Public Call for Admission to 4 positions in the International PhD in Science at Università Cattolica del Sacro Cuore and 1 position at the Pontificia Universidad Católica de Chile, Santiago (Chile) – XXXIII Cycle

Art. 1

Opening

This Call indicates the Coordinator, the partner universities, the duration of the course, the number of positions available and the number of scholarships granted by the partner Universities of the International PhD in Science.

International PhD in Science
Coordinator: Prof. Prashant V. KAMAT - University of Notre Dame du Lac, Indiana (United States of America).
Duration: 4 years.
Scholarship: 5.
Information: http://dottorati.unicatt.it/science

Details of scholarships:

There will be 4 scholarships positions at Università Cattolica del Sacro Cuore:

- 1 scholarship Istituto Italiano Tecnologia (IIT) - Genova (joint research project between Università Cattolica del Sacro Cuore, IIT and University of Notre Dame du Lac) "Porous polymeric nanocomposites for daylight-induced catalytic degradation of water pollutants."
  Research topic: The aim of the PhD project is to develop active porous polymeric materials for water remediation applications. The research will focus on the photocatalytic degradation of organic pollutants, such as dyes, pesticides and drugs, under day light by nanocomposite fibrous materials with controlled band gap energies. The nanocomposites will be obtained by combining deposition of metallic or carbon seeds by supersonic cluster beam or pulsed laser deposition on porous polymers with in-situ growth of hybrid nanostructures upon heating or light irradiation of the composite material. The PhD candidate will explore some combinations of the seeds-nanomaterials in order to achieve the optimal photocatalytically active material under daylight. The candidate will develop the porous materials, will deposit the appropriate seeds and will subsequently develop the hybrid systems. The candidate will fully characterize the physicochemical and optical properties of the developed materials and will perform the degradation experiments of defined pollutants
  IIT – Istituto Italiano di Tecnologia – Genova - tutor: Dott. Despina Fragouli;
  Università Cattolica del Sacro Cuore - tutors: Prof. Luca Gavioli and Dr. Emanuele Cavaliere;
  University of Notre Dame du Lac - tutor: Prof. Prashant Kamat.

- 1 scholarship (jointly research project between Università Cattolica del Sacro Cuore and KU Leuven) "Development of nanostructured platforms for

breathonomics: from surface science to devices" (joint research project between Università Cattolica del Sacro Cuore and KU Leuven).
Research topic: Among forefront applications of nanostructured carbon materials such as graphene (GR) and nanotubes (CNT), breathonomics is challenging physics, chemistry and device engineering to develop extremely sensitive, selective, and stable platform to recognize ppb amount of target molecules in the environment. In this project, platforms based on CNT and GR will be developed to discriminate potential pathologies through pattern recognition in molecular fingerprint of breath samples. This objective will be realized through properly developed devices based first on CNT and then on graphene layers. Layers characterization will involve electron and Raman spectroscopies, as well as scanning probe spectro-microscopies. All materials will be functionalized with selected molecules to make them more selective to specific target molecules. Algorithms for fast data retrieval and handling will be developed to feed statistical analysis packages for molecular fingerprint detection.
Università Cattolica del Sacro Cuore - tutor: Prof. Luigi Sangaletti;
KU Leuven - tutor: Prof. Steven De Feyter.

- 1 scholarship (joint research project between Università Cattolica del Sacro Cuore - MIUR PRIN 2015, prot. 2015C5SEJJ_002 - and KU Leuven): Controlling multi-band materials via orbital manipulation.
  Research topic: Many materials of great scientific and technological interest have an intrinsically multi-orbital electronic structure which leads to a variety of remarkable phenomena, such as metal-to-insulator phase transitions, superconductivity, exotic magnetic phases and multiferroicity.
  The aim of this project is to identifying operative protocols to control the electronic properties and induce phase transitions. The key idea is that, by manipulating the occupation of different orbitals, we can change the conduction properties of the systems inducing metal-insulator transitions and orbital-selective Mott states where only the electrons in some orbitals are localized. The control of the orbital occupation will be realized by combining laser manipulation and suitable nanostructuring. These ideas will be tested on prototypical correlated materials, such as vanadium oxides (V2O3, VO2, LaVO3).
  Università Cattolica del Sacro Cuore - tutor: Dr. Claudio Giannetti;
  KU Leuven - tutors: Prof. Jean Pierre Locquet and Dr. Mariela Menghini

- 1 scholarship (joint research project between Università Cattolica del Sacro Cuore and KU Leuven): "Size-resolved aerosol particle deposition to European broadleaved forests".
  Research topic: The aim is the micrometeorological characterization of the size-resolved PM deposition and resuspension processes to European broadleaved forests under different climatic conditions with related possible physiological interactions. The research will consist of a combination of experimental and observational work both in the field (eddy covariance) and in the Lab (wind tunnel or growth chambers) with the aim to improve actual deposition models. A solid background in micrometeorology and ecology is required, as well as in programming and modelling.

Università Cattolica del Sacro Cuore - tutor: Prof. Giacomo Gerosa;
KU Leuven - tutor: prof. Bart Muys.

- 1 scholarship positions at the partner Universities:

  1 scholarship (joint research project between the Pontificia Universidad Católica de Chile and Università Cattolica del Sacro Cuore) in "Classical and noncommutative geometry applied to Quantum Hall Effect and other condensed matter problems".

  Research topics: The present project proposes some mutually intermingled research paths, mostly focussed towards classical and noncommutative geometry together with applications to modern physics issues, notably condensed matter physics, with an emphasis on Quantum Hall Effect (QHE) and its related topological aspects. TKNN-duality vs. T-duality. Braids and their application to solid state physics (QHE). Jain's composite fermions, cyclotron braid groups. Stable bundles, generalized theta functions and knots. Solid background in functional analysis, differential geometry and topology and in the mathematics of classical and quantum mechanics is required.
  Pontificia Universidad Católica de Chile - tutor: Prof. Giuseppe de Nittis;
  Università Cattolica del Sacro Cuore - tutor: Prof. Mauro Spera;

Education programme and activities at Università Cattolica del Sacro Cuore:

Both positions offer advanced education for researchers able to perform theoretical scientific research in the field of Geometry and Theoretical Quantum Physics according to the Research Program. The drafting of the final dissertation will take advantage from the supervision of researchers selected for their specific expertise.

Art. 2
Assessment procedure by Università Cattolica del Sacro Cuore

The comparative evaluation of candidates applying to the International PhD in Science aims to discern the candidates aptitude for and interest in the scientific research proposed in the Research Program. The examination panel reserves the right to ask for a telephone or remote interview (such as Skype or similar).

Art. 3
Admission requirements

Application for participation in the competition, with no restrictions with respect to age and nationality, is open to candidates holding a Master's degree, or an Italian university degree obtained under the education system prior to Italian Ministerial Decree no. 509 of November 3rd, 1999 or a second-level university qualification obtained abroad and deemed eligible.

Application for participation is also open to candidates due to obtain one of the above-mentioned qualification by **October 31st, 2017**. In this case, examination candidates shall provide the Examination Panel with a self-declaration form attesting graduation or a qualification from a foreign university. Failure to do so will be cause for invalidation of the application.

Italian, EU and non-EU candidates that obtained, or will obtain, a qualification abroad,

by October 31st, 2017, for the sole purpose of admission to the PhD Programme shall request recognition of its eligibility in the PhD Programme application form. To this end, the application shall be accompanied with appropriate documentation to enable the Examination Panel to rule on the request for eligibility.

Art. 4
Application to the positions available at Università Cattolica del Sacro Cuore

Candidates who intend to participate in the competition must submit an application to the Rector of Università Cattolica del Sacro Cuore by **Monday October 16th, 2017.**

The application form is available at http://dottorati.unicatt.it/concorsi-milano **until 2 p.m. (local time) on the expiration date of the present public announcement.**

In the application form, available in English, candidates shall declare under their responsibility:
– one of the 4 research topics established by Università Cattolica del Sacro Cuore;
– personal information: surname, first name, fiscal code (for Italian nationals only), date and place of birth, citizenship, residence and domicile elected for the purposes of the competition;
– for graduate students: qualification, date it was obtained and name of the conferring university;
– foreign languages known besides English.

A printed and duly signed copy of the application form along with the documentation specified below must be forwarded, in *.pdf* or *jpeg* format, to phd.science@unicatt.it within the date of expiration of the present public announcement:

- a detailed *curriculum vitae et studiorum* written in English;
- self-certified Master's degree document with final mark and exams transcript, or certification of qualification obtained abroad with final mark and exams transcript translated in English. A self-certified translation will be accepted for the purpose of selection;
- certification of any other qualifications, such as postgraduate and advanced specialisation degrees, obtained in Italy and/or abroad; a copy of any other qualification considered useful for the purposes of the comparative evaluation. The documentation as to be translated in English. A self-certified translation will be accepted for the purpose of selection;
- a list of the publications deemed useful for the purposes of the comparative evaluation, and a list thereof on unstamped paper;
- two references letters written in English. The letters shall be sent to the same email address indicated above phd.science@unicatt.it within the date of expiration of the present public announcement;
- for non-native speakers of English, a certificate attesting adequate proficiency in English, such as:
  - FCE;
  - CAE;

  - CPE ;
  - BEC
  - *British Chamber of Commerce*;
  - *Trinity College*;
  - TOEFL;
  - IELTS;
  - or certificate ok the kind deemed useful to prove proficiency in English;
- an identification document, duly signed;
- fiscal code (for Italian nationals only);
- receipt of payment of the participation fee of € 100,00 (hundred/00) – (not refundable) – paid by credit card (VISA or MASTERCARD).

It is the candidates' responsibility to notify promptly of any change of residence or domicile elected for the purposes of the competition.

The University Administration assumes no responsibility for misdirected communication due to incorrect residence information provided by candidates, or to absent or late notification of any changes thereof. The University Administration shall bear no responsibility for any postal errors due to circumstances beyond their control.

The University reserves the right to adopt measures for the exclusion of candidates who do not have the prerequisites required or did not comply with the indications of the public announcement, also after the competition-related examinations have taken place.

Candidates with disabilities must specify in their application the aid required in relation to their disability, in accordance with Law no. 104 of February 5th, 1992.

Art. 5

Application at the Partner Universities

Regarding scholarships at the Partner Universities, as mentioned in the Art.1, the recruitment rules for candidates applying for the International Ph.D. in Science will be provided by each institution according to its own procedures.

Art. 6

Examination Panel

The Examination Panel of the comparative evaluation for admission to the PhD Programme in Science is appointed by Rector's Decree for the competition-related examinations.

The Examination Panels will consist of three academics/researchers pertaining respectively to the PhD Research Programme Topic in Differential geometry and applications to modern physics or Topic in Cooperative Effects in quantum systems.

The composition of the Panels will be published, after the expiration date of the present public announcement, at http://dottorati.unicatt.it/concorsi-milano

In a preliminary meeting or preliminary meeting the Examination Panels shall define the criteria for the comparative evaluation necessary for a single merit-based ranking to be drawn up. These criteria will be published, as by law enacted, at http://dottorati.unicatt.it/concorsi-milano

Art. 7

Admission of candidates by Università Cattolica del Sacro Cuore

Candidates are admitted to the International PhD in Science according to the ranking, until the established number of positions have been filled.

The results of the competition in the form of a single merit-based ranking will be published at http://dottorati.unicatt.it/concorsi-milano

Art. 8

Enrolment by Università Cattolica del Sacro Cuore

Candidates admitted to the PhD must enrol via the Doctoral Studies Office at Università Cattolica del Sacro Cuore - Largo Gemelli 1, 20123 Milan, by sending the following documentation by email:

- the PhD Programme application form (once uploaded this will produce a confirmation email sent to the candidate);
- 2 passport photographs;
- Personal and Tax data Form;

The documents must be sent within 7 (seven) days of receipt of the email congirming enrolment confirmation at Università Cattolica del Sacro Cuore.

Art. 9

Aid and scholarship - Università Cattolica del Sacro Cuore

Tuition fees for the International PhD in Science at Università Cattolica del Sacro Cuore are set annually by the Board of Directors.

PhD students enrolled at Cycle XXXIII in Università Cattolica del Sacro Cuore are required to pay annual tuition fees amounting to € 1,500.00 (one thousand five hundred/00) in two equal instalments: one upon matriculation or renewal of enrolment, and one on June 30th each year.

A scholarship on the PhD programme is compatible with other income (alsoearned on a regular basis) in the calendar year of the scholarship, provided that such income does not exceed the scholarship itself. Should these income limits be surpassed, the scholarship shall be revoked for the year in question. Students with scholarships shall annually declare the income and notify of any excess of the prescribed limits.

The scholarship are renewed annually, provided that the PhD students have completed the programme of activities set for the previous year.

The amount of the scholarship, paid in monthly instalments, is € 13,638.47 per year, before social security charges. The scholarship is subject to the payment of social security contributions (INPS separate management) pursuant to Art. 2, Paragraph 26, of Law 335 dated of August 8th, 1995, and subsequent amendments. The scholarship is exempt from local income tax and personal income tax (IRPEF).

The studentship amount shall be increased by max. 50 percent, for a period not over 18 months, if the PhD student is authorised by the Teaching Panel to conduct research abroad.

Starting from the second year, to each PhD student, with or without a studentship, is granted an annual sum covering research activities in Italy and abroad amounting to 10 percent of the annual gross amount of the scholarship, equal to € 1,363.85.

Art. 10
Public employee

Current legislation on leave of absence or special leave applies to public employees admitted to International PhD in Science.

Art. 11
Incompatibility

Attendance of the International PhD in Science is not compatible, in Italy, with simultaneous attendance of university degree courses, Postgraduate courses, non-medical Specialisation schools, Tirocinio Formativo Attivo (TFA) or other PhD Programmes (granted the agreements of joint supervision).

Art. 12
Obligations of PhD students

PhD students are required to take part regularly in the activities set out in their curricula, and to commit to the regulatory norms of their University of enrolment.

Art. 13
Conferment of PhD degree

The procedure of PhD degree conferment is governed by the regulatory norms of the University of enrolment.

Art. 14
Public disclosure

This public announcement is published on the *Euraxess* European website, on the MIUR website and at: http://dottorati.unicatt.it/concorsi-milano

Art. 15
Final provisions

For any matter not explicity contemplated in this public announcement, the provisions indicated in the Regulatory Norms of the University of PhD students' enrolment shall apply.
Head of the procedure of the present selection is Dr Roberto BRAMBILLA, Director of Postgraduate Education and Research Partnership, Via Carducci 28/30, Milan, Italy.