

COLABORAN:



**SIEMENS**



PTW



# LA FISICA DEL CANCER

SIMPOSIO • VALENCIA • 19 JUNIO 2015



ORGANIZAN

FUNDACION INSTITUTO VALENCIANO DE ONCOLOGIA (FIVO)

UNIVERSIDAD DE VALENCIA



DIRECCIÓN CIENTÍFICA

Profesor Antonio Llombart Bosch

Profesor José Bernabéu Alberola

Profesor Francisco Dalmases Moncayo

Profesor Juan José Gómez Cadenas

**NH Center**  
Valencia

Solicitada acreditación formación continuada EVES  
Solicitado Reconocimiento Interés Sanitario

**19 de junio de 2015**

# INTRODUCTION/ INTRODUCCIÓN

*The perspectives of physics, mathematics and engineering can help understand the complexity of cancer biology, and open new avenues for a possible efficient cure. The aim of this one-day symposium is to discuss the some of such new directions opened in cancer research, counting with the presence of world-leading researchers in the field.*

Las perspectivas de la física, matemáticas e ingeniería pueden ayudar a describir la complejidad de la biología del cáncer y abrir nuevas avenidas para una posible cura eficaz. El objetivo de este simposio es presentar y discutir algunas de las nuevas direcciones que se abren en la investigación sobre cáncer, contando con la presencia de algunos de los líderes en el campo

## PROGRAMA

08:30 - 09:00 Recogida documentación

09:00 - 09:15 Inauguración

**Profesora Dra. Pilar Campins Falco**, Vicerrectora de Investigación y Política Científica

**Profesor Dr. Antonio Llombart Bosch**, Presidente de la Fundación Instituto Valenciano de Oncología

Presidente de la Real Academia de Medicina de la Comunidad Valenciana

09:15 - 09:35 *"IFIMED, The Facility of Medical Physics for Imaging and Accelerators"*

**José Bernabéu Alberola, PhD**

Professor of Physics in the University of Valencia , Spain





# SEDE

NH CENTER  
Gran Salon  
C/I Ricardo Micó nº1  
VALENCIA

## SECRETARÍA TÉCNICA



Alejandro Salesa  
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09:35 – 11:15 Moderadores: Profesor Antonio Llombart Bosch  
Profesor Juan José Gomez Cadenas  
Dr. Jose Antonio Lopez Guerrero

09:35- 09:55 *"The heterogeneity of cancer diagnosis: interdisciplinary knowledge"*

**Estanislao Arana, MD, PhD**  
Radiology Department, Fundación IVO, Valencia, Spain

09:55- 10:15 *"Phase Transitions in Oncology"*

**Carlos Peña Garay, PhD**  
Research scientist, CSIC, Spain

10:15- 10:45 *"On the law governing the lysis of solid tumors"*

**Miguel A. F. Sanjuán, PhD**  
Head of Dept. of Physics, Universidad Rey Juan Carlos, Madrid, Spain

10:45- 11:15 *"A physical approach to brain tumors using mathematics: Success stories"*

**Víctor M. Pérez García, PhD**  
Head of the Mathematics Dept., Universidad de Castilla-La Mancha, Spain

11:15- 11:30 Coffee break

11:30 – 14:00 Moderadores: Profesor Antonio Llombart Bosch  
Profesor José Bernabéu Alberola  
Dra. Ana Calatrava Fons

11:30- 11:50 *"Applications of Particle Physics to treatment and monitoring in hadrontherapy"*

**Josep F. Oliver, PhD**

**Research scientist, CSIC, Spain**

11:50 - 12:10 *"Advances in Accelerators for Hadrontherapy"*

**Silvia Verdú-Andrés, PhD**

**Brookhaven National Laboratory (Upton, NY, USA)**

12:10 - 12:30 *"Technological innovation against Cancer"*

**Antonio Llombart Cussac, MD, PhD**

**Head of the Medical Oncology Dept., Hospital Arnau de Vilanova, Valencia, Spain**

12:30- 13: 15 *"Living Tissue as Active Matter"*

**Ramin Golestanian, PhD**

**Professor of Theoretical Condensed Matter Physics, University of Oxford, UK**

13:15- 13: 35 *"Acquisition and Classification of Breast Tissue Microarray in Pathology"*

**Gloria Bueno, PhD**

**Lecturer and Principal Research at School of Engineering in UCLM, at Ciudad Real, Spain since 2002. She is leading the VISILAB Group (Machine Vision and artificial Intelligence Group)**

13:35- 14:00 **Discusión y conclusiones**

## Ramin Golestanian, PhD

Prof. Golestanian is Professor of Theoretical Condensed Matter Physics at the University of Oxford. He received the Holweck Medal and Prize for his pioneering contributions to the development of the new research area of active soft matter, particularly microscopic swimmers and active colloids. His research aims to understand the physical and structural properties of both synthetic and biological soft matter.

## Gloria Bueno, PhD

Gloria Bueno is a Lecturer and Principal Research at School of Engineering in UCLM, at Ciudad Real, Spain since 2002. She is leading the VISILAB Group (Machine Vision and artificial Intelligence Group). She holds a PhD in Machine Vision obtained at Coventry University in 1998. She has carried on her research activities at different research centres, such as: Carnegie Mellon University, Pittsburgh (USA), Centre National de la Recherche Scientifique, Hôpitaux Civil & Telecommunication School, Univ. Louis Pasteur, Strasbourg (FR), Centro de Estudios e Investigaciones Técnicas de Guipuzkoa – San Sebastián (E), Warwick University (UK) and Gilbert Gilkes & Gordon Technology, Kendal (UK). She is leading different national and European research projects in biomedical image processing and artificial intelligence. She is author of more than 100 articles, including book chapters. Her current interests are in signal and image processing, modeling and artificial intelligence, electronic health records and CAD systems.



## José Bernabéu Alberola, PhD

José Bernabéu was Staff Member of CERN, the European Laboratory of Particle Physics, in the 70's and he is Professor of Physics in the University of Valencia since 1981. He discussed the conceptual basis and methodology for a first observation of direct time reversal violation in the laws of physics. At present he works on physics in the LHC accelerator of CERN. He has published more than 200 research articles in the scientific journals of highest impact. Bernabeu has been Principal Investigator of Grants obtained by the Theory Group of Valencia and regularly invited to international Centres of excellence. He is a referee for journals, funding agencies and evaluation systems. He has been Advisor of more than 20 Ph. D. Thesis. Academician of the National Academy of Exact, Physical and Natural Sciences of Argentina and of the Royal Academy of Sciences of Spain, he is and has been Chair/Member of Committees related to the scientific life in Spain, Europe and CERN. He is the Project Leader for the Facility of Research on Medical Physics: IFIMED. In 2001 he obtained the Distinction of the Valencian Generalitat to the Cultural Merit. The King Jaime I Prize in Basic Research was awarded to him in 2008. In 2011 he obtained the Medal of the Spanish Physical Society-BBVA Foundation Prize.

## Miguel A. F. Sanjuán, PhD

Miguel A.F. Sanjuán is Professor of Physics at the Rey Juan Carlos University in Madrid. He is also the Head of the Department of Physics and the Head of the Research Group on Nonlinear Dynamics, Chaos Theory and Complex Systems. He was a lecturer at the University of Valladolid during the 1982–1984 period and later he became a Professor at the Polytechnic University of Madrid, 1986–1997. He is a foreign member of the Lithuanian Academy of Sciences. His active Spanish blog greatly helped common public to improve the basic understanding of chaos theory and complexity, and he has written some popular articles in Spanish newspapers.

## Estanislao Arana, MD, PhD

Estanislao Arana is Consultant Radiologist at the Department of Radiology, Foundation IVO. He is also Thesis supervisor at "Master of Biomedical Engineering " at Polytechnic University of Valencia. He was a lecturer at the Catholic University of Valencia during the 2011–2014. Currently working on the application of advanced image posprocessing in clinical practice.;

## Carlos Peña Garay, PhD

*Carlos Peña Garay leads the theoretical research in solar neutrinos. Carlos participated in the resolution of the solar neutrino problem, difference between observed and standard solar model neutrino fluxes, what led to the discovery of neutrino masses and flavor mixing. In 1999, Carlos was the first to show that the correct solution to the solar neutrino problem was the one with large mixing named as the LMA solution. Since 2003, Carlos published influential works on solar neutrinos, a roadmap for future solar neutrino experiments and the relevance of the discovery of CNO cycle neutrinos. Nowadays, Carlos leads the most precise calculations of solar neutrino fluxes and works with the Borexino collaboration, which is leading the discovery of neutrinos produced by several nuclear reactions in the Sun.*

*Carlos Peña Garay has produced the most precise calculations in cosmological simulations of dark matter and neutrinos. These calculations permitted Carlos to characterize in detail the shape of the neutrinos phase space distribution, with a density profile with a core and a distorted Fermi Dirac distribution at low momenta. Most importantly, these simulations serve to predict cosmological observables sensitive to the neutrino mass. Lensing profiles of many galaxy clusters are among the best observables to verify the existence of the cosmological neutrino background and determine the neutrino masses.*

*Carlos Peña Garay has contributed in many areas in Astroparticle Physics and Cosmology, including neutrino oscillations, high energy neutrinos, neutrinoless double beta decay, dark matter and modified gravity. In particular, Carlos is making pioneering proposals in searches of QCD axions and on the origin of low energy positrons observed in our galaxy by INTEGRAL and previous X-ray telescopes. Other contributions in science include a physical model of the human gut microbiota to describe the routes to disease.*

## Víctor M. Pérez García, PhD

Graduate in Physics (Complutense U., 1991). PhD in Optics (Complutense U., 1995). Associate professor (1997) and full professor (2002) in Applied Mathematics at the Mathematics Department of the University of Castilla-La Mancha. He has published more than 110 ISI-indexed research papers with 3400 citations and an H-index of 32. Currently working on the application of mathematical modeling to oncology and the implications in the clinic.

## Josep F. Oliver, PhD

Josep F. Oliver works at the Instituto de Física Corpuscular, IFIC (CSIC-UV). In 2004 he obtained a Ph.D. degree in Physics at the University of Valencia. From 2004 to 2006 he worked at the University Libre of Bruxelles (ULB). In 2006 he went to IFIC as a postdoctoral researcher. Currently he is with the Medical Physics group IRIS, where he is in charge of the image reconstruction research lines. He is also in charge of the image reconstruction subject in the Master of Advanced Physics. His research interests include reconstruction algorithms, hadrontherapy monitoring, physics models of the image formation processes in PET and Compton cameras as well as applications of high energy physics techniques to medical image reconstruction.

## Silvia Verdú-Andrés, PhD

Dr. Silvia Verdú-Andrés studied Physics in the University of Valencia and received her PhD in Physics from the same university in 2012 with a thesis on “High-gradient accelerating structures and their application in hadrontherapy”. This work was developed under the supervision of Prof. Ugo Amaldi (TERA Foundation, Italy) and Dr. Ángeles Faus-Golfe (IFIC, Spain) in the framework of the Marie Curie Training Network PARTNER. She currently works at Brookhaven National Laboratory (Upton, NY, USA) where she is dedicated to the development of Crab Cavities for the High Luminosity upgrade of the Large Hadron Collider LHC at CERN.

## Antonio Llombart Cussac, MD, PhD

Antonio Llombart, MD, PhD, is chairman of the Medical Oncology Service at the University Hospital Arnau de Vilanova in Valencia, Spain. He received his medical school training in Pamplona and Valencia, Spain; as well as his training in medical oncology at the University Clinic Hospital in Valencia. He performed a 4 years fellowship in the Breast Cancer Unit at Institute Gustave Roussy (Villejuif, France) focusing on new drugs (phase I and phase II studies). From 1997 to 2005, Dr Llombart was a member of the Department of Medical Oncology at the Instituto Valenciano de Oncología. In 2003, he was promoted to the position of head of the Breast Cancer Research Unit. He obtained his PhD degree in breast cancer in 2005. From 2005 to 2010, Dr Llombart was the head of the Medical Oncology Service at the University Hospital HUAV in Lleida, Spain. In 2011 he returned to the Hospital Arnau de Vilanova in Valencia as Head of department of Medical Oncology and professor of Clinical Oncology at the Universidad Católica de Valencia