis
Pascal Chardonnet
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Demetrios Christodoulou
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Simonetta Filippi
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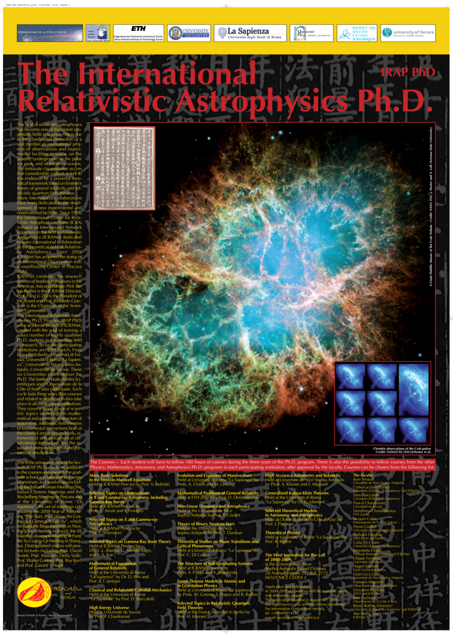
Hagen Kleinert
Freie Universitat Berlin
Olivier Michel
Université de Nice- Sophia Antipolis
Francois Mignard
Observatoire de la Cote d'Azur
Giovanni Montani
ENEA and ICRANet
José Pacheco
Observatoire de la Côte d'Azur
Remo Ruffini (Director)
Università di Roma La Sapienza and ICRANet
Xue She Sheng
ICRANet

Stampa Palombi & Partner - Roma - Maggio 2007

IRAP PhD 2008(50x70)_print 6-06-2008 15:32 Pagina 1



The International Relativistic Astrophysics Ph.D.

IRAP PhD

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This is the announcement of the seventh IRAP Ph.D. cycle. In addition to the courses and research the graduate school will take part in a series of seminars and workshops including the Italian-Korean Meetings, the Italian-Chinese Meetings and the Stuckelberg Meetings in Pescara and at the University of Rome "La Sapienza", the set of meetings celebrating the 2009 Year of Astronomy "The Stars, the Galaxy, the Cosmos for General Relativity", which includes the Bego Meetings in Nice, the Sobral Meeting in Brazil, the XII Marcel Grossmann Meeting in Paris, the Xu Guang-Qi Meeting in Shanghai. Distinguished visitors will present lectures including Prof. David Arnett, Prof. Massimo Della Valle, Prof. Walter Greiner, Prof. Roy Kerr, and Prof. Gerard 't Hooft.

A Giant Hubble Mosaic of the Crab Nebula - Credit: NASA, ESA, J. Hester and A. Loll (Arizona State University)

Chandra observations of the Crab pulsar
Credit: NASA/CXC/ASU/J.Hester et al.

The Courses – Each student will have to follow 180 hours of courses during the three years of the Ph.D. program. There is also the possibility to follow courses from the 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:

Many Body Solutions in the Einstein-Maxwell Equations
Held at ICRANet Pescara by Prof. V. Belinski

Selected Topics on Observations in X and Gamma-ray Astronomy, including Gamma-Ray Bursts
Held at ICRANet Pescara by
Profs. L. Amati and F. Frontera

Selected Topics on X and Gamma-ray Astrophysics
Held at ICRANet Pescara by
Prof. F. Aharonian

Selected Topics on Gamma-Ray Burst Theory
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Drs. C.L. Bianco, G. Vereshchagin,
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Sophia Antipolis by Prof. P. Coullet

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Application and Fellowships
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The application deadline is August 31st, 2008.
See http://www.icra.it/ and http://www.icranet.org/.
For information contact Berti Armida,
tel. +390649914254,
e-mail: secretariat-irapphd@icra.it

The Faculty
Jean Arnaud
Université de Nice-Sophia Antipolis
Carlo Luciano Bianco
Università di Roma "La Sapienza" and ICRANet
Dino Boccaletti
Università di Roma "La Sapienza"
Pascal Chardonnet
Université de Savoie
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Simonetta Filippi
Campus Biomedico Roma and ICRANet
Filippo Frontera
Università di Ferrara
Hagen Kleinert
Freie Universitat Berlin
Gian Luca Lippi
Université de Nice-Sophia Antipolis
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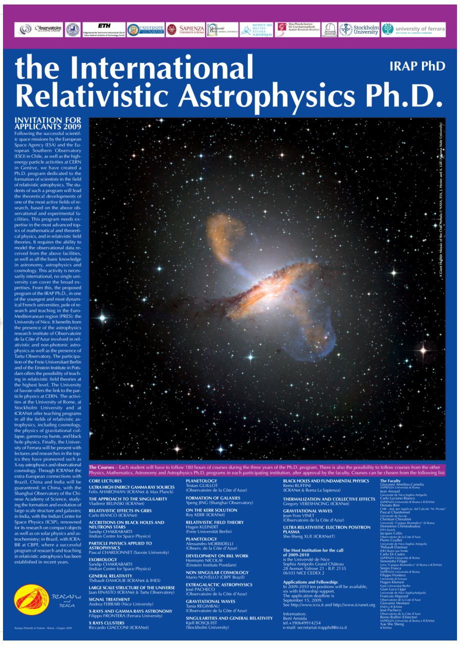
Giovanni Montani
ENEA and ICRANet
José Pacheco
Observatoire de la Côte d'Azur
Remo Ruffini (Director)
Università di Roma "La Sapienza" and ICRANet
She-Sheng Xue
ICRANet

Stampa Palombi & Partner - Roma - Giugno 2008



the International Relativistic Astrophysics Ph.D.

IRAP PhD

INVITATION FOR APPLICANTS 2009

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 created a Ph.D. program dedicated to the formation of scientists in the field of relativistic astrophysics. The students of such a program will lead the theoretical developments of one of the most active fields of research, based on the above observational and experimental facilities. This program needs expertise in the most advanced topics of mathematical and theoretical physics, and in relativistic field theories. It requires the ability to model the observational data received from the above facilities, as well as all the basic knowledge in astronomy, astrophysics and cosmology. This activity is necessarily international, no single university can cover the broad expertises. From this, the proposed program of the IRAP Ph.D., in one of the youngest and most dynamical French universities, pole of research and teaching in the Euro-Mediterranean region (PRES): the University of Nice. It benefits from the presence of the astrophysics research institute of Observatoire de la Côte d'Azur involved in relativistic and non-photonic astrophysics as well as the presence of Tartu Observatory. The participation of the Freie Universitaet Berlin and of the Einstein Institute in Potsdam offers the possibility of teaching in relativistic field theories at the highest level. The University of Savoie offers the link to the particle physics at CERN. The activities at the University of Rome, at Stockholm University and at ICRANet offer teaching programs in all the fields of relativistic astrophysics, including cosmology, the physics of gravitational collapse, gamma-ray bursts, and black hole physics. Finally, the University of Ferrara will be present with lectures and researches in the topics they have pioneered such as X-ray astrophysics and observational cosmology. Through ICRANet the extra-European connections with Brazil, China and India will be guaranteed: in China, with the Shanghai Observatory of the Chinese Academy of Science, studying the formation and evolution of large-scale structure and galaxies; in India, with the Indian Centre for Space Physics (ICSP), renowned for its research on compact objects as well as on solar physics and astrochemistry; in Brazil, with ICRABR at CBPF, where a successful program of research and teaching in relativistic astrophysics has been established in recent years.

The Courses – Each student will have to follow 180 hours of courses during the three years of the Ph.D. program. There is also the possibility to follow courses from the 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:

CORE LECTURES

ULTRA HIGH ENERGY GAMMA RAY SOURCES
Felix AHARONIAN (ICRANet & Max Planck)

THE APPROACH TO THE SINGULARITY
Vladimir BELINSKI (ICRANet)

RELATIVISTIC EFFECTS IN GRBS
Carlo BIANCO (ICRANet)

ACCRETIONS ON BLACK HOLES AND NEUTRONS STARS
Sandip CHAKRABARTI
(Indian Centre for Space Physics)

PARTICLE PHYSICS APPLIED TO ASTROPHYSICS
Pascal CHARDONNET (Savoie University)

EXOBIOLOGY
Sandip CHAKRABARTI
(Indian Centre for Space Physics)

GENERAL RELATIVITY
Thibault DAMOUR (ICRANet & IHES)

LARGE SCALE STRUCTURE OF THE UNIVERSE
Jaan EINASTO (ICRANet & Tartu Observatory)

SIGNAL TREATMENT
Andrea FERRARI (Nice University)

X-RAYS AND GAMMA RAYS ASTRONOMY
Filippo FRONTERA (Ferrara University)

X RAYS CLUSTERS
Riccardo GIACCONI (ICRANet)

PLANETOLOGY
Tristan GUILLOT
(Observatoire de la Côte d'Azur)

FORMATION OF GALAXIES
Ypeng JING (Shanghai Observatory)

ON THE KERR SOLUTION
Roy KERR (ICRANet)

RELATIVISTIC FIELD THEORY
Hagen KLEINERT
(Freie Universität Berlin)

PLANETOLOGY
Alessandro MORBIDELLI
(Observ. de la Côte d'Azur)

DEVELOPMENT ON BKL WORK
Hermann NICOLAI
(Einstein Institute Postdam)

NON SINGULAR COSMOLOGY
Mario NOVELLO (CBPF Brazil)

EXTRAGALACTIC ASTROPHYSICS
José PACHECO
(Observatoire de la Côte d'Azur)

GRAVITATIONAL WAVES
Tania REGIMBAU
(Observatoire de la Côte d'Azur)

SINGULARITIES AND GENERAL RELATIVITY
Kjell ROSQUIST
(Stockholm University)

BLACK HOLES AND FUNDAMENTAL PHYSICS
Remo RUFFINI
(ICRANet & Roma La Sapienza)

THERMALIZATION AND COLLECTIVE EFFECTS
Gregory VERESHACING (ICRANet)

GRAVITATIONAL WAVES
Jean-Yves VINET
(Observatoire de la Côte d'Azur)

ULTRA RELATIVISTIC ELECTRON POSITRON PLASMA
She-Sheng XUE (ICRANetT)

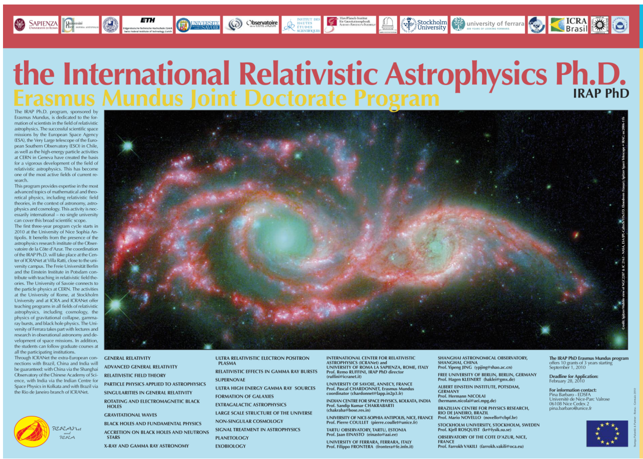
The Host Institution for the call of 2009-2010
is the Université de Nice
Sophia Antipolis Grand Château
28 Avenue Valrose 21 - B.P. 2135
06103 NICE CEDEX 2

Applications and Fellowship:
In 2009-2010 ten positions will be available,
six with fellowship support.
The application deadline is
September 15, 2009.
See http://www.icra.it and http://www.icranet.org

Information:
Berti Armida
tel.+390649914254
e-mail: secretariat-irapphd@icra.it

The Faculty
Giovanni Amelino-Camelia
SAPIENZA Università di Roma
Jean Arnaud
Université de Nice-Sophia Antipolis
Carlo Luciano Bianco
SAPIENZA Università di Roma e ICRANet
Donato Bini
CNR – Istit. per Applicaz. del Calcolo "M. Picone"
Pascal Chardonnet
Université de Savoie
Christian Cherubini
Università "Campus Biomedico" di Roma
Demetrios Christodoulou
ETH Zurich
Jacques Colin
Observatoire de la Cote d'Azur
Pierre Coullet
Université de Nice-Sophie Antipolis
Thibault Damour
IHES Bures-sur-Yvette
Carlo Di Castro
SAPIENZA Università di Roma
Simonetta Filippi
Univ."Campus Biomedico" di Roma e ICRANet
Sergio Frasca
SAPIENZA Università di Roma
Filippo Frontera
Università di Ferrara
Hagen Kleinert
Freie Universitat Berlin
Gian Luca Lippi
Université de Nice SophiaAntipolis
Francois Mignard
Observatoire de la Cote d'Azur
Giovanni Montani
ENEA e ICRANet
José Pacheco
Observatoire de la Cote d'Azur
Remo Ruffini (Director)
SAPIENZA Università di Roma e ICRANet
Xue She Sheng
ICRANet

Stampa Palombi & Partner - Roma - Giugno 2009



the International Relativistic Astrophysics Ph.D.

Erasmus Mundus Joint Doctorate Program

IRAP PhD

The IRAP Ph.D. program, sponsored by Erasmus Mundus, is dedicated to the formation of scientists in the field of relativistic astrophysics. The successful scientific space missions by the European Space Agency (ESA), the Very Large telescope of the European Southern Observatory (ESO) in Chile, as well as the high-energy particle activities at CERN in Geneva have created the basis for a vigorous development of the field of relativistic astrophysics. This has become one of the most active fields of current research.

This program provides expertise in the most advanced topics of mathematical and theoretical physics, including relativistic field theories, in the context of astronomy, astrophysics and cosmology. This activity is necessarily international – no single university can cover this broad scientific scope.

The first three-year program cycle starts in 2010 at the University of Nice Sophia Antipolis. It benefits from the presence of the astrophysics research institute of the Observatoire de la Côte d'Azur. The coordination of the IRAP Ph.D. will take place at the Center of ICRANet at Villa Ratti, close to the university campus. The Freie Universität Berlin and the Einstein Institute in Potsdam contribute with teaching in relativistic field theories. The University of Savoie connects to the particle physics at CERN. The activities at the University of Rome, at Stockholm University and at ICRA and ICRANet offer teaching programs in all fields of relativistic astrophysics, including cosmology, the physics of gravitational collapse, gamma-ray bursts, and black hole physics. The University of Ferrara takes part with lectures and research in obserational astronomy and development of space missions. In addition, the students can follow graduate courses at all the participating institutions.

Through ICRANet the extra-European connections with Brazil, China and India will be guaranteed: with China via the Shanghai Observatory of the Chinese Academy of Science, with India via the Indian Centre for Space Physics in Kolkata and with Brazil via the Rio de Janeiro branch of ICRANet.

Credit: Spitzer/Hubble view of NGC2207 & IC 2163 - NASA, ESA/JPL-Caltech/STScI/D. Elmegreen (Vassar); Spitzer Space Telescope • IRAC: ssc2006-11b

GENERAL RELATIVITY
ADVANCED GENERAL RELATIVITY
RELATIVISTIC FIELD THEORY
PARTICLE PHYSICS APPLIED TO ASTROPHYSICS
SINGULARITIES IN GENERAL RELATIVITY
ROTATING AND ELECTROMAGNETIC BLACK HOLES
GRAVITATIONAL WAVES
BLACK HOLES AND FUNDAMENTAL PHYSICS
ACCRETION ON BLACK HOLES AND NEUTRONS STARS
X-RAY AND GAMMA RAY ASTRONOMY
ULTRA RELATIVISTIC ELECTRON POSITRON PLASMA
RELATIVISTIC EFFECTS IN GAMMA RAY BURSTS
SUPERNOVAE
ULTRA HIGH ENERGY GAMMA RAY SOURCES
FORMATION OF GALAXIES
EXTRAGALACTIC ASTROPHYSICS
LARGE SCALE STRUCTURE OF THE UNIVERSE
NON-SINGULAR COSMOLOGY
SIGNAL TREATMENT IN ASTROPHYSICS
PLANETOLOGY
EXOBIOLOGY

INTERNATIONAL CENTER FOR RELATIVISTIC ASTROPHYSICS (ICRANet) and UNIVERSITY OF ROMA LA SAPIENZA, ROME, ITALY
Prof. Remo RUFFINI, IRAP PhD director (ruffini@icranet.it)

UNIVERSITY OF SAVOIE, ANNECY, FRANCE
Prof. Pascal CHARDONNET, Erasmus Mundus coordinator (chardonnet@lapp.in2p3.fr)

INDIAN CENTRE FOR SPACE PHYSICS, KOLKATA, INDIA
Prof. Sandip Kumar CHAKRABARTI (chakraba@bose.res.in)

UNIVERSITY OF NICE-SOPHIA ANTIPOLIS, NICE, FRANCE
Prof. Pierre COULLET (pierre.coullet@unice.fr)

TARTU OBSERVATORY, TARTU, ESTONIA
Prof. Jaan EINASTO (einasto@aai.ee)

UNIVERSITY OF FERRARA, FERRARA, ITALY
Prof. Filippo FRONTERA (frontera@fe.infn.it)

SHANGHAI ASTRONOMICAL OBSERVATORY, SHANGHAI, CHINA
Prof. Yipeng JING (ypjing@shao.ac.cn)

FREE UNIVERSITY OF BERLIN, BERLIN, GERMANY
Prof. Hagen KLEINERT (haklei@gmx.de)

ALBERT EINSTEIN INSTITUTE, POTSDAM, GERMANY
Prof. Hermann NICOLAI (hermann.nicolai@aei.mpg.de)

BRAZILIAN CENTRE FOR PHYSICS RESEARCH, RIO DE JANEIRO, BRAZIL
Prof. Mario NOVELLO (novello@cbpf.br)

STOCKHOLM UNIVERSITY, STOCKHOLM, SWEDEN
Prof. Kjell ROSQUIST (kr@fysik.su.se)

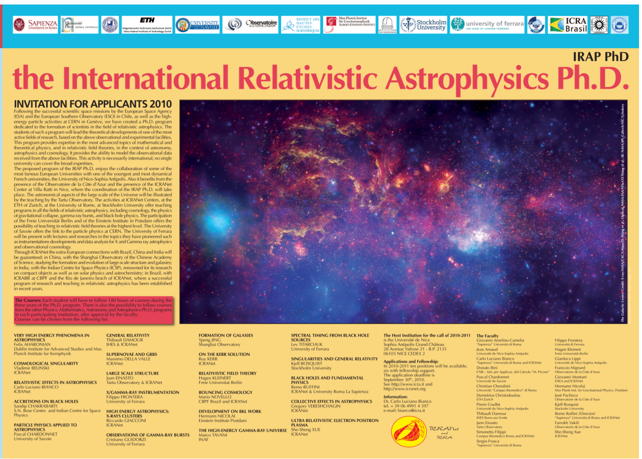
OBSERVATORY OF THE COTE D'AZUR, NICE, FRANCE
Prof. Farrokh VAKILI (farrokh.vakili@oca.eu)

The IRAP PhD Erasmus Mundus program
offers 10 grants of 3 years starting September 1, 2010

Deadline for Application:
February 28, 2010

For information contact:
Pina Barbaro - EDSFA
Université de Nice-Parc Valrose
06108 Nice Cedex 2
pina.barbaro@unice.fr

Stampa Palombi & Partner - Roma - Gennaio 2010



the International Relativistic Astrophysics Ph.D.

IRAP PhD

INVITATION FOR APPLICANTS 2010

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 created a Ph.D. program dedicated to the formation of scientists in the field of relativistic astrophysics. The students of such a program will lead the theoretical developments of one of the most active fields of research, based on the above observational and experimental facilities. 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 facilities. This activity is necessarily international, no single university can cover the broad expertises.

The proposed program of the IRAP Ph.D. enjoys the collaboration of some of the most famous European Universities with one of the youngest and most dynamical French universities, the University of Nice-Sophia Antipolis. Also it benefits from the presence of the Observatoire de la Côte d'Azur and the presence of the ICRANet Center at Villa Ratti in Nice, where the coordination of the IRAP Ph.D. will take place. The astronomical aspects of the large scale of the Universe will be illustrated by the teaching by the Tartu Observatory. The activities at ICRANet Centers, at the ETH of Zurich, at the University of Rome, at Stockholm University offer teaching programs in all the fields of relativistic astrophysics, including cosmology, the physics of gravitational collapse, gamma-ray bursts, and black hole physics. The participation of the Freie Universität Berlin and of the Einstein Institute in Potsdam offers the possibility of teaching in relativistic field theories at the highest level. The University of Savoie offers the link to the particle physics at CERN. The University of Ferrara will be present with lectures and researches in the topics they have pioneered such as instrumentations developments and data analysis for X and Gamma ray astrophysics and observational cosmology.

Through ICRANet the extra-European connections with Brazil, China and India will be guaranteed: in China, with the Shanghai Observatory of the Chinese Academy of Science, studying the formation and evolution of large-scale structure and galaxies; in India, with the Indian Centre for Space Physics (ICSP), renowned for its research on compact objects as well as on solar physics and astrochemistry; in Brazil, with ICRABR at CBPF and the Rio de Janeiro brach of ICRANet, where a successful program of research and teaching in relativistic astrophysics has been established in recent years.

The Courses: Each student will have to follow 180 hours of courses during the three years of the Ph.D. program. There is also the possibility to follow courses from the 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:

The Galactic Center. Credit: X-ray:NASA/CXC/UMass/D. Wang et al.;

VERY HIGH ENERGY PHENOMENA IN ASTROPHYSICS
Felix AHARONIAN
Dublin Institute for Advanced Studies and Max Planck Institute fur Kernphysik

COSMOLOGICAL SINGULARITY
Vladimir BELINSKI
ICRANet

RELATIVISTIC EFFECTS IN ASTROPHYSICS
Carlo Luciano BIANCO
ICRANet

ACCRETIONS ON BLACK HOLES
Sandip CHAKRABARTI
S.N. Bose Centre and Indian Centre for Space Physics

PARTICLE PHYSICS APPLIED TO ASTROPHYSICS
Pascal CHARDONNET
University of Savoie

GENERAL RELATIVITY
Thibault DAMOUR
IHES & ICRANet

SUPERNOVAE AND GRBS
Massimo DELLA VALLE
ICRANet

LARGE SCALE STRUCTURE
Jaan EINASTO
Tartu Observatory & ICRANet

X/GAMMA-RAY INSTRUMENTATION
Filippo FRONTERA
University of Ferrara

HIGH ENERGY ASTROPHYSICS: X-RAYS CLUSTERS
Riccardo GIACCONI
ICRANet

OBSERVATIONS OF GAMMA-RAY BURSTS
Cristiano GUIDORZI
University of Ferrara

FORMATION OF GALAXIES
Ypeng JING
Shanghai Observatory

ON THE KERR SOLUTION
Roy KERR
ICRANet

RELATIVISTIC FIELD THEORY
Hagen KLEINERT
Freie Universitat Berlin

BOUNCING COSMOLOGY
Mario NOVELLO
CBPF Brazil and ICRANet

DEVELOPMENT ON BKL WORK
Hermann NICOLAI
Einstein Institute Postdam

THE HIGH-ENERGY GAMMA-RAY UNIVERSE
Marco TAVANI
INAF

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
ICRANet & University Roma La Sapienza

COLLECTIVE EFFECTS IN ASTROPHYSICS
Gregory VERESHCHAGIN
ICRANet

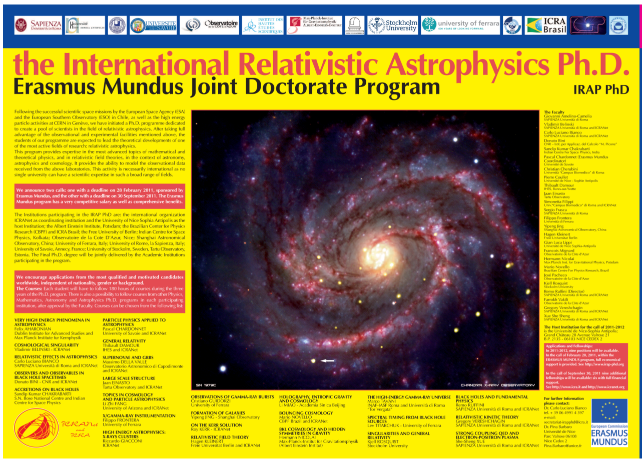
ULTRA RELATIVISTIC ELECTRON POSITRON PLASMA
She-Sheng XUE
ICRANet

The Host Institution for the call of 2010-2011
is the Université de Nice
Sophia Antipolis Grand Château
28 Avenue Valrose 21 - B.P. 2135
06103 NICE CEDEX 2

Applications and Fellowship:
In 2010-2011 ten positions will be available,
six with fellowship support.
The application deadline is
September 30th, 2010.
See http://www.icra.it and
http://www.icranet.org

Information:
Dr. Carlo Luciano Bianco
tel. + 39 06 4991 4 397
e-mail: bianco@icra.it

The Faculty
Giovanni Amelino-Camelia
"Sapienza" Università di Roma
Jean Arnaud
Université de Nice-Sophia Antipolis
Carlo Luciano Bianco
"Sapienza" Università di Roma and ICRANet
Donato Bini
CNR – Istit. per Applicaz. del Calcolo "M. Picone"
Pascal Chardonnet
Université de Savoie
Christian Cherubini
Università "Campus Biomedico" di Roma
Demetrios Christodoulou
ETH Zurich
Pierre Coullet
Université de Nice-Sophia Antipolis
Thibault Damour
IHES Bures-sur-Yvette
Jann Einasto
Tartu Observatory
Simonetta Filippi
Campus Biomedico Roma and ICRANet
Sergio Frasca
"Sapienza" Università di Roma
Filippo Frontera
Università di Ferrara
Hagen Kleinert
Freie Universität Berlin
Gianluca Lippi
Université de Nice-Sophia Antipolis
Francois Mignard
Observatoire de la Côte d'Azur
Giovanni Montani
ENEA and ICRANet
Hermann Nicolai
Max Plank Inst. for Gravitational Physics, Postdam
José Pacheco
Observatoire de la Côte d'Azur
Kjell Rosquist
Stockolm University
Remo Ruffini (Director)
"Sapienza" Università di Roma and ICRANet
Farrokh Vakili
Observatoire de la Côte d'Azur
She-Sheng Xue
ICRANet



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 28 February 2011, 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 ICRANet 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 Cote D'Azur, Nice; Shanghai Astronomical Observatory, China; University of Ferrara, Italy; University of Rome, la Sapienza, Italy; University of Savoie, Annecy, France; University of Stockolm, 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 most qualified and motivated 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 fur Kernphysik

COSMOLOGICAL SINGULARITY
Vladimir BELINSKI - ICRANet

RELATIVISTIC EFFECTS IN ASTROPHYSICS
Carlo Luciano BIANCO
SAPIENZA Università di Roma and ICRANet

OBSERVERS AND OBSERVABLES IN BLACK HOLE SPACETIMES
Donato BINI - CNR and ICRANet

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 ICRANet

GENERAL RELATIVITY
Thibault DAMOUR
IHES and ICRANet

SUPERNOVAE AND GRBS
Massimo DELLA VALLE
Osservatorio Astronomico di Capodimonte and ICRANet

LARGE SCALE STRUCTURE
Jaan EINASTO
Tartu Observatory and ICRANet

TOPICS IN COSMOLOGY AND PARTICLE ASTROPHYSICS
Li Zhi FANG
University of Arizona and ICRANet

X/GAMMA-RAY INSTRUMENTATION
Filippo FRONTERA
University of Ferrara

HIGH ENERGY ASTROPHYSICS: X-RAYS CLUSTERS
Riccardo GIACCONI
ICRANet

SN 1979C

CHANDRA X-RAY OBSERVATORY

OBSERVATIONS OF GAMMA-RAY BURSTS
Cristiano GUIDORZI
University of Ferrara

FORMATION OF GALAXIES
Yipeng JING - Shanghai Observatory

ON THE KERR SOLUTION
Roy KERR - ICRANet

RELATIVISTIC FIELD THEORY
Hagen KLEINERT
Freie Universitat Berlin and ICRANet

HOLOGRAPHY, ENTROPIC GRAVITY AND COSMOLOGY
Li MIAO - Academia Sinica Beijing

BOUNCING COSMOLOGY
Mario NOVELLO
CBPF Brazil and ICRANet

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 ICRANet

RELATIVISTIC KINETIC THEORY
Gregory VERESHCHAGIN
SAPIENZA Università di Roma and ICRANet

STRONG COUPLING QED AND ELECTRON-POSITRON PLASMA
She-Sheng XUE
SAPIENZA Università di Roma and ICRANet

The Faculty
Giovanni Amelino-Camelia
SAPIENZA Università di Roma
Vladimir Belinski
SAPIENZA Università di Roma and ICRANet
Carlo Luciano Bianco
SAPIENZA Università di Roma and ICRANet
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 Coullet
Université de Nice - Sophie Antipolis
Thibault Damour
IHES, Bures-sur-Yvette
Jaan Einasto
Tartu Observatory
Simonetta Filippi
Univ."Campus Biomedico" di Roma and ICRANet
Sergio Frasca
SAPIENZA Università di Roma
Filippo Frontera
Università di Ferrara
Yipeng Jing
Shanghai Astronomical Observatory, China
Hagen Kleinert
Freie Universitat 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
Stockolm University
Remo Ruffini (Director)
SAPIENZA Università di Roma and ICRANet
Farrokh Vakili
Observatoire de la Côte d'Azur
Gregory Vereshchagin
SAPIENZA Università di Roma and ICRANet
Xue She Sheng
SAPIENZA Università di Roma and ICRANet

The Host Institution for the call of 2011-2012
is the Université de Nice-Sophia Antipolis;
Grand Château 28 Avenue Valrose 21
B.P. 2135 - 06103 NICE CEDEX 2

Applications and Fellowships:
In 2011-2012, nine positions will be available.
In the call of February 28, 2011, within the ERASMUS MUNDUS program, full economical support is provided. See http://www.irap-phd.org

In the call of September 30, 2011 nine additional fellowships will be available: six with full financial support.
See http://www.icra.it and http://www.icranet.org

For further Information please contact:
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e-mail:
secretariat-irapphd@icra.it
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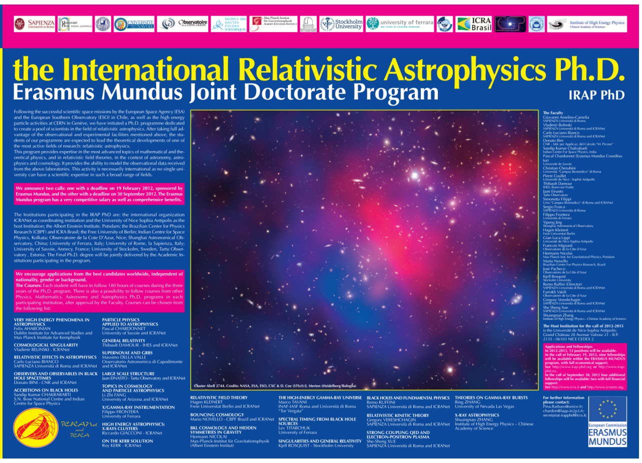

the International Relativistic Astrophysics Ph.D.

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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 2012. 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 ICRANet 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 Cote D'Azur, Nice; Shanghai Astronomical Observatory, China; University of Ferrara, Italy; University of Rome, la Sapienza, Italy; University of Savoie, Annecy, France; University of Stockolm, 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 fur Kernphysik

COSMOLOGICAL SINGULARITY
Vladimir BELINSKI - ICRANet

RELATIVISTIC EFFECTS IN ASTROPHYSICS
Carlo Luciano BIANCO
SAPIENZA Università di Roma and ICRANet

OBSERVERS AND OBSERVABLES IN BLACK HOLE SPACETIMES
Donato BINI - CNR and ICRANet

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 ICRANet

GENERAL RELATIVITY
Thibault DAMOUR - IHES and ICRANet

SUPERNOVAE AND GRBS
Massimo DELLA VALLE
Osservatorio Astronomico di Capodimonte and ICRANet

LARGE SCALE STRUCTURE
Jaan EINASTO - Tartu Observatory and ICRANet

TOPICS IN COSMOLOGY AND PARTICLE ASTROPHYSICS
Li Zhi FANG
University of Arizona and ICRANet

X/GAMMA-RAY INSTRUMENTATION
Filippo FRONTERA
University of Ferrara

HIGH ENERGY ASTROPHYSICS: X-RAYS CLUSTERS
Riccardo GIACCONI - ICRANet

ON THE KERR SOLUTION
Roy KERR - ICRANet

Cluster Abell 2744. Credits: NASA, ESA, ESO, CXC & D. Coe (STScI)/J. Merten (Heidelberg/Bologna)

RELATIVISTIC FIELD THEORY
Hagen KLEINERT
Freie Universitat Berlin and ICRANet

BOUNCING COSMOLOGY
Mario NOVELLO - CBPF Brazil and ICRANet

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 ICRANet

RELATIVISTIC KINETIC THEORY
Gregory VERESHCHAGIN
SAPIENZA Università di Roma and ICRANet

STRONG COUPLING QED AND ELECTRON-POSITRON PLASMA
She-Sheng XUE
SAPIENZA Università di Roma and ICRANet

THEORIES ON GAMMA-RAY BURSTS
Bing ZHANG
University of Nevada Las Vegas

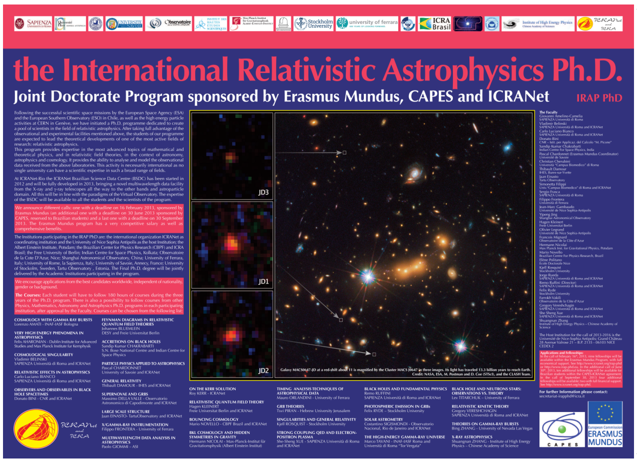
X-RAY ASTROPHYSICS
Shuangnan ZHANG
Institute of High Energy Physics – Chinese Academy of Science

The Faculty
Giovanni Amelino-Camelia
SAPIENZA Università di Roma
Vladimir Belinski
SAPIENZA Università di Roma and ICRANet
Carlo Luciano Bianco
SAPIENZA Università di Roma and ICRANet
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 Coullet
Université de Nice - Sophie Antipolis
Thibault Damour
IHES, Bures-sur-Yvette
Jaan Einasto
Tartu Observatory
Simonetta Filippi
Univ."Campus Biomedico" di Roma and ICRANet
Sergio Frasca
SAPIENZA Università di Roma
Filippo Frontera
Università di Ferrara
Yipeng Jing
Shanghai Astronomical Observatory
Hagen Kleinert
Freie Universitat 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
Stockolm University
Remo Ruffini (Director)
SAPIENZA Università di Roma and ICRANet
Farrokh Vakili
Observatoire de la Côte d'Azur
Gregory Vereshchagin
SAPIENZA Università di Roma and ICRANet
She Sheng Xue
SAPIENZA Università di Roma and ICRANet
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;
chardon@lapp.in2p3.fr;
secretariat-irapphd@icra.it;



the International Relativistic Astrophysics Ph.D.

Joint Doctorate Program sponsored by Erasmus Mundus, CAPES and ICRANet

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 analyse and 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.

At ICRANet-Rio the ICRANet Brazilian Science Data Centre (BSDC) has been started in 2012 and will be fully developed in 2013, bringing a novel multiwavelength data facility from the X-ray and γ-ray telescopes all the way to the other bands and astroparticle domain. All this will be in line with the paradigms of the Virtual Observatory. The expertise of the BSDC will be available to all the students and the scientists of the program.

We announce different calls: one with a deadline on 16 February 2013, sponsored by Erasmus Mundus (an additional one with a deadline on 30 June 2013 sponsored by CAPES, reserved to Brazilian students) and a last one with a deadline on 30 September 2013. 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 ICRANet 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 Cote D'Azur, Nice; Shanghai Astronomical Observatory, China; University of Ferrara, Italy; University of Rome, la Sapienza, Italy; University of Savoie, Annecy, France; University of Stockolm, 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:

COSMOLOGY WITH GAMMA RAY BURSTS
Lorenzo AMATI - INAF-IASF Bologna

VERY HIGH ENERGY PHENOMENA IN ASTROPHYSICS
Felix AHARONIAN - Dublin Institute for Advanced Studies and Max Planck Institute fur Kernphysik

COSMOLOGICAL SINGULARITY
Vladimir BELINSKI
SAPIENZA Università di Roma and ICRANet

RELATIVISTIC EFFECTS IN ASTROPHYSICS
Carlo Luciano BIANCO
SAPIENZA Università di Roma and ICRANet

OBSERVERS AND OBSERVABLES IN BLACK HOLE SPACETIMES
Donato BINI - CNR and ICRANet

FEYNMAN DIAGRAMS IN RELATIVISTIC QUANTUM FIELD THEORIES
Johannes BLUEMLEIN
DESY and Freie Universitat Berlin

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 ICRANet

GENERAL RELATIVITY
Thibault DAMOUR - IHES and ICRANet

SUPERNOVAE AND GRBS
Massimo DELLA VALLE - Osservatorio Astronomico di Capodimonte and ICRANet

LARGE SCALE STRUCTURE
Jaan EINASTO- TartuObservatory and ICRANet

X/GAMMA-RAY INSTRUMENTATION
Filippo FRONTERA - University of Ferrara

MULTIWAVELENGTH DATA ANALYSIS IN ASTROPHYSICS
Paolo GIOMMI – ASI

JD3

JD1

JD2

Galaxy MACS0647-JD at a red-shift about 11 is magnified by the Cluster MACS J0647 in three images. Its light has traveled 13.3 billion years to reach Earth. Credit: NASA, ESA, M. Postman and D. Coe (STScI), and the CLASH Team.

ON THE KERR SOLUTION
Roy KERR - ICRANet

RELATIVISTIC QUANTUM FIELD THEORY
Hagen KLEINERT
Freie Universitat Berlin and ICRANet

BOUNCING COSMOLOGY
Mario NOVELLO - CBPF Brazil and ICRANet

BKL COSMOLOGY AND HIDDEN SYMMETRIES IN GRAVITY
Hermann NICOLAI - Max-Planck-Institut für Gravitationsphysik (Albert Einstein Institut)

TIMING ANALYSIS TECHNIQUES OF ASTROPHYSICAL DATA
Mauro ORLANDINI - University of Ferrara

GRB THEORIES
Tsvi PIRAN - Hebrew University Jerusalem

SINGULARITIES AND GENERAL RELATIVITY
Kjell ROSQUIST - Stockholm University

STRONG COUPLING QED AND ELECTRON-POSITRON PLASMA
She-Sheng XUE - SAPIENZA Università di Roma and ICRANet

BLACK HOLES AND FUNDAMENTAL PHYSICS
Remo RUFFINI
SAPIENZA Università di Roma and ICRANet

PHOTOSPHERIC EMISSION IN GRBs
Felix RYDE – Stockholm University

SOLAR ASTROMETRY
Costantino SIGISMONDI - Observatorio Nacional, Rio de Janeiro and ICRANet

THE HIGH-ENERGY GAMMA-RAY UNIVERSE
Marco TAVANI - INAF-IASF Roma and Università di Roma "Tor Vergata"

BLACK HOLE AND NEUTRONS STARS: OBSERVATIONS VS. THEORY
Lev TITARCHUK – University of Ferrara

RELATIVISTIC KINETIC THEORY
Gregory VERESHCHAGIN
SAPIENZA Università di Roma and ICRANet

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

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Giovanni Amelino-Camelia
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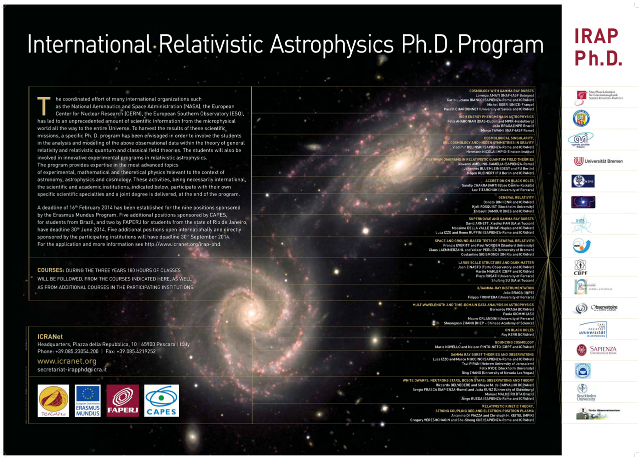
Carlo Luciano Bianco
SAPIENZA Università di Roma and ICRANet
Donato Bini
CNR – Istit. per Applicaz. del Calcolo "M. Picone"
Sandip Kumar Chakrabarti
Indian Centre For Space Physics, India
Pascal Chardonnet (Erasmus Mundus Coordinator)
Université de Savoie
Christian Cherubini
Università "Campus Biomedico" di Roma
Thibault Damour
IHES, Bures-sur-Yvette
Jaan Einasto
Tartu Observatory
Simonetta Filippi
Univ."Campus Biomedico" di Roma and ICRANet
Sergio Frasca
SAPIENZA Università di Roma
Filippo Frontera
Università di Ferrara
Jean-Marc Gambaudo
Université de Nice Sophia-Antipolis
Yipeng Jing
Shanghai Astronomical Observatory
Hagen Kleinert
Freie Universitat Berlin
Olivier Legrand
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
Elène Politano
Ecole Doctorale Nice
Kjell Rosquist
Stockholm University
Jorge Rueda
SAPIENZA Università di Roma and ICRANet
Remo Ruffini (Director)
SAPIENZA Università di Roma and ICRANet
Felix Ryde
Stockholm University
Farrokh Vakili
Observatoire de la Côte d'Azur
Gregory Vereshchagin
SAPIENZA Università di Roma and ICRANet
She Sheng Xue
SAPIENZA Università di Roma and ICRANet
Shuangnan Zhang
Institute of High Energy Physics – Chinese Academy of Science

The Host Institution for the call of 2013-2016 is the Université de Nice-Sophia Antipolis; Grand Château 28 Avenue Valrose 21 – B.P. 2135 - 06103 NICE CEDEX 2

Applications and Fellowships:
In the call of February 16th, 2013, nine fellowships will be available within the Erasmus Mundus Program, with full economical support. See http://www.icranet.org/irap-phd or http://www.irap-phd.eu. In the additional call of June 30th, 2013, ten additional fellowships will be available for Brazilian students within the CAPES-ICRANet agreement. In the call of September 30, 2013 four additional fellowships will be available: two with full financial support. See http://www.icranet.org/irap-phd.

For further Information please contact:
secretariat-irapphd@icra.it



International Relativistic Astrophysics Ph.D. Program

IRAP Ph.D.

The coordinated effort of many international organizations such as the National Aeronautics and Space Administration (NASA), the European Center for Nuclear Research (CERN), the European Southern Observatory (ESO), has led to an unprecedented amount of scientific information from the microphysical world all the way to the entire Universe. To harvest the results of these scientific missions, a specific Ph. D. program has been envisaged in order to involve the students in the analysis and modeling of the above observational data within the theory of general relativity and relativistic quantum and classical field theories. The students will also be involved in innovative experimental programs in relativistic astrophysics.

The program provides expertise in the most advanced topics of experimental, mathematical and theoretical physics relevant to the context of astronomy, astrophysics and cosmology. These activities, being necessarily international, the scientific and academic institutions, indicated below, participate with their own specific scientific specialties and a joint degree is delivered, at the end of the program.

A deadline of 16th February 2014 has been established for the nine positions sponsored by the Erasmus Mundus Program. Five additional positions sponsored by CAPES, for students from Brazil, and two by FAPERJ for students from the state of Rio de Janeiro, have deadline 30th June 2014. Five additional positions open internationally and directly sponsored by the participating institutions will have deadline 30th September 2014. For the application and more information see http://www.icranet.org/irap-phd.

COURSES: DURING THE THREE YEARS 180 HOURS OF CLASSES WILL BE FOLLOWED, FROM THE COURSES INDICATED HERE, AS WELL AS FROM ADDITIONAL COURSES IN THE PARTICIPATING INSTITUTIONS.

ICRANet
Headquarters, Piazza della Repubblica, 10 | 65100 Pescara | Italy
Phone: +39.085.23054.200 | Fax: +39.085.4219252
www.icranet.org
secretariat-irapphd@icra.it

COSMOLOGY WITH GAMMA RAY BURSTS
Lorenzo AMATI (INAF-IASF Bologna)
Carlo Luciano BIANCO (SAPIENZA-Rome and ICRANet)
Michel BOER (UNICE-France)
Pascal CHARDONNET (University of Savoie and ICRANet)

HIGH ENERGY PHENOMENA IN ASTROPHYSICS
Felix AHARONIAN (DIAS-Dublin and MPIK-Heidelberg)
João BRAGA (INPE Brazil)
Marco TAVANI (INAF-IASF Rome)

COSMOLOGICAL SINGULARITY, BKL COSMOLOGY AND HIDDEN SYMMETRIES IN GRAVITY
Vladimir BELINSKI (SAPIENZA-Rome and ICRANet)
Hermann NICOLAI (MPIG-Einstein Institut)

FEYNMAN DIAGRAMS IN RELATIVISTIC QUANTUM FIELD THEORIES
Giovanni AMELINO-CAMELIA (SAPIENZA-Rome)
Johannes BLUEMLEIN (DESY and FU Berlin)
Hagen KLEINERT (FU Berlin and ICRANet)

ACCRETION ON BLACK HOLES
Sandip CHAKRABARTI (Bose Centre-Kolkata)
Lev TITARCHUK (University of Ferrara)

GENERAL RELATIVITY
Donato BINI (CNR and ICRANet)
Kjell ROSQUIST (Stockholm University)
Thibault DAMOUR (IHES and ICRANet)

SUPERNOVAE AND GAMMA RAY BURSTS
David ARNETT, Xiaohui FAN (UA at Tucson)
Massimo DELLA VALLE (INAF-Naples and ICRANet)
Luca IZZO and Remo RUFFINI (SAPIENZA-Rome and ICRANet)

SPACE AND GROUND-BASED TESTS OF GENERAL RELATIVITY
Francis EVERITT and Paul WORDEN (Stanford University)
Claus LAEMMERZAHL and Volker PERLICK (University of Bremen)
Costantino SIGISMONDI (ON Rio and ICRANet)

LARGE SCALE STRUCTURE AND DARK MATTER
Jaan EINASTO (Tartu Observatory and ICRANet)
Martin MAKLER (CBPF and ICRANet)
Piero ROSATI (University of Ferrara)
Shufang SU (UA at Tucson)

X/GAMMA-RAY INSTRUMENTATION
João BRAGA (INPE)
Filippo FRONTERA (University of Ferrara)

MULTIWAVELENGTH AND TIME-DOMAIN DATA ANALYSIS IN ASTROPHYSICS
Bernardo FRAGA (ICRANet)
Paolo GIOMMI (ASI)
Mauro ORLANDINI (University of Ferrara)
Shuangnan ZHANG (IHEP – Chinese Academy of Science)

ON BLACK HOLES
Roy KERR (ICRANet)

BOUNCING COSMOLOGY
Mario NOVELLO and Nelson PINTO-NETO (CBPF and ICRANet)

GAMMA RAY BURST THEORIES AND OBSERVATIONS
Luca IZZO and Marco MUCCINO (SAPIENZA-Rome and ICRANet)
Tsvi PIRAN (Hebrew University of Jerusalem)
Felix RYDE (Stockholm University)
Bing ZHANG (University of Nevada Las Vegas)

WHITE DWARFS, NEUTRONS STARS, BOSON STARS: OBSERVATIONS AND THEORY
Riccardo BELVEDERE and Sheyse M. de CARVALHO (ICRANet)
Sergio FRASCA (SAPIENZA-Rome) and Jutta KUNZ (University of Oldenburg)
Manuel MALHEIRO (ITA Brazil)
Jorge RUEDA (SAPIENZA-Rome and ICRANet)

RELATIVISTIC KINETIC THEORY, STRONG COUPLING QED AND ELECTRON-POSITRON PLASMA
Antonino DI PIAZZA and Christoph H. KEITEL (MPIK)
Gregory VERESHCHAGIN and She-Sheng XUE (SAPIENZA-Rome and ICRANet)