

CURRICULUM VITAE FOR JOSUE ORELLANA

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EDUCATION

B. S. in Electrical Engineering, Washington State University, May 2012
Emphasis in Microelectronics and Bioengineering; GPA: 3.55/4.0
High School Diploma, IMFRAMS, El Salvador, March 2007; GPA: 3.9/4

WORK EXPERIENCE

Research Assistant, Singapore Institute for Neurotechnology (SINAPSE), Nov 2012 - June 2013
National University of Singapore, Singapore; Supervisor: Professor Nitish Thakor, PhD
Research Assistant, Neuroengineering and Bioinstrumentation Laboratory, June-Oct 2012
Johns Hopkins University, USA; Supervisor: Professor Nitish Thakor, PhD and Post-
Doctoral Fellow Anil Maybhate, PhD.

RESEARCH INTERESTS

Electrophysiology and Neural Coding
Computational Sensory Neuroscience
Brain Recovery and Neurological Disorders

JOURNAL PUBLICATIONS (PEER-REVIEWED)

J. Orellana, Y. Akbari, E. Greenwald, X. Jia, R. Geocadin, N. V. Thakor, and A. Maybhate: A Novel Multimodal Method for Quantitative Monitoring of Coma Arousal. In preparation, to be submitted January 2013.

T. Ewing, **J. Orellana**, N. Tang, D. Heo, and H. Beyenal: Microbial Fuel Cells: Self-powered waste water treatment system using energy from microbial fuel cells. In preparation.

CONFERENCE PROCEEDINGS (PEER-REVIEWED)

J. Orellana, F. Quiroa, A. Abu-Lail, N. I. Abu-Lail: A Step towards the Development of a Wet Cellular Bioengineering Laboratory. Annual Conference of the 2011 American Society for Engineering Education on Biomedical Engineering Division (BED), Vancouver, BC, Canada, June 26-29, 2011. AC 2011-2286

Akbari, Y, **Orellana, J**, Maybhate, A, Greenwald, E, Jia, X, Thakor, N, Geocadin, R. Acceleration as a Quantitative Measure of Coma Arousal in Rodents after Cardiac Arrest. Poster presented at *the 2012 Annual Neurocritical Care Society Conference* in Denver, Colorado in October, 2012.

Akbari Y, Maybhate A, Chen C, Greenwald E, **Orellana J**, Liang L, Payton A, Thakor N, Geocadin R, Jia X. Enhanced Coma Recovery after Cardiac Arrest in a Rat Model Using Orexin-A. Poster presentation accepted and to be presented at the *Society of Critical Care Medicine 42nd Annual Congress*, January 19-23, 2013 in San Juan, Puerto Rico.

POSTER PRESENTATIONS (NON PEER-REVIEWED)

J. Orellana, A. Hamdan, T. Reardon, and N. I. Abu-Lail: Software Development for the Analysis of Bacterial Adhesion. Undergraduate Research Poster Symposium at Washington State University, Pullman, WA, March 30, 2012.

J. Orellana, F. Quiroa, A. Abu-Lail, N. I. Abu-Lail: A Step towards the Development of a Wet Cellular Bioengineering Laboratory. Undergraduate Research Poster Symposium at Washington State University, Pullman, WA, April 10-11, 2011.

J. Orellana, A. Abu-Lail, N. I. Abu-Lail. The Concept of Indirect Measurement Techniques, 2010 Summer Undergraduate Research Poster Symposium at Washington State University, Pullman, WA, August 2010.

RESEARCH EXPERIENCE

OPTOGENETIC INSTRUMENTATION, NEUROPROTECTION, AND ELECTROPHYSIOLOGY SINGAPORE INSTITUTE FOR NEUROTECHNOLOGY – NOVEMBER 2012 – JUNE 2013

PI: NITISH THAKOR/ YEN SHIH-CHEN, PHD

I am involved in two main areas: neuroprotection in a peripheral nerve injury project, and developing neuroengineering electronic instrumentation. My main role is to assist with the instrumentation for electrophysiological stimulation and recordings. Such instrumentation includes wireless power/data transfer, and optogenetics.

MULTIMODAL MONITORING OF RATS RECOVERING FROM CARDIAC ARREST

JOHNS HOPKINS UNIVERSITY – MAY 2011 – DECEMBER 2012

PI: NITISH THAKOR, PHD

Learning experience: EEG recording, micro-controllers, wireless communication, accelerometers, video-processing tools, 3D prototyping, and animal care and use (rats).

I worked with a clinical/research postdoctoral fellow (Yama Akbari, MD, PhD) and a research postdoctoral fellow (Anil Maybhate, PhD) in the optimization and development of a system to record long term (+24 hrs.) wireless EEG, acceleration and video of rats. This is a translational research project focused on using behavioral data alongside EEG data that has direct implications for the clinical setting (e.g. intensive care units) as a diagnostic and prognostic tool to monitor coma recovery and arousal. We are finalizing a manuscript to be submitted for publication in the Resuscitation journal in January 2013. Based on this work, clinical research trials with a similar setup will also be initiated in humans.

EEG ANALYSIS FOR DIURNAL RYTHMS AND MARKERS OF PAIN

UNIVERSITY OF MARYLAND / JOHNS HOPKINS – JUNE 2012– DEC 2012

PI: ASAF KELLER/ ANIL MAYBHATE PHD

Learning experience: Signal Processing (C, Matlab) of long-term EEG data, and Multi-scale Entropy.

We analyzed EEG collected from rats subjected to chronic pain. By evaluating the effect of diurnal rhythms in EEG, we seek to better understand the disruption caused by states of pain in animal models. We have found that multiscale entropy of EEG can be used as an effective marker of diurnal rhythms. Also we show that chronic pain causes a disturbance in the periodicity of diurnal rhythms in brain activity. This is an innovative quantitative method for evaluating the occurrence of pain in animal models. Currently we are preparing a manuscript to be submitted early in 2013.

ALTERED TEMPERATURE STATES AND BRAIN ACTIVITY

JOHNS HOPKINS UNIVERSITY— JUNE 2012 – OCTOBER 2012

PI: NITISH THAKOR, PHD

Learning experience: Single Neuron Activity recordings, rat surgery, hypothermia protocols, and animal care and use (rats).

Therapeutic hypothermia has been shown to ameliorate post-resuscitation recovery. But more studies are needed in order to understand why hypothermia is so effective, and whether it can be improved. To address this question, we are recording single neuron activity to evaluate the thermal response of the body to altered temperature states.

POWER MANAGEMENT SYSTEMS (PMS) FOR SELF-POWERED DEVICES

WASHINGTON STATE UNIVERSITY— AUGUST 2009 –MAY 2012

PI's: DEUK HEO & HALUK BEYENAL, PHD

Learning experience: low voltage power management systems, sensor technologies, circuit design, prototyping, micro-controllers, super-capacitors, charge pumps and DC-DC converters.

This research entailed developing power management systems for two main applications: indoor solar sensors and Microbial Fuel Cell air-pumps. Indoor solar sensor's PMS involved managing power for smart-home sensors, deployment and networking. Microbial fuel cell air-pump's PMS research consisted of powering aeration for waste water treatment plants from a low input voltage (<500mV). We created a model for a self-powered aeration system for wastewater treatment based on Microbial fuel cells. Currently we are getting ready to submit a journal publication describing its performance and scalability.

HAPTIC RESPONSE TEST METHODOLOGY AND EQUIPMENT FOR SWITCHES USED IN THE AEROSPACE INDUSTRY (SENIOR DESIGN PROJECT)

WASHINGTON STATE UNIVERSITY / KORRY ELECTRONICS – AUGUST 2011- MAY 2012

Learning experience: Haptic sensing: Force, Acceleration, Displacement, Microcontrollers, and LabView.

This project explored haptics as applied towards the avionics industry. Our team designed a test methodology and setup for characterizing the tactile feedback of mechanical switches. The designed instrumentation will also be used to measure haptic parameters for the touch panel displays. Test methodologies and equipment for haptic response will be useful in many industries like video gaming, mobile computing, and medical equipment to name a few. ---> SENIOR DESIGN TEAM AWARD

SOFTWARE DEVELOPMENT FOR BACTERIAL ADHESION AND SURFACE INTERACTION

WASHINGTON STATE UNIVERSITY— JANUARY-MAY 2011

PI: NEHAL ABU-LAIL, PHD

Learning experience: Matlab, Development of graphical user interfaces, Atomic Force Microscopy data analysis.

I developed a Matlab based software for the analysis of data generated from Atomic Force Microscopy experiments. The analysis time of retraction energy and peak forces has been reduced by about 80% from the previous analysis method. The program is already being used in Dr. Abu-Lail's laboratory.

DESIGN OF A CELLULAR ENGINEERING UNDERGRADUATE COURSE LABORATORY

WASHINGTON STATE UNIVERSITY— AUGUST-DECEMBER 2010

PI: NEHAL ABU-LAIL, PHD

Learning experience: experimental design and troubleshooting, mathematical modeling (bacterial growth, cellular transport and enzyme kinetics) and pedagogical techniques.

I participated in the design and troubleshooting of new cellular engineering laboratory experiments. We developed four problem based interdisciplinary experiments that cross the borders of chemistry, biology and physics. This new laboratory has now been incorporated into the Bioengineering curriculum at Washington State University.

THE CONCEPT OF INDIRECT MEASUREMENT

WASHINGTON STATE UNIVERSITY— MAY-AUGUST 2010

PI: NEHAL ABU-LAIL, PHD

Learning experience: Design of learning modules for high school students, light detecting circuits, LED's and 3D animation and prototyping.

I was the student coordinator in the development of engineering learning modules for high school students. We modeled and built two low cost devices that mimic the functioning of a UV/Vis. Spectrophotometer and an Atomic Force Microscope respectively.

Dr. Abu-Lail presented this work at the 2011 PNW-ASEE Section meeting (March 31- April 2, Gonzaga University, Spokane, Washington)

HONORS AND AWARDS

Senior Design Project, EECS WSU: Second Place	Spring 2012
Nomination as successful grantee, Academic Excellence Scholarship, Ministry of Education of El Salvador	October 2011
President's Honor Roll at Washington State University	Fall 2008 - May 2012
\$100,000 Academic Excellence Undergraduate Scholarship, in the U.S., Ministry of Education of El Salvador. (3 students were awarded this scholarship in 2007 based on academic record and future promise).	Fall 2008 - May 2012 to study
Cougar Undergraduate Research Experience and Funding \$1000	May 11-15th, 2009
General Education Student Excellence Award	Spring 2009
WSU Mortar Board, Outstanding Freshman Scholar	Spring 2009
Claude and Patricia Munsell, Meek/Markely/McPhail Awards for EE Majors	2009-2011
2nd in the state out of 1661 high school graduates, Senior Placement Test (PAES), Chalatenango El Salvador	Fall 2006
Bronze Medal in the First Salvadorian Physics Olympics. (Organized by University of El Salvador).	Spring 2005
First Place in Intellectual and Academic Performance in Class 7th, 8th and 9th grades	2002-2004

AFFILIATIONS

- National Society of Collegiate Scholars

- IEEE Student member
- Total Health Physician Group student board member, Pullman, WA

SKILLS

COMPUTER

Programming: Matlab, C, C++, Assembly language, LabView, Simulink,
Circuit simulation (Analog and Digital): Cadence, SPICE, VHDL
Video: Matlab, OpenCV (Video Processing programming tool)
Prototyping: Altium PCB design, Arduino, 3D CAD (Sketch Up.
Computer administration: Linux, Windows, Mac OS
Graphic and Document Design: Adobe Illustrator, Photoshop, and Microsoft Office.
Signal Processing and Statistical Analysis of Electrophysiological data

LABORATORY EQUIPMENT

Electrical Oscilloscope and Digital Analyzer
Printed circuit board soldering
Solar cells and ultra capacitors
UV/Vis. Spectrophotometer
Microbial Fuel Cells
Atomic Force Microscope and Data Analysis
Cell cultures
Contact angle measurements on bacterial cell wettability
3D Printing design

ANIMAL HANDLING

Rat single unity activity recording and EEG
Animal Care and Use Category I training (small rodents)
Rodent Surgery certification (JHU)

COMMUNITY SERVICE PROJECTS

- Mission Trip to paint an elementary school, Kauai, HI, Dec. 29, 2008- Jan. 11, 2009
- High School Outreach for Science/Engineering, learning modules Summer 2010
- Relay for life participant, Moscow, ID, 2009-2011
- Leader for CROP Hunger Walk, Pullman, WA, 2009-2011

SPORTS AND OTHER TRAINING/EXPERIENCE

- Amateur painting and photography
- Scuba Diving and Lifeguard Certifications
- Triathlete: Swimming, biking, marathon runner
 - Placed 1st, Men 20-29, 14th Vibrant Life 5k Run on Sep. 23th, 2012, Hagerstown, MD
 - Placed 1st, Men 20-24, Pine Hollow Triathlon: 1.5 km swim, 30k bike, 10k run on Jun 3rd, 2012, Tygh Valley, OR
- Beginning Guitar

CURRENT AND RECENT LEISURE READINGS

S. Seung, *Connectome*: how the brain's wiring makes us who we are. Boston: Houghton Mifflin Harcourt, 2012.

N. Silver, *The signal and the noise* : why most predictions fail but some don't. New York: Penguin Press, 2012.

Nicolelis, Miguel. *Beyond Boundaries*: The New Neuroscience of Connecting Brains with Machines-and How It Will Change Our Lives. New York: Times Books/Henry Holt and Co, 2011

REFERRALS

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Anatomy and Neurobiology
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