

CURRICULUM VITAE

JOSÉ MANUEL MEDINA RUIZ

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Education

Degrees

M.Sc. Physics (1996), University of Granada, Spain.

Ph.D. Physics (2002), University of Granada, Spain.

Professional experience

- Research assistant professor (2008- present). Center for Physics, University of Minho, Braga, Portugal.
- Postdoctoral research fellow (2006-2007). Department of Ophthalmology, McGill Vision Research Unit. McGill University, Canada. Supervisor: Kathy T. Mullen.
- Assistant professor (2000-2006). Department of Physics and Computer Architecture (Applied Physics division), Miguel Hernandez University, Spain.
- Color researcher (industry) (1999-2000), BASF Coatings. Guadalajara, Spain.

Other

- Visiting researcher (2003-2004). Sensory Communications Group. Institute of Biomaterials & Biomedical Engineering (IBBME). University of Toronto, Canada (15 weeks).
- Visiting researcher (2004-2005). Department of Ophthalmology, McGill Vision Research Unit. McGill University, Canada (24 weeks). Granted by Generalitat Valenciana, Conselleria de Empresa, Universidad y Ciencia, (Council of Company, University and Science), Valencia, Spain. Code: CTESPP/2004/108.

Professional membership

- Regular member of the Optical Society of America (OSA).
- Regular member of the Spanish College of Physics (COFIS).

Editorial boards

- Review editor, *Frontiers in Fractal Physiology* (2010- present).
<http://frontiersin.org/physiology/fractalphysiology/editorialboard/>

Teaching experience

Undergraduate courses at Miguel Hernández University, Spain.

Type	Subject	Year
<i>Fundamentals of Physics</i>	Telecommunications engineering and industrial engineering (2000-2006)	2000-2006
<i>Fundamentals of Photonics</i>	Telecommunications engineering (2000-2002)	2000-2002
<i>Photonic devices</i>	Telecommunications engineering	2001-2002

Courses description: *Fundamental of Physics* included an overview of vibration and electromagnetic waves, interference, diffraction, polarization, and geometrical optics. The number of students varied between 100-120 students each academic year. *Fundamentals of Photonics* included an overview of geometrical optics, basic optical instrumentation, fundamentals of radiometry, photometry and colorimetry, Fourier optics, interference, diffraction and polarization: vector and the Jones matrix formulation. Optical guides and components, radiation emitters, fundamentals of the laser and radiation detectors. The number of students was also around 100-120 students each academic year. *Photonic devices* included fundamentals of quantum physics, passive optical devices: interferometers, attenuators, circulators, isolators, wave retarders etc., optical guides and components. The number of students was 12.

Training of qualify personnel

Undergraduate students at the University of Minho, Portugal.

Name	Title	Status
Abel Almeida Oliveira Cláudio Rodrigues Costeira Fernando Jorge Carneiro Dias Pires Duarte Gomes	<i>Are two eyes better than one?</i>	Completed
Ana Costa Patricia Baptista Paula Queiros	<i>Cross-orientation masking in human vision</i>	Completed

Graduate students at the University of Minho, Portugal.

Name	Title	Status
Jorge Miguel Barbosa de Carvalho	<i>Orientation processing in amblyopia.</i> (grant BII/257/2010)	Completed
Catia Denise Viera da Silva	<i>Iris colorimetry</i> (grant BII/6/2010)	Completed
Duarte Gomes	<i>Hyperspectral imaging</i>	In progress
Rui Barros	<i>Hyperspectral imaging</i>	In progress

Academic books published

- J.A. Díaz & **J.M. Medina** (2006). “Ondas de luz: fundamentos físicos de la emisión, propagación, polarización, interferencias y difracción de la luz”, (*physical foundations of light waves, polarization, interference and diffraction, undergraduate level*). Edited and printed by CopiCentro Granada, S.L., Spain. ISBN: 84-934971-1-8. Depósito legal: GR-679/2006 (in Spanish) (<http://www.ugr.es/~jadiaz/textbook.jpg>).
- R. Castañer, **J.M. Medina**, F. Mateos, I. Moreno, C. Rodriguez-Pousa & P. Velasquez (2002). “Prácticas de Ampliación de Física”, (*laboratory guide in general physics, undergraduate level*). Edited by Miguel Hernández University. Printed by CEE Limencop, S.L., Spain. ISBN: 84-95893-26-6. Depósito legal: A-328-2002 (in Spanish).

Funded research

Project title: Hyperspectral Imaging of Structural Colors (2010- present).

Code: PTDC/CTM-MET/113352/2009.

Finance Institution: FCT Fundação para a Ciência e a Tecnologia. Ministerio da Ciência, Tecnologia e Ensino Superior, (Ministry of Science, Technology and Higher Education), Portugal.

Host Institution: Center for Physics. University of Minho, Portugal

Participating institutions: Akzo Nobel Pigments, The Netherlands & Department of Optics, University of Granada, Spain.

Group leader: **José Manuel Medina Ruiz.**

Number of researchers: 3.

Total budget: \$132398.

Web page: http://www.ugr.es/~jadiaz/ingles/hyperstruct_en.html

Publications

Peer-reviewed book chapters published

- **J.M. Medina** (2012). *Principal component analysis in industrial color coating formulations*, in “Principal Component Analysis - Engineering Applications”. Chapter 9, pages, 16. InTech Publishers. ISBN: 979-953-

307-562-3. URL: <http://www.intechopen.com/books/indexing/principal-component-analysis-engineering-applications/principal-component-analysis-in-industrial-color-coating-formulations>

Papers published in peer-reviewed journals

Spectral imaging and thin-films

- **J.M. Medina** & J.A. Diaz (2011). “Scattering characterization of nanopigments in metallic coatings using hyperspectral optical imaging”. *Applied Optics*, 50 (31), G47-G55. Impact factor: 1.707. Co-published in *Virtual Journal of Biomedical Optics*, 7(1), January 4 (2012).
- **J.M. Medina**, L.M. Pereira, H. T. Correia & S.M.C Nascimento (2011). “Hyperspectral optical imaging of human iris in vivo: characteristics of reflectance spectra”. *Journal of Biomedical Optics*, 16 (7), 076001-12. Impact factor: 3.188.
- **J.M. Medina**, S.M.C Nascimento and P. Vukusic (2011). “Hyperspectral optical imaging of two different species of Lepidoptera”. *Nanoscale Research Letters*, 6, 369, 1-5. Impact factor: 2.560.
- **J.M. Medina** (2008). “Linear basis for metallic and iridescent colors”. *Applied Optics*, 47 (30), 5644-5653. Impact factor: 1.707. Co-published in *Virtual Journal of Biomedical Optics*, 3 (12), December. 1, 2008.
- **J.M. Medina** (2002). “Proposed metameric indexes for goniochromatic objects”. *Color Research & Application*, 27, 6, 382-390. Impact factor: 0.753.

Visual optics, color and computational neuroscience

- **J.M. Medina**, (2012). “Multiplicative processes and power laws in human reaction times derived from hyperbolic functions”. *Physics Letters A*. 376, 1617-1623. Impact factor: 1.963
- **J.M. Medina** & J.A. Diaz (2012). “1/f noise in human color vision: the role of S-cone signals”. *Journal of the Optical Society of America A*. 29 (2), A82-A95. Impact factor: 1.936. Co-published in *Virtual Journal of Biomedical Optics*, 7(4), March 29, (2012).
- **J.M. Medina** (2011). Effects of multiplicative power-law neural noise in visual information processing. *Neural Computation*, 23 (4), 1015-1046. Impact factor: 2.290.
- **J.M. Medina** & J.A. Diaz (2010). “S-cone excitation ratios for reaction times to blue-yellow suprathreshold changes at isoluminance”.

Ophthalmic & Physiological Optics, 30, 5, 511-517. Impact factor: 1.259.

- **J.M. Medina** & K.T. Mullen (2009). “Cross-orientation masking in human color vision”. *Journal of Vision*, 9(3): 20, 1-16. Impact factor: 2.826.
- **J.M. Medina** (2009). “ $1/f^\alpha$ noise in reaction times: a proposed model based on Piéron’s law and information processing”. *Physical Review E*, 79(1), 011902. Impact factor: 2.352. Co-published in *Virtual Journal of Biological Physics Research*, 17(2), January 15 (2009).
- **J.M. Medina** & K.T. Mullen (2007). “Colour-luminance interactions in binocular summation”. *Vision Research*, 47 (8), 1120-1128. Impact factor: 2.332.
- **J.M. Medina** & J.A. Diaz (2006). “Post-receptoral chromatic adaptation mechanisms in the red-green and blue-yellow systems using simple reaction times”. *Journal of the Optical Society of America A*, 23 (5), 993-1007. Impact factor: 1.936. Co-published in *Virtual Journal of Biomedical Optics*, 1(6), June 13, (2006) and *Virtual Journal of Biological Physics Research*, 11(9), May 1 (2006).
- **J.M. Medina** (2006). “Binocular interactions in random chromatic changes at isoluminance”. *Journal of the Optical Society of America A*, 23 (2), 239-246. Impact factor: 1.936. Co-published in *Virtual Journal of Biomedical Optics*, 1(3), March. 7, (2006) and *Virtual Journal of Biological Physics Research*, 11(6), March 15 (2006).
- **J.M. Medina**, J.R. Jiménez & L. Jiménez del Barco (2004). “A human binocular vision model based on information theory for luminance and chromaticity at isoluminance suprathreshold changes”. *Neurocomputing*, 58-60, 879-884. Impact factor: 1.442.
- **J.M. Medina**, J.R. Jiménez & L. Jiménez del Barco (2004). “Visual Latency, hazard functions and the polarity in the yellow-blue signal at isoluminance conditions”. *Optica Pura y Aplicada*, (Applied and Pure Optics), 37, 1, 77-81 (in Spanish).
- **J.M. Medina**, J.R. Jiménez & L. Jiménez del Barco (2003). “The effect of pupil size on binocular summation at suprathreshold conditions”. *Current Eye Research*, 26, 6, 327-334. Impact factor: 1.360.
- **J.M. Medina**, J.R. Jiménez & L. Jiménez del Barco (2003). “Binocular summation and the polarity in the red-green and yellow-blue isoluminant signals in relation to visual reaction time”, *Optica Pura y Aplicada*, (Applied and Pure Optics), 36, 59-63 (in Spanish).
- J.R. Jiménez, **J.M. Medina**, L. Jiménez del Barco & J.A. Díaz (2002). “Binocular summation of chromatic changes as measured by visual

reaction time”, *Perception & Psychophysics*, 64, 140-147. Impact factor: 1.333.

Physics education

- R. Castañer, **J.M. Medina** & M.J. Cuesta-Bolao (2006). “The magnetic dipole interaction as measured by spring dynamometers”. *American Journal of Physics*, 74(6), 510-513. Impact factor: 0.791.

Conference proceedings and published abstracts

- **J.M. Medina** (2011). “Detailed characterization of reflectance spectra in metallic butterflies using hyperspectral optical imaging”. *1st International Symposium on Natural Photonic Structures*, ISNPS-2011. *Book of abstracts*, 27.
- **J.M. Medina**, J. Carvalho and S. Franco (2011). “Properties of neural noise in amblyopic vision”. 21th International Conference on Noise and Fluctuations, ICNF-2011. *IEEE conference proceedings*, 421-424.
- **J.M. Medina** and J. A. Díaz (2011). “Response variability of the red-green color vision system using reaction times”. *International Conference on Applications of Optics and Photonics*, AOP-2011. *Invited paper. Proceedings of SPIE*, 80013B1-9.
- **J.M. Medina**, J. Carvalho and S. Franco (2010). “Cross-orientation masking in amblyopia”. *33rd European Conference on Visual Perception. Perception*, S39, p. 22.
- **J.M. Medina** & J.A. Díaz, (2009). “1/f noise through retino-cortical pathways assessed by reaction times”. 20th International Conference on Noise and Fluctuations, ICNF-2009. *AIP conference proceedings 1129*, ISBN 978-0-7354-0665-0, pp. 553-556.
- E. Perales, **J.M. Medina**, E. Chorro, F. Martínez-Verdú (2010). “Estimation of spectral bands of metallic coatings assessed by multi-angle spectrophotometers”, *5th European Conference on Colour in Graphics, Imaging, and Vision*, (CGIV-10), CD ISBN 978-0-89208-291-9, pp. 113-119.
- **J.M. Medina** & J.A. Díaz, (2009). “Spatial summation effects in red-green color vision using simple reaction times”. In *Proceedings of the 11th Congress of the International Colour Association* (AIC 2009), edited by Dianne Smith, Paul Green-Armytage, Margaret A. Pope and Nick Harkness. CD ISBN 1-877040-76-2. Sydney: Colour Society of Australia. *Granted by Fundação Calouste Gulbenkian, Portugal* (Calouste Gulbenkian Foundation, Portugal).
- **J.M. Medina** & J.A. Díaz, (2009). “S-cones excitation ratios for reaction

times to blue-yellow suprathreshold changes at isoluminance”. *20th Symposium of the International Colour Vision Society*. Abstract booklet, ISBN 978-989-96317-0-0, p.46.

- K.T. Mullen & **J. M. Medina** (2009). “Absence of orientation tuning in masking in color vision”. *Vision Sciences Society 2009 annual meeting (VSS)*. *Journal of Vision*, 9(8), 316a.
- **J.M. Medina**, T.S. Meese & K.T. Mullen (2007). “Cross-orientation masking in the red-green isoluminant and luminance systems”. *Vision Sciences Society 2007 annual meeting (VSS)*. *Journal of Vision*, 7(9), 257a.
- **J.M. Medina** (2005). “Fourier analysis of binocular reaction time distributions for luminance changes”. *28th European Conference on Visual Perception*. *Perception*, S34, pp.135-136
- **J.M. Medina** & J.A. Diaz (2005). “Chromatic contrast coding in the parvo-cellular system using simple reaction times” in proceedings of *10th Congress of the International Colour Association*, AIC 2005, ISBN 84-609-5162-6, pp. 179-182.
- **J.M. Medina** (2004). “Rectified chromatic detection mechanisms at suprathreshold isoluminance conditions”. *Fall vision meeting*. *Journal of Vision*, 4 (11), 68a.
- **J.M. Medina**, J.R. Jiménez, E. Hita & L. Jiménez del Barco (2004). “Binocular stochastic models for suprathreshold chromatic changes at isoluminance”. *Interim meeting of the International Color Association, Color and Paints*, AIC-2004. Conference proceedings, pp. 52-55.
- **J.M. Medina** (2004). “Rectified luminance detection mechanisms at suprathreshold conditions”. *II EOS Topical Meeting on Physiological Optics*. Abstract booklet, pp. 58-59
- **J.M. Medina** (2004). “Binocular summation effects in the standard deviation of simple reaction times for chromatic changes at isoluminance”. *27th European Conference on Visual Perception*. *Perception*, S33, 91.
- **J.M. Medina** (2004). “Binocular stochastic models in relation to visual reaction time for random chromatic stimuli at isoluminance”. *The 2nd International Symposium on Measurement, Analysis and Modelling of Human Functions*. Conference Proceedings, pp. 270-274.
- **J.M. Medina**, J.R. Jiménez & L. Jiménez del Barco (2004). “Latencia visual, funciones de riesgo y polaridad en la señal amarillo-azul en condiciones de isoluminancia” (*visual latency and hazard functions in the blue-yellow system at isoluminant conditions*). *VII Spanish color meeting*. Congress Book, ISBN, 84-9769-053-2, pp.179-180 (in

Spanish).

- **J.M. Medina**, J.R. Jiménez & L. Jiménez del Barco (2003). “Sumación binocular y polaridad de la señal cromática con relación al tiempo de reacción visual” (*binocular summation and the polarity of the chromatic signal in reaction times*). VII Spanish Optics meeting. Abstract booklet, ISBN, 84-8102-347-7, L-17, 86-87. CD abstract, ISBN, 84-8102-348-5, pp. 365-367 (in Spanish).
- **J.M. Medina**, J.R. Jiménez & L. Jiménez del Barco (2003). “A human binocular vision model based on information theory for luminance and chromaticity at isoluminance suprathreshold changes”. *The Annual Computational Neuroscience Meeting*. Abstract book, 145.
- **J.M. Medina**, J.R. Jiménez & L. Jiménez del Barco (2003). “Binocular stochastic models for suprathreshold luminance changes”. 4th European Biophysics congress. *European Biophysics Journal with Biophysics Letters*, 32, 3, 214.
- **J.M. Medina**, J.R. Jiménez, & L. Jiménez del Barco & E. Hita (2003) “Binocular summation models for luminance and chromatic at isoluminance changes for visual reaction times”. 26th European Conference on Visual Perception. *Perception*, S32, 80.
- **J.M. Medina** (2002). “Índice de metamería geométrica para objetos que presentan goniocromatismo” (*a geometric metamerism index in goniochromatic objects*). VI Spanish Color Meeting. Congress book, ISBN, 84-699-9187-6, pp. 209-210 (in Spanish).
- **J.M. Medina**, J.R. Jiménez & L. Jiménez del Barco (2002). “Efectos de sumación binocular para variaciones cromáticas aleatorias con relación al tiempo de reacción visual” (*binocular summation and random chromatic stimuli in reaction times*). VI Spanish Color Meeting. Congress book, ISBN, 84-699-9187-6, pp. 127-128 (in Spanish).
- **J.M. Medina**, J.R. Jiménez & L. Jiménez del Barco (2001). “Binocular luminance interactions due to near-responses at suprathreshold conditions: a psychophysical evidence”. 4th Iberoamerican Meeting on Optics. *Proceedings of SPIE*, vol. 4419, pp. 596-599.
- **J.M. Medina**, J.R. Jiménez & L. Jiménez del Barco (2000). “Influencia del tamaño de la pupila y de la adaptación cromática en el fenómeno de la sumación binocular” (*pupil size, chromatic adaptation and binocular summation*). VI Spanish Optics Meeting. Congress book, 349-350 (in Spanish).
- J.R. Jiménez, **J.M. Medina**, J.A. Díaz, F. Pérez Ocón, & L. Jiménez Del Barco (1999). “Sumación binocular para cambios cromáticos en relación al tiempo de reacción visual” (*binocular summation and chromatic*

changes in reaction times). *V Spanish Color Meeting*. Congress book, ISBN, 84-605-9118-2, pp. 103-104 (in Spanish).

- J.R. Jiménez, L. Jiménez del Barco, **J.M. Medina** & J.A. Díaz (1998). “Comparison of visual reaction times for chromatic changes at isoluminance”. *21th European Conference on Visual Perception. Perception*, S17, p. 23.

Accepted

- **J.M. Medina**, J. A. Diaz & R. Barros (2012). “Reflectance variability of surface coatings reveals characteristic power relations in the eigenvalue spectrum”, SPIE Optical Engineering + Applications (Reflection, Scattering, and Diffraction from Surfaces). Paper number 8495- 40.
- J. D. Gomes & **J. M. Medina**, (2012) “Binocular summation in the standard deviation of contrast detection thresholds”. 9th International Conference of Optometry and Visual Sciences (CIOCV2012).

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Summary statistics

- Articles in the ISI web of knowledge: **20**
(<http://www.researcherid.com/rid/A-6698-2008>)
- Average citations per article: **3.83**
- h-index: **4**.

Organization of scientific international conferences

- 20th symposium of the international colour vision society association (ICVS-2009). University of Minho, Braga, Portugal, 24-28, July, 2009.
- 3rd Iberian Conference on Perception (CIP-2009). University of Minho, Guimarães, Portugal, 8-10, July, 2009.

Occasional reviewer

- Biological Cybernetics since 2011.
- Bulletin of Mathematical Biology since 2009.
- Ophthalmic and Physiological Optics since 2009.
- Applied Optics since 2008.
- Journal of the Optical Society of America-A since 2006.
- *Optica Pura y Aplicada* (Applied and Pure Optics) (in Spanish) since 2003.

Granting agency reviewer for:

- Adi: *Agência de Inovação*, Portugal (<http://www.adi.pt/>), (ADI, innovation agency, Portugal) (2010-present).

Institutional services

- Member of the scientific council, Faculty of Sciences. University of Minho, Portugal (2009-present).

Languages

- Spanish (Mother tongue).
- English: good comprehension, written and spoken.
- French: basic comprehension, written and spoken.
- Portuguese: basic comprehension, written and spoken.

Statement of research interests of the candidate Dr. José Manuel Medina Ruiz

My current research interests are in the fields of vision, visual optics and color with applications to visual neuroscience, biomedical optics and computational neuroscience.

Current research achievements

Vision, color, visual optics and computational neuroscience

One of the most fundamental aspects of sensory communications is the existence of trial-to-trial variations. These fluctuations appear highly irregular and are usually referred as part of endogenous or “internal noise”. Although they have been traditionally ignored in the studies of the brain, a large body of recent theoretical and experimental studies has pointed out that fluctuations could reflect complex correlations between neurons, suggesting perhaps a more fundamental role in neural computation and most elementary cognitive functions. I am interested in the possible functional role of neural noise in the human visual-motor system. From the experimental point of view, my approach has involved non-invasive studies using accurate color calibration models for display characterization, specific visual stimuli using color vision models and standard psychophysical methods. Topics have covered the research on $1/f$ noise in human color vision or the role of fluctuations in amblyopia, a common cortical disorder in developmental visual plasticity (usually called, “lazy eye”).

From the theoretical point of view, I have developed mathematical models based on statistical physics and information theory in the study of stochastic latency mechanisms. I was able, possible for the first time, to establish the separation between sensory and motor latencies based on an efficient coding process. Contrary to the common assumption of maximum transmission of information in neurons, I have also proposed that neurons promote the minimum transmission of information after efficient coding at large scale. Finally, I was also able to establish the neural basis of Zip’s law by means of multiplicative neural interactions.

Other research interests: color imaging

The interaction of light with tissue involves different aspects that depend on the spectrum interval considered. Hyperspectral imaging spectroscopy is a powerful non-destructive technology that offers a plausible solution for high spectral and spatial resolution measurements in a wide range of topics from chemical to biomedical applications (e.g., non-invasive cancer detection). Hyperspectral data collection

involves the generation of an “image cube”, with two spatial dimensions, or the x - y plane, (the size of the digital image), and the third, the spectral axis. In multispectral systems, the spectra are obtained at discrete wavelength intervals. In hyperspectral imaging, however, hundreds of spectral bands are provided to estimate the continuous spectrum. Therefore, the principal advantage of hyperspectral imaging is to obtain more spectral information than the naked eye and RGB-camera based systems for spectral unmixing, differentiation, display and characterization of distant surfaces across the electromagnetic spectrum. I am interested on hyperspectral imaging to yield quantitative spectral maps in biological thin-films. This may uncover novel optical methods and sensors as well as the development of a rigorous understanding of the physics of light propagation in different biological tissues. I have developed, possible for the first time, a hyperspectral imaging application in the visible range for the study of structurally colored butterfly wings such as Morpho butterflies and for the study of the human iris color *in vivo*.

Future research plans

Vision, color, visual optics and computational neuroscience

A particular aim of the research proposal may be the role of stochastic resonance (SR) in anomalous sensory perception. Contrary to the popular assumption that noise is always a nuisance, under specific conditions the presence of an appropriate amount of external noise can improve the detection of incoming signals, a nonlinear phenomenon often assigned to SR. SR has great impact in neuroscience because neurons can exploit this counter-intuitive effect to detect near-threshold signals and can reflect a fundamental strategy of sensory information processing. The underlying idea is that the right amount of external noise may restore the proper functioning of sensory organs in people with elevated thresholds. This raises the fundamental question about the simultaneous interplay between internal noise, from the sensory system itself, and the addition of external noise. A possible research plan may include theoretical and perhaps experimental studies of internal noise in sensory perception and to examine behavioral SR. For instance, the research plan may involve the study of internal noise and SR in amblyopia and in normal binocular vision, the latter as the control group. This particular part of the research proposal may inspire novel prostheses to help people with low vision and better rehabilitation therapies. In a different example, I am interested in the theme of linking neurophysiology and sensory psychophysics using scaling laws. How

the dynamics of single neurons reflects the emergent properties of the entire sensory organ is an issue that remains unknown. Applications may cover the development of algorithms in computer vision and artificial vision, models of human performance and aging, in air and land navigation and in human decision making.

Teaching experience of the candidate Dr. José Manuel Medina Ruiz

My teaching experience has involved topics in Physical Optics. I was an assistant professor for 6 years at the Miguel Hernandez University (Spain) in the Department of Physics and Computer Architecture, Applied Physics division. I am quite experienced in lecturing on the *Fundamentals of Physics*. Such lectures included the mathematical foundations of Vibrations and Waves and basic concepts such as Interference, Diffraction, Polarization, Colorimetry and Geometric Optics, etc.

I taught more than 80 undergraduate students specializing in Telecommunication or Industrial Engineering. I also collaborated with other academic disciplines such as *Fundamental of Photonics* or *Photonic devices*, both in Telecommunication Engineering. Teaching in these special disciplines required me to elaborate concepts such as light-wave guides, optical microscopy or fundamentals of lasers. In each course, didactic material included mathematical explanation of theoretical concepts, practical exercises on the board, complemented by basic experiments in the laboratory. I implemented novel multimedia demonstrations, and certain experiments were created specifically at the lab or were provided by commercial suppliers such as Pasco, Phywe or Leybold. I also delivered, by invitation, many graduate seminars related to my current research interests.

I published, together with five members of the Miguel Hernandez University, a Physics laboratory guidebook for undergraduate students in 2002. I also published a second book in 2006 with Professor José A. Diaz at the University of Granada (Spain), dealing with the Fundamentals of Physical Optics. I am also interested in methods of teaching Physics. I have published didactic material in the *American Journal of Physics* in 2006 together with two members of the Miguel Hernandez University.