

## Curriculum Vitae

### Beatriz Morales Cruzado

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**Current job position:** CONACYT researcher at the Faculty of Engineering of the Autonomous University of San Luis Potosí (UASLP) since September 2014. Recognition in the National System of Researchers (SNI), level 1 since January 2014.

**Education:** PhD in Optics, INAOE, Puebla. September 2012. Master in Optics, INAOE, Puebla August 2008. Bachelor in Physics, FCFM-BUAP, Puebla, May 2006.

### Research stays

- **Research stay** at the Oregon Medical Laser Center (OMCL) in the city of Portland, Oregon, USA, under the direction of **Dr. Scott Prahl**, from October 5, 2010 to March 31, 2011
- **Postdoctoral stay** at the Mechanical Engineering Group, Faculty of Engineering, Autonomous University of San Luis Potosí, PROMEP scholarship (February 2013 - January 2014).
- **National postdoctoral stay** with the support of CONACYT at the Mechanical Engineering Group, Autonomous University of San Luis Potosí (February 2014 - August 2014).
- **Research stay** at the optics department of the Ensenada Center for Scientific Research and Higher Education (CICESE), from August 2 to 16, 2017, in the group of Dr. Víctor Ruiz.
- Research stay at the Technological University of Panama (UTP), from May 20 to 24, 2019.

### Research areas

- Optical tweezers.
- Biomedical optics.
- Cavitation
- Light interaction with turbid media.

### Teaching activities

- **Course “Topics in optics for Mechanical Engineering”** in the master program in Mechanical Engineering, Faculty of Engineering UASLP, Mexico.
- **Course “Electricity and magnetism B”** taught 8 times in the Faculty of Engineering of the Autonomous University of San Luis Potosí (UASLP), Mexico.
- **Course “Experimental techniques in thermofluids (Module B)”**, twice in the master program in Mechanical Engineering of the Faculty of Engineering (UASLP).
- **Course “Selected Topics in Mechanical Engineering (Statistical Mechanics)”**, Master program in mechanical engineering, during the period August-December 2015.
- **Preparatory Course “Introduction to Thermofluids”**, 5 times in the Master program in Mechanical Engineering of the Faculty of Engineering (UASLP).
- **Course “elected Topics: Applied Optics for Thermofluids”**, 4 times in the Master program in Mechanical Engineering of the Faculty of Engineering (UASLP).

### Publications

- B. Morales Cruzado, S. Vázquez y Montiel and J. A. Delgado Atencio, *Behavior of optical properties of coagulated blood samples at 633 nm wavelength*, Proc. Of SPIE, Vol. 7897, 78970S, 2011 (doi.org/10.1117/12.873591).

- B. Morales Cruzado y S. Vázquez y Montiel. ***Obtención de los parámetros ópticos de la piel usando algoritmos genéticos***, Rev. Mex. Fis., Vol. 57(4), 375-381, 2011 (ISSN 0035-001X).
- B. Morales Cruzado, S. A. Prah, J. A. Delgado Atencio and S. Vázquez y Montiel, ***Validation of a new algorithm for the recovery of optical properties from turbid samples: GA-MCML against IAD Program***, Proc. Of Spie, Vol. 8011, 80118O, 2011 (doi.org/10.1117/12.902151).
- B. Morales Cruzado, J. A. Delgado Atencio and S. Vázquez y Montiel, ***Optical properties in simulated human skin at a wavelength of 633***, Proc. Of SPIE, Vol. 8229, 82291J, 2012 (DOI:10.1117/12.907109).
- J. A. Delgado Atencio, B. Morales Cruzado and S. Vázquez y Montiel, ***Influence of air bubbles on the recovery of optical properties***, Proc. OF SPIE, Vol. 8229, 82291K, 2012 (doi.org/10.1117/12.909325).
- M. Cunill-Rodríguez, J.A. Delgado-Atencio, S. Vázquez-Montiel and B. Morales-Cruzado, ***Determining the Scale Factor of a Video-Reflectometry Set-Up***, Medical Physics, AIP Conf. Proc. 1494, 167-169, 2012 (DOI: 10.1063/1.4764633).
- B. Morales Cruzado, J. A. Delgado Atencio and S. Vázquez y Montiel, ***Genetic Algorithms and MCML program for recovery of optical properties of homogeneous turbid media***, Biomedical Optics Express, Vol. 4(3), 433-446, 2013 (doi.org/10.1364/BOE.4.000433).
- B. Morales Cruzado, F.G. Pérez Gutiérrez, D. F. de Lange and R. Romero-Méndez, ***Effect of an integrating sphere measurement on the distortion of a laser pulse propagating through a turbid medium***, Proc. Of SPIE, Vol. 8941, 89410O, 2014 (doi.org/10.1117/12.2036384).
- E. Sarmiento-Gomez, B. Morales Cruzado and R. Castillo, ***Absorption effects in Diffusing Wave Spectroscopy***, Applied Optics, Vol. 53 (21), pp. 4675-4682, 2014 (doi.org/10.1364/AO.53.004675).
- B. Morales-Cruzado, F.G. Pérez-Gutiérrez, D.F. de Lange and R. Romero-Méndez, ***Study of the effect introduced by an integrating sphere on the temporal profile characterization of short laser pulses propagating through a turbid medium***, Applied Optics, Vol. 54 (9), 2383-2390, 2015 (doi.org/10.1364/AO.54.002383).
- B. Morales Cruzado, J. A. Delgado Atencio, S. Vázquez y Montiel and E. Sarmiento Gómez, ***Hybrid Algorithm for Simulating the Collimated Transmittance of Homogeneous Stratified Turbid Media***, Biomedical Optics Express, Vol. 6 (5), 1726-1737, 2015 (doi.org/10.1364/BOE.6.001726).
- P. Almendarez-Rangel, B. Morales-Cruzado, R. Romero-Méndez, F. G. Pérez-Gutiérrez, ***Medición de velocidad en microfluidos mediante un sistema basado en pinzas ópticas***, Memorias del XXII Congreso de la SOMIM, 2016 (ISSN 2448-5551).
- B. Morales-Cruzado, E. Sarmiento-Gómez, S. Camacho-López and F. G. Pérez-Gutiérrez, ***Nanosecond laser pulse propagating through turbid media: a numerical analysis***, Revista Mexicana de Física, Vol. 63, 89-96, 2017 (ISSN 0035-001X).
- B. Quistián-Vázquez, B. Morales-Cruzado, E. Sarmiento-Gómez, F. G. Pérez-Gutiérrez, ***Study of the effect of temperature on the optical properties of latin skins***, Proc. Of SPIE, Vol. 10062, 1006210, 2017 (doi.org/10.1117/12.2252945).
- P. Almendarez Rangel, B. Morales-Cruzado, E. Sarmiento Gómez, F. G. Pérez-Gutiérrez, ***Finding trap stiffness of optical tweezers using digital filters***, Applied Optics, Vol. 57 (4), 652-658, 2018 (doi.org/10.1364/AO.57.000652).
- P. Almendarez Rangel, B. Morales-Cruzado, E. Sarmiento Gómez, R. Romero Méndez, F. G. Pérez-Gutiérrez, ***A microflow velocity measurement system based on optical tweezers: A comparison using particle tracking velocimetry***, European Journal of Mechanics / B Fluids, Vol. 72, 561-566, 2018 (doi.org/10.1016/j.euromechflu.2018.08.004).

- R. Romero-Méndez, C. Romero-González, B. Morales-Cruzado, and F. G. Pérez-Gutiérrez, *Respuesta dinámica de una partícula atrapada en una pinza óptica cuando se somete a un pulso de velocidad en el fluido, estimación del tiempo de respuesta temporal del sistema como medidor de velocidad instantánea*, memorias en XXV Congreso Internacional Anual de la SOMIM, 2019 (ISSN: 2448-5551).
- B. Quistián-Vázquez, B. Morales-Cruzado, E. Sarmiento-Gómez, and F. G. Pérez-Gutiérrez, *Retrieval of Absorption or Scattering Coefficient Spectrum (RASCS) program: a tool to monitor optical properties in real time*, Lasers in Surgery & Medicine, Vol 52(6), 2020 (doi.org/10.1002/lsm.23164).
- O. L. Torres-Saucedo, B. Morales-Cruzado, F. G. Pérez-Gutiérrez, *Characterization of an interstitial current model around a cancer nodule using optical tweezers*, Suplemento de la Revista Mexicana de Física, vol. 1(2), 12-17, 2020 (ISSN 0035-001X).
- S. Acosta-Morales, C. Moreno-Aguilar, D. Hernández-Sánchez, B. Morales-Cruzado, E. Sarmiento-Gómez, C. Bittencourt, L.O. Sánchez-Vargas and M. Quintana, *A few-layer graphene/chlorin e6 hybrid nanomaterial and its application in photodynamic therapy against Candida albicans*, Beilstein Journal of Nanotechnology, 11, 1054–1061, 2020 (doi:10.3762/bjnano.11.90)
- N. G. García, B. Morales, R. Romero S. Camacho, L. F. Devia, and F. G. Pérez, *Mathematical modeling of a micropump without mobile parts actuated by thermocavitation bubbles*, Microsystem Technology, vol. 27, 801-812, 2021 (DOI 10.1007/s00542-020-04998-0).
- O. L. Torres-Saucedo, B. Morales-Cruzado, and F. G. Pérez-Gutiérrez, *Experimental determination of shear stresses on an artificial transcoelomic metastasis model using optical tweezers: A comparison using numerical simulation*, Lasers Surg Med. 2-11, 2022 (doi.org/10.1002/lsm.23554).

#### Directed and co-directed theses

- Master program in Mechanical Engineering, Faculty of Engineering, UASLP. **Ing. Pedro Almendarez Rangel**, “Implementation of a velocity measurement system with application in microfluidics based on the use of optical tweezers”. Concluded on February 3, 2017.
- Master program in Mechanical Engineering, Faculty of Engineering, UASLP. **Ing. Rebeca de la Paz Díaz Santana Sainz**, “Study of the mechanical properties of cancer cells by means of a dual optical tweezers tensile test”. Concluded on September 27, 2017.
- Master program in Metallurgy and Materials Engineering, Institute of Metallurgy, Faculty of Engineering, UASLP. **Ing. Nancy Gabriela García Morales**, “Mathematical modeling of a micropump without moving parts actuated by thermocavitation bubbles”. Concluded on February 8, 2018.
- Master program in Mechanical Engineering, Faculty of Engineering, UASLP. **Ing. Brenda Quistián Vázquez**, “Optical properties of human skin in vivo as a tool in cancer treatments”. Concluded on February 26, 2018.
- Bachelor of Biophysics, Faculty of Sciences, UASLP. **Héctor Alejandro Contreras Sánchez**, “Dynamic study of mechanical properties of human cells”. Concluded on March 6, 2020.
- Master program in Mechanical Engineering, Faculty of Engineering, UASLP. **Ing. Oscar Leonardo Torres Saucedo**, “Characterization of an interstitial flow model around a cancerous nodule using optical tweezers.” Concluded on October 6, 2020.
- Master program in Mechanical Engineering, Faculty of Engineering, UASLP. **Ing. Diego Alberto Robledo Santoyo**, “Characterization of an oscillatory interstitial flow model around a cancerous nodule using optical tweezers.” Concluded in December 2021.
- Master in Interdisciplinary Sciences, Institute of Physics, UASLP. **Lic. Daniela Najar Medrano**, “Comparison of mechanical properties of cancerous and healthy cells using optical tweezers”. Concluded on February 17, 2022.

- Master program in Mechanical Engineering, Faculty of Engineering, UASLP. **Ing. Laura Lucía Sánchez Ramos**, “Determination of tissue oxygen saturation by diffuse reflectance spectroscopy.” Concluded on February 21, 2022.
- Bachelor of Mechanical Engineering in Administration, Faculty of Engineering, UASLP. **Jesús Ricardo Torres Saucedo**, “Experimental induction of flow in microchannels by thermocavitation”. Concluded in November 2021.

### **Participación en proyectos de investigación**

- Participation in Research Project 22/G/EXC/05 "Segmentation of images of earth surfaces in an optoelectronic system" BUAP, from June 1, 2004 to December 31, 2004. March 2005.
- Principal investigator of the project **C15-FAI-04-72.72 of the Research Support Fund 2015** UASLP. “Diffuse reflection analysis in Latin skin to calculate non-ionizing radiation dose during a photodynamic therapy session in cancer treatment”.
- Participation in the project A1-S-9887 **Basic Scientific Research SEP-CONACYT 2017-2018** “Development of an optical and microfluidic platform to study the mechanisms of adaptation of groups of cancer cells to physical stress”.
- Principal investigator of the group project 102986 de **Frontier Science 2019** “Biomedical applications and basic science of optical tweezers”.