CV of Miguel Arocena

PERSONAL INFORMATION

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NATIONALITY: Uruguay

EDUCATION

Graduate
PhD from the College of Life Sciences and Medicine, University of Aberdeen. Project title: “Controlling neural stem cell migration electrically”. Main Supervisor: Dr. Martin Collinson. Co-supervisor: Dr. Bing Song.

Master degree in Cell and Molecular Biology, 2005 (Faculty of Sciences, Universidad de la República, Uruguay). Average course grade: 10.8/12.
Master thesis title: “Influence of cell shape and the system of intermediate filaments on the apoptosis induced by staurosporine on cultured bovine epithelial lens cells”.
Grade awarded: Excellent. Thesis director: Dr. Cristina Arruti.

Undergraduate
Degree in Biochemistry, 2002 (Faculty of Sciences, Universidad de la República, Uruguay). Average course grade: 8.5/12.

PUBLICATIONS


Arocena, M. and Acerenza, L. (2004) “Necessary conditions for a minimal model of
receptor to show adaptive response over a wide range of levels of stimulus”, *Journal of Theoretical Biology* 229: 45-57.
http://dx.doi.org/10.1016/j.jtbi.2004.03.002

**MANUSCRIPTS SUBMITTED AND IN PREPARATION**

*equal author contributions.

**BOOK CHAPTERS**


**AWARDS**

**Programme AlBan PhD Scholarship** (2007-2010): Programme AlBan is a European Commission scholarship programme addressed for students from Latin America to conduct graduate studies in the European Union.

**Overseas Research Student Award Scheme** (ORSAS, 2008-2010): The award provides funding to pay the difference between the overseas rate of tuition fees and the UK/EU rate of tuition fees.

**Bursary to attend the conference: “The Physical Cell: In search of the design principles of life”:** the award, granted by the organizers, covered the registration, travel and accommodation costs for attending this conference, which took place at University College London, between the 28-30th June 2010.
POSTER AND ORAL PRESENTATIONS

Arocena, M, Song, B and Collinson JM. “A time-lapse and quantitative modelling analysis of neural stem cell motion in the absence of directional cues and in electric fields”. **Poster Presentation.** The Physical Cell: In search of the design principles of life. June 2010, London, UCL.

Arocena, M, Song, B and Collinson JM. “Neural stem cell directional migration in electric fields proceeds by Pi3K dependent biased protrusion generation”. **Poster Presentation.** Scottish Developmental Biology Group meeting, December 2009, Dundee.

Arocena, M, Zhao, M and Song, B. “Adult Neural Stem Cell Directed Migration in Electric Fields: Growth Factor Dependence and Pi3K Pathway Involvement”. **Poster and Oral presentation.** Cambridge Centre for Brain Repair Spring School, April 2009


**PhD PROJECT DESCRIPTION**

Endogenous electric fields (EFs) have been detected in tissues in numerous contexts, and EFs can direct cell migration *in vitro*, a phenomenon known as galvanotaxis or electrotaxis. My PhD project focuses on studying the effects of EFs on neural stem cell (NSC) migration. We have initially studied the *in vitro* migratory response of adult NSCs exposed to EFs of physiological magnitude. These cells show highly oriented migration in EFs towards the cathode, which is independent of growth factors at higher but not lower EF strengths, and can be reduced by phosphatidylinositol-3 kinase inhibitors. Also, these cells displayed a particular kind of amoeboid motion in the absence of EFs, sequentially extending small lamellipodial-like protrusions with varying, often opposite, orientations. This pattern of protrusion extension led to highly tortuous trajectories. In the presence of EFs, this pattern was altered and trajectories became much more linear, probably due to inhibition of protrusions orientating towards the anode. Based on quantitative data from time-lapse analysis, a simple model related to cellular automata has been developed, which closely reproduces the migration patterns in the absence or presence of EFs.

We have also studied the migratory response of embryonic NSCs to combinations of EF cues and topographic guidance cues with conflicting orientations. Wild type NSCs showed the capacity to integrate both cues, whereas NSCs from Pax6 deficient embryos only showed impaired responses to both cues in combination.

The long-term goal of the project is to understand how EFs can be used to control NSC migration, with eventual applications in stem cell based therapies for brain repair.

**PREVIOUS RESEARCH ACTIVITY**

- Master thesis description: evaluation of the effects of acrylamide, a known disrupter of intermediate filaments, on the cytoskeleton of bovine lens epithelial cells, and on their sensitivity to staurosporine-induced apoptosis. Acrylamide was found to have a profound effect on the three cytoskeletal systems; however, its effects became attenuated in colchicine pre-treated cells and in spreading cells. Unexpectedly, simultaneous treatment with acrylamide and staurosporine caused a marked decrease in apoptosis compared with staurosporine alone, and pre-incubation with acrylamide followed by staurosporine alone caused an even
more pronounced decrease.

- Participation in a theoretical biology research project entitled “Design of Modular Metabolic Systems”, under the direction of Dr. Luis Acerenza. This project involved studying the conditions under which a simple model of chemotaxis displayed sensory adaptation and response to increasing attractant concentrations. It was found that a wide range of response could be achieved only in a system outside equilibrium, thus requiring energy expenditure.

INTERNATIONAL EXAMINATIONS

- Certificate of Proficiency in English, taken in December 1997. Grade awarded: B.
- Diplôme du Baccalauréat Général (French comprehensive high school final examination, equivalent to British A-levels), taken in December 1995. Grade awarded: Mention Bien.

TEACHING ACTIVITY

Teaching assistant of the undergraduate laboratory course of Cell Biology, in the Faculty of Sciences, Universidad de la República, Uruguay (2000-present). Teaching participation in other courses, such as Developmental Biology, and Introduction to Biology.

OTHER ACADEMIC ACTIVITIES

Attendance, as an undergraduate, to the event “Dr. Bessie F. Lawrence 30th International Summer Science Institute”, which took place in July 1998 in the Weizmann Institute of Science, in Israel. This participation included the realization of a short project, entitled “Incorporation of Nde I Restriction Endonuclease Site at the
Initiation Codon of Different ODC Mutant genes by Site Directed Mutagenesis”, and its results were presented to the other participants.

**LANGUAGES SPOKEN**

Spanish (first language); English (TOEFL and CPE level, plus the experience of two and a half years of residence as a PhD student in the UK); French (10 years of study at a bilingual school, and Diplôme du Baccalauréat Général level).