FULBRIGHT

Linking Minds Across Cultures

Fulbright Program to Italy for US Scholars
a.y. 2018-19

Fulbright Lectureship in Biotechnologies at the University of Udine

Award # 8232 **Grant Category: Teaching/Research**

- **Number of Awards:** One grant

- **Discipline and specialization:** **Biology, Biotechnologies and Molecular Medicine**

- **Grant period and activity:** Three, four or five months.

  Grant must begin on
  5 mos: 1st March 2019;
  4 mos: 1st March or 1st April 2019;
  3 mos: 1st April 2019;
  July: Exams session

  The scholar will teach a single 12 weeks' course of 3h-4h per week during the second semester (March-June) for undergraduate students of biotechnology and health care sciences. The class will be composed of approximately 30 students. Lectures will be held in English and will focus on the molecular aspects of tumor biology as well as on their clinical impact or consequences.
  The applicant is required to furnish a detailed program curriculum for the course indicating how he/she intends to structure the class, the topics discussed during the lectures, what is the final goal of the course and the modality of the final evaluation exam.
  Proposal based on bioinformatics or mathematic approaches will not be taken into consideration.

  The scholar will be hosted by the Molecular Biology Section of the Department of Medical and Biological Sciences where he/she will be allowed to do research and collaborate with Italian colleagues. On a voluntary basis the scholar could also hold a seminar to present his/her research work and a lecture to the Ph.D. students of the Department. In addition, a seminar at the University of Trieste or in other institutes (SISSA and ICGEB) in the nearby city of Trieste could also be arranged.

  During the Fulbright grant, the scholar may be also invited to take part in academic meetings, conferences, seminars and other program-related activities organized by Italian or European universities, under the Fulbright Inter-Country Program (www.fulbright.it/it/fulbright-universitas/risorse-per-universita/programma-intercountry).

- **Qualifications:** The award is open to university faculty members regardless of academic rank. Ph.D. degree and two years or more of research experience post doctorate is required. Previous teaching experience is also desirable but not mandatory.

- **Language:** All teaching will be in English; No interpreters will be provided. Italian language proficiency sufficient to complete the research project is required.

- **Letter of Invitation and project proposal:** Letter of invitation should not be requested. Applicants should submit a detailed project proposal in the Fulbright US Scholar application.

- **Award benefits:** Depending on the length of the research period, € 7.500/three months, €10.000/four months, and €12.500/five months.

  In addition the grantee will receive a travel allowance of € 1.100. The grantee

will be covered by Health and Accident Insurance for the whole grant period, provided to participants in the Fulbright cultural exchange Program by the *United States Department of State*.

Furnished free housing will be provided by the University of Udine for the scholar and one accompanying dependent (if any). The University of Udine will provide office space with secretarial assistance, Internet access and email services.

The university will provide office space with secretarial assistance, Internet access and e-mail services. The scholar will have free access to the library of the School of Medicine, the university canteen and facilitated access to the university sport facilities. An intensive free Italian language course (50h) organized by the linguistic center of the university will also be available.

How to apply:

Fulbright Scholar Awards to Italy are assigned through an annual competition administered at the national level in the US by the *Council for International Exchange of Scholars* - CIES in Washington DC, in collaboration with the Fulbright Commission in Italy. Potential candidates can apply online through CIES (www.cies.org).

Information on the Fulbright US Scholar Program, catalogue of awards, eligibility requirements, tips, guidelines and resources for applying, review criteria, selection and competition timeline is available on CIES website at www.cies.org/us_scholars.

Application Deadline: August 1, 2017

Host Institution

UNIVERSITÀ DEGLI STUDI DI UDINE

Academic Calendar and terms	Second semester: 1st March – 30th June Exams session: June-July
Host Department/Institution	Department of Medical and Biological Sciences (DSMB) – Molecular Biology Section
Web address of Host Department/Institution	University of Udine: http://www.uniud.it/
Helpful Links	http://www.turismofvg.it/Locality/Udine

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Università degli Studi di Udine
Department of Medical and Biological Sciences (DSMB)
Piazzale Kolbe 4 – 33100 UDINE IT
University website: www.uniud.it

Information about the City of Udine can be found at http://www.turismofvg.it/Locality/Udine

The University of Udine was founded in 1978 as part of the reconstruction plan of Friuli after the earthquake in 1976. Its aim was to provide the Friulian community with an independent center for advanced training in cultural and scientific studies. Geographically situated in the center of the European Union, the University of Udine plays an active role in a close network of relations, committed to sharing its knowledge and ideas. For this reason, since its establishment, the University of Udine has pursued the policy of internationalization, aimed at preparing students and creating a rich cooperation network which allows itself to integrate its educational opportunities and to promote fruitful relationships in teaching and research. The University of Udine is currently organized with 14 Departments covering four distinct areas: Humanities, Economics and Low, Scientific and Medical. A staff of about 1300 people working as faculty and administrative support, and approximately 17000 enrolled students comprise the pulsing heart of the university.

The Institute of Biology was founded in 1982 in concomitance with the School of Medicine. It was later converted into the Department of Biomedical and Biotechnological Sciences, to finally become in recent year the Department of Medical and Biological Sciences (DSMB). Currently, the Department is located in an ancient convent near the Hospital "Santa Maria della Misericordia" and is composed by 50 faculty members. It is organized in sections: molecular biology, biology, biochemistry, immunology, physiology, pathology, genetics, pharmacology, oncology, surgery and radiology. The Department runs the Ph.D. program in Biomedical Sciences and Biotechnologies providing an average of 14 students per year with lab training, lectures and seminaries.

With a population of 100,000 people, the city of Udine is the historical capital of Friuli. The city is located in a flat territory behind the foot of the mountains, distinguished by the 16th century hill-top castle that dominates the city's landscape. The legend says that the hill of the castle was raised with the earth carried in the helmets of Attila's soldiers, to allow this fierce warrior to see the Aquileia burning. The historical center extends on the southwestern side of the castle hill, where it is possible to admire one of the most beautiful Venetian square on "dry land" Piazza Libertà, the fifteen-century Loggia del Lionello, and several other impressive monuments. Each street, square, building or corner in the old town carries with it a little piece of history. Other cities in close proximity to Udine that are worth a visit are: the Unesco world heritage site of Cividale del Friuli, the medieval village of San Daniele del Friuli and on the sea side the cities of Trieste and Grado. Since Udine is in the middle of Friuli-Venezia Giulia, the city of Venice, or the neighbor state of Slovenia and Austria can be reached via a short train ride.

Main contact person at the institution for applicants' questions about this award:

Dr. Carlo Vascotto
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Secondary contact person:

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For information about the grant, please contact Fulbright Commission staff:

Commissione per gli Scambi Culturali fra l'Italia e gli Stati Uniti
The US - Italy Fulbright Commission
Via Castelfidardo 8 - 00185 Rome Italy
www.fulbright.it

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Resources on the Italian university system and research:

- MIUR - Ministry of Education, Universities and Research - www.istruzione.it
  Italian Government - Ministry of Education, Universities and Research
- CRUI - Conference of Italian University Rectors - www.crui.it
  National Conference of Italian state and private universities
- ENIC-NARIC network - www.enic-naric.net/index.aspx?c=Italy
  Italy Country page on the ENIC-NARIC network of European Information Centers on academic recognition and mobility
- Ricerca Italiana - www.ricercaitaliana.it
  National portal on the world of Italian Research
- ICCU - www.iccu.sbn.it
  National Institute for the Italian Library Catalogue

Travelling to Italy

- ITALIA - www.italia.it
  Discover Italy - info, ideas and resources for the travel to Italy
- CULTURA ITALIA, Un patrimonio da esplorare - www.culturaitalia.it
  Italian Ministry of Cultural Heritage and Activities - Cultural paths and resources from the world of Italian culture

Additional Information on the Master's Degree in Health Biotechnologies

The Master Degree Course in Health Biotechnologies at the University of Udine is aimed to prepare the modern Medical Biotechnologist for future challenges, by focusing on those concepts and theories which are mostly important for creating a stable platform to develop technical know-how and skills. Basic attention will be devoted to molecular diagnostics, experimental medicine, regenerative medicine, inherited diseases, and biotechnological application to various fields of clinical medicine.

A selected group of students (20-30 per year) will learn bioinformatics and statistical tools and their application in the biomedical research, as well as advanced methodologies for protein analysis. Courses of biochemistry, physiology, embryogenesis and histogenesis are intended to deepen previously acquired knowledge of the students. Gradually, students will be enlightened on the biomolecular aspects of medical disciplines such as medical genetics, pharmacology, immunology, pathology, oncology, hematology, rheumatology and neurodegenerative diseases. A peculiar characteristic of this Master in Biotechnologies are a series of courses focused on regenerative medicine and tissue engineering.

The course lasts for 2 years and the degree is obtained after the final dissertation related to the experimental project carried out by the student during the last year.

Applied Bioinformatics & Molecular Modeling

The course is mainly focused on the use of biological databases and methodologies for information retrieval, sequence and multiple sequence alignment. Students will also be educated on phylogenetic analyses and predictive methods and the use of neural networks and hidden Markov models. Part of the course will focus on the use of bioinformatics approaches for molecular modeling. Lectures will focus on aspects correlated to computer representation of molecules, coordinates and topology force fields, implicit solvent representation, effective potentials, energy minimization and molecular dynamics simulations.

Medical Statistics

The course focuses on the acquisition of sufficient knowledge of existing methods of clinical scientific research, biostatistical analytical methods, ability to conduct research, collect and analyze data, and draw conclusions. This course starts with an overview of the principles of interpreting diagnostic test results and evaluating diagnostic tests. We first review basic concepts such as sensitivity, specificity, predictive probabilities, likelihood ratios, Bayes theorem and ROC curves. We discuss possible forms of bias that can influence studies evaluating diagnostic test performance and a method to correct for verification bias. Further topics include statistical modeling for prediction and developing valid prediction models using regression analysis. The course also emphasizes the proper formulation and interpretation of regression models, the assumptions of regression analysis and the impact of violations of the assumptions on inference.

Proteomic methodologies

This is a theoretical/practical course were students learn the fundamental biochemical and biotechnological approaches to study proteins. A first part of the course focuses on the study of the proteome and the preparation of human originate samples (body fluids and tissues) for proteomic analysis and the basic methods for differential display protein analysis such as 1DE, 2DE, DIGE, ICAT, SILAC. Particular relevance is also given to the use of mass spectrometry for protein identification and analysis. The second part of the course is mainly focused on the description of chromatographic techniques to purify proteins: ion exchange, size exclusion, reverse phase, hydrophobic interaction, hydroxyapatite, chromatofocusing and multidimensional chromatography.

Different approaches for protein/protein interactions are also described such as: calculation of kinetics parameters through SPR analysis, expression of protein in fusion with tag (FLAG, MBP, GST,…), co-immunoprecipitation and GST pull down, use of cross linkers to stabilize interactions, yeast two hybrid, TAP-Tag technologies, FRET and PLA.

The third part of the course is mainly focused on the description of the proteomic approaches for structural and functional analyses of plasma membrane and mitochondria proteomes, emphasizing in particular the strategies aimed to investigate membrane proteins and protein complexes. Particular attention will be devoted to mitochondrial proteome in relation to the multitasking role played by mitochondria in physiopathology, as well as to the new visions of mitochondrial morphology/ultrastructure and of supramolecular assembly of OXPHOS complexes. Relevance is also given to the application of different proteomic analyses to human samples in the field of the numerous well known mitochondria-related diseases.

Organ Biochemistry

The main aim of this course is to describe the fundamental biochemical pathways that are distinctive for different organs, such as liver and heart. Concepts of tissues homeostasis and communication through metabolites and signal molecules will be also discussed. In this respect, particular attention will be devoted to the biochemical aspects of nutrition. Students will familiarize with the metabolism of skeletal muscles: energetic metabolism, aerobic and anaerobic metabolism during exercise, metabolic modifications during anoxia and ischemia. Finally, the peculiar metabolic shift occurring along with stem cells differentiation, as well as oncogenic transformation, will be also described.

Organ & System Physiology

The main aim of this course is to point out to the student the basic physical and biophysical principles underlying the function of the physiological systems, from the sub-cellular level to the whole organism and, where applicable, to condense the function itself in quantitative terms. Main contents are: functions, composition and physico-chemical properties of blood; the cardiovascular system; body fluids and renal function; the nervous system; general features about respiration, respiratory mechanisms, alveolar ventilation and gas exchange; thermoregulation; energetics, thermodynamics and mechanics of muscle contraction.

Embryogenesis and Histogenesis

The aim of this course is the acquirement by students of knowledge about germ cell differentiation processes and biological properties correlating with fertilization, modality and chronology of morphodynamic steps occurring during human embryonic/fetal life, various tissue arrangements within organ anlages and mature organs, postnatal tissue dynamics involved in tissue repair/regeneration, in order to achieve an overall view on mature anatomic/structural arrangements characterizing the human body as well as cell performances related to development, growth, tissue preservation and aging. Moreover, the understanding of these processes is addressed to the acquirement of skill of designing more appropriate tissue-compatible bioconstructs or tissue engineering protocols. In addition, students have to acquaint with evolution, structure, relationships and phylogenetic analogies of embryonic annexes in order to understand their functional meaning and physio-pathological aspects during pregnancy.
On the basis of previously acquired knowledge students have to achieve deeper notions about tissue arrangements and morpho-functional correlations concerning some selected organs for a suitable interpretation of structural/ultrastructural patterns and to be able of choosing the most useful visualization procedures in accordance with the experimental purposes.

Medical Genetics 1

The course is mainly devoted to the presentation of problems of medical genetics that can be potentially faced by biotechnological approaches. Major technological approaches for analysis of nucleic acids are presented as well as general techniques for generation of animal models of genetic diseases. Specific issues are: general features of diseases with monofactorial and multifactorial genetic components; relevance of SNPs and CNVs evaluation in medical genetics; technological approaches to evaluate SNPs and CNVs; morphological and molecular caryotyping; DNA sequencing; complex diseases and the problem of missing heritability; epigenetics in human diseases; animal models of genetic diseases.

Medical Genetics 2

The course focuses on introducing the student to the general and mainly innovative techniques for: i. Gene Therapy of human diseases in the field of monofactorial and hereditary phenotypes as well as of cancer: pre-clinical and clinical studies adopting viral and non viral strategies for gene transduction and tissue targeting; ii. Study of human genes/genome through Next Generation Sequencing methodologies; iii. Complex diseases and strategies for the identification of susceptibility genes: classical approaches and Genome Wide Association Studies (GWAS) potentiated by the HapMap of human genome. In each of these three field more attention is given to the study design underlying the peculiar genetic problem to be solved.

Pharmacology

The course is structured in two parts. The first part aims to illustrate the concepts that are an integral part of General Pharmacology such as principles governing the pharmacokinetics and pharmacodynamics, the causes of variability in the responses to drugs and their possible interactions. The second part of the course involves the discussion of matters pertaining to the Clinical Pharmacology particularly the examination of mechanisms of action, pharmacokinetics, therapeutic use and toxicity of molecules belonging to the most representative classes of currently clinically employed traditional drugs. The major classes of drugs examined relate to the drugs used for inflammation and pain treatment, the drugs affecting central nervous system, cardiovascular system, blood, skeletal muscle and endocrine system. Are also discussed pharmacological agents employed in the treatment of infectious diseases and the antineoplastic drugs. In addition to these therapeutic agents are also taken into consideration the substances of abuse and their addiction. The characteristics of traditional drugs examined are also compared with those relating to biotechnological drugs.

Immunology

Course program within the Immunology track is focused on several key aspects of immunity aimed to define different aspect of deregulation of immune system in diverse conditions from autoimmunity, to transplant to cancer. Main topics of the course are: acquired tolerance to self-proteins of the immune system; crosstalk of immune cells to maintain self-protein tolerance; consequence of immunological tolerance breakdown; elimination of self-reactive T and B lymphocytes during the development; immune system and tumor recognition; molecular basis of immune diseases. A second part of the course focuses on various aspects of the role of immune system in transplantation: immunological basis of transplant rejection; mechanisms of rejection in xenotransplantation.

Molecular Pathology

The course focuses on molecular pathophysiology of diseases. Specific attention is devoted to describing current pitfalls in diagnosis and therapy and to develop examples of biotechnological innovative solutions. Described in details are diabetes, dyslipidemia, atherosclerosis, methabolic syndrome, haemoglobinaemia, cystic fibrosis, Alzheimer disease, prion diseases, gout. The course also describes basic principles of the regulatory scenario.

Medical Oncology

The aim of the course is to inform students about the concepts of translational oncology and the “from bench top to bedside” concept through a series of seminar-type presentations highlighting recent advances of translational research. Students will be motivated to apply the concepts of translational oncology to their research through a series of assignments. The main theme for the course is personalized medicine, with topics on a variety of cancer types and issues ranging from cancer genetics to molecular imaging.

Hematology

The first part of the course will focus on the recent progresses in pathophysiology of onco-hematologic diseases and on the possible role of new molecular markers as a target for innovative biotechnological drugs. Many examples of translational hematology will be discussed to explain the role of biotechnology in unraveling the basis of neoplastic transformation thus designing patient’s tailored therapies.

The second part of the program will be dedicated to elucidate the biological and molecular basis of stem cell transplantation and post-transplant immune-related diseases, the possibility of modulation of immune response to enhance graft-versus-tumor effect and control graft-versus-host disease with the ultimate aim of short and long term survival after transplant procedure, reducing infectious complication and controlling disease recurrence.

Rheumatology

This course is focused on rheumatologic diseases, defining epidemiology, etiology, pathogenic mechanisms, genetic predisposition and main laboratory and clinical features. The rheumatologic diseases are chronic inflammatory conditions characterized by hyperactivation of the immune system leading to autoimmune reactions that can determine systemic or organ-specific diseases. There are frequent (such as rheumatoid arthritis) and rare diseases (such as scleroderma and lupus), that can affect also young people leading to severe disability and reduction of life expectancy. Several immunologic defects and genetic variants have been described as significantly associated with disease susceptibility and/or severity, and many key molecules were identified as important modulators of the pathogenic process. These molecules represent the specific target of an increasing number of biotechnological drugs. During this course the most recent advances of translational research in this area will be discussed, to show the students how and where to apply the biotechnology to support clinical decisions. One of the main focuses is to introduce the students to the concept of personalized medicine, through the evaluation of several examples of pharmacogenetic studies. Moreover, the important mechanisms underlying drug resistance, in particular to the biotechnological drugs, will be analyzed in detail.

Neurodegeneration

This course is focused on the pathogenetic study of the neurodegenerative disorders in which the process of misfolding protein is associated with neuronal death. Particularly, the aim of the course is to analyze the mechanism of misfolding protein in different pathogenetic conditions and describe the relationship of oligomers, fibrils and aggregates with human neuropathological aspects related to the principal clinical phenotypes, such as prion disorders, Alzheimer's disease, Frontotemporal lobar degeneration, Parkinson's disease and amyotrophic lateral sclerosis. In vitro and trangenic models are compared with the human neurodegenerative pathology.

Epigenetic & Stem Cell

The course addresses current aspects of stem cell biology and epigenetic gene regulation. The program covers key mechanisms that control pluri- and multipotency of stem cells. Central epigenetic regulatory mechanisms that include tranposons, pseudogenes, imprinting, gene silencing, X-chromosome inactivation, position effect, reprogramming, regulation of DNA and histone modifications, heterochromatin and technical limitation affecting reproductive cloning are discussed. Current advancements in understanding the role of the non-coding genome are addressed, focusing on long and small non coding RNAs. Particular focus is given on stem cell-based regenerative medicine and its great promise for repair of diseased tissue.

Stem Cell biology & Regenerative Medicine

The aim of this course is to define and describe the major stem cell classes (i.e. pluripotent -both embryonic and induced-, fetal and adult). Common and peculiar regulatory mechanisms are described as well as the role played by stem cell niches and physical forces on stem cell biology. Furthermore, the involvement of Stem Cells in tissue turnover both in physiology and pathology are described. The principal features of tissue regeneration will be exposed, focusing on common pathways and differences between regenerating and non-regenerating organisms. As an example of the use of Stem Cells for tissue regeneration, the cardiovascular system will be described. Both experimental and clinical evidence for the exploitation of stem cells for cardiac repair will be provided.

Tissue engineering

The course focuses on strategies to repair, replace and ultimately regenerate various tissues and organs to solve major clinical problems describing. Topics include advantages and disadvantages with different fabrication methods for different scaffolds, present commercially available scaffolds and discuss their applications, introduce cell biology and discuss how the material properties influence the cell response, give the basic knowledge in the most common characterization methods, inform about rules and ethics tissue development and growth, tissue induction, stem cell differentiation, delivery of bioactive molecules, bioreactor design, product development. Inflammatory reactions and tissue normal or pathological repair will be discussed as a model. A special attention will be devoted to regulatory issues.

Economy, Law and Ethics in Biomedical Research

Students will be enlightened on general law and ethics aspects of the biomedical research. Some basic notions about economy, business law and organization will also be discussed.