## BIOGRAPHICAL SKETCH

| NAME: **JUAN LARRAIN** | POSITION TITLE: PROFESSOR |
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| INSTITUTION AND LOCATION | DEGREE (If applicable) | Completion Date MM/YY | FIELD OF STUDY |
|---|---|---|---|
| P. Universidad Católica de Chile | Biochemist | 12/1993 | Biochemistry |
| P. Universidad Católica de Chile | PhD | 06/1998 | Cell and Molecular Biology |
| Howard Hughes Medical Institute<br>University of California, Los Angeles | PEW Postdoctoral Fellow | 07/2000 | Molecular Embryology |

### A. Personal Statement

My research focuses on the study of the **development and regeneration of the nervous system**, using both **Xenopus and mouse** as model organisms. I first worked as a PEW Latin American Postdoctoral Fellow in Dr. Edward M. De Robertis' laboratory at the Howard Hughes Medical Institute in UCLA (1998-2002). I have been a Principal Investigator at the **Center for Aging and Regeneration** (CARE, http://www.carechile.cl/home/) and the Department of Cell and Molecular Biology at the P. Universidad Católica de Chile (http://laboratoriolarrain.uc.cl/index.html) since 2002.

On nervous system development, we discovered that proteoglycans regulate neural tube closure in both frog and mouse through modulation of non-canonical Wnt signaling. **This work was published in high impact journals including *Nature Cell Biology, The EMBO Journal* and *Development*, and included a fruitful collaboration with Dr. Andrew Copp (University College London), a world leader in the field of neural tube defects.** We also performed transcriptomic analysis to identify genes involved in early neural development, and published this in Genome Biology, PLOS One and Methods in Molecular Biology in collaboration with John Mattick (Garvan Institute for Medical Research, Australia) expert in the field of non-coding RNAs.

In 2008, we started a new research line to understand the cellular and genetic mechanisms governing nervous system regeneration in *Xenopus*, taking advantage of the fact that frogs can regenerate the spinal cord before metamorphosis, but lose this ability during metamorphosis. **Our laboratory is now a world leader in using *Xenopus* as a model organism to study spinal cord regeneration, as shown by our recent report in *Nature Protocols* (Edwards-Faret et al., 2017) and the invitations received to write book chapters (*Xenopus* Development, Wiley-Blackwell) and reviews in different journals (*Genesis*, *Neuroscience Letters*) about this topic.** Our work has demonstrated that Neural Progenitor Cells expressing Sox2 are necessary for spinal cord regeneration, and we have performed transcriptomics and proteomics analyses to identify genes with regenerative potential. These results have been published in journals including Neural Development, Developmental Biology and Regeneration. For this work we have established international collaborations with Dr. Hollis Cline (Scripps, San Diego, USA); José Manuel García Verdugo (University of Valencia, Spain); Norman Dovichi (University of Notre Dame, USA) and Dietmar Schmucker (VIB, KU Leuven, Belgium).

Very recently and related to our work in regeneration we found that Lin28, a heterochronic gene discovered in *C. elegans*, regulates vertebrate metamorphosis through disturbance of the thyroid hormone axis. **These findings were published during the last year in Developmental Biology (Faunes and Larraín, 2016; Faunes et al., 2017), and could contribute to understand perinatal development in mammals: a fundamental area of research to understand birth defects, cognitive behavioral risks and child development.** In line with this, our next step is to evaluate the role of Lin28 in brain maturation during the perinatal period in mice.

The impact of our research is also reflected in the participation as speaker in international conferences including: International *Xenopus* Meeting (2004, 2006, 2008, 2014, 2016); Gordon Conference (2005, 2006); Latin American Society for Developmental Biology (2005, 2010, 2012, 2015); Society for Developmental Biology (2007); International Society for Developmental Biology (2013); EMBO Conference Series (2008, 2009); Keynote Symposium (2012) and the International Symposium on Neural Regeneration (2015). In addition, **we have obtained more than 16research grants funded by Chilean and International Agencies that in total have implicated a support of approximately USD 3,000,000.**

## B. Positions and Honors

### POSITIONS

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| **2000-2002** | Research Associate, Howard Hughes Medical Institute, University of California, Los Angeles, U.S.A. |
| **2002-2006** | Assistant Professor, Faculty of Biological Sciences, P. Universidad Católica de Chile |
| **2005-2009** | Chair, PhD Program in Cell & Molecular Biology, P. Universidad Católica de Chile |
| **2006-2015** | Associate Professor, Faculty of Biological Sciences, P. Universidad Católica de Chile |
| **2009- 2011** | Director, Millennium Nucleus in Regenerative Biology |
| **2010- 2015** | Vice-President for Research, P. Universidad Católica de Chile |
| **2015-** | Professor, Faculty of Biological Sciences, P. Universidad Católica de Chile |
| **2015-** | Vice-President for Academic Affairs, P. Universidad Católica de Chile |

### HONORS

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| **1993** | "DIUC Research Fellowship" from the P. Universidad Católica de Chile for the development of his undergraduate Thesis. |
| **1993** | Best graduate student of the 1988 Class in Biochemistry, P. Universidad Católica de Chile. |
| **1994-1998** | "Fundación Andes" Ph.D. Fellowship. |
| **1998-2000** | Pew Latin American Postdoctoral Fellow. |
| **1999** | Chilean Society for Cell Biology Award. Awarded for his Ph.D. thesis work. |
| **1999** | Chilean Academy of Science Award. Best National Ph.D. thesis in Biology. |

**2006** Young Scientist Prize from Bios-Chile and "Sociedad Chilena de Biología"

**2007** TWAS ROLAC Young Scientist Award in Biological Sciences

**2007** Affiliated member Third World Academy of Science (TWAS)

**2008** Pius XI Gold Medal 2008, Pontifical Academy of Science

C. **Peer-reviewed Publications**

**Publications since 2012-**

1.- Faunes, F., Almonacid, L., Melo, F., and **Larrain, J.** (2012). Characterization of small RNAs in *X. tropicalis* gastrulae. Genesis 50, 572-583.

2.- Lee-Liu, D., Faunes, F., Almonacid, L.I., Melo, F. and **Larrain, J.** (2012) Transcriptomics Using next Generation Sequencing Technologies. In Methods Mol. Biol. 917, 293-317.

3.- Gaete, M., Muñoz, R., Sánchez, N., Tampe, R., Moreno, M., Contreras, E., Lee-Liu, D. and **Larraín, J.** (2012). Spinal cord regeneration in *Xenopus* tadpoles proceeds through activation of Sox2 positive cells. Neural Dev. 7, 13.

4.- Escobedo, N., Contreras, O., Muñoz, R., Farías, M., Carrasco, H., Hill C., Tran, U., Wessely O., Copp A.J. and **Larraín, J.** (2013). Syndecan 4 interacts with Vangl2 to regulate neural tube closure and planar cell polarity. Development. 140, 3008-3017.

5.- Lee-Liu, D, Edwards-Faret, G., Tapia, V. and **Larraín, J.** (2013). Spinal Cord Regeneration: Lessons for Mammals from Non-Mammalian Vertebrates. Genesis 51, 529-44.

6.- Astudillo, P., Carrasco, H. and **Larraín, J.** (2014). Syndecan-4 inhibits Wnt/β-catenin signaling through regulation of Low-Density Lipoprotein receptor-related protein (LRP6) and R-Spondin 3. Int. J. Biochem. Cell Biol., 46, 103-112.

7.- Moreno, M., Tapia, K. and **Larrain, J.** (2014) Neural regeneration in Xenopus tadpoles during metamorphosis. *Xenopus* development. Life Sciences Book, Wiley-Blackwell.

8.- Astudillo, P. and **Larrain, J.** (2014). Wnt signaling and cell-matrix adhesion. Current Molecular Medicine 14, 209-220.

9.- Lee-Liu, D., Moreno, M., Almonacid, L.I., Tapia, V.S., Muñoz, R., von Marees, J., Gaete, M., Melo, F., and **Larraín, J.** (2014) Genome-wide expression profile of the response to spinal cord injury in *Xenopus laevis* reveals extensive differences between regenerative and non-regenerative stage. Neural Dev. 9, 12.

10.- Muñoz, R., Edwards-Faret, G., Moreno, M., Zuñiga, N., Cline, H. and **Larraín, J.** (2015) *Xenopus laevis* as a model organism to study spinal cord regeneration: role of Sox2/3$^{+}$ cells. Dev. Biol. 408, 229-243

11.- Riadi, G., Ossandón, F., **Larraín, J.** and Melo, F. (2016) Towards the bridging of molecular genetics data across *Xenopus* species BMC Genomics 17, 161.

12.- Faunes, F. and **Larraín, J.** (2016) “A conserved program of heterochronic genes and hormones regulate stem cells during developmental transitions” Dev. Biol. 416, 3-17.

13.- Lee-Liu, D., Méndez-Olivos, E.E., Muñoz, R. and **Larraín, J.** (2017) The African Clawed frog Xenops laevis: a model organism to study regeneration of the Central Nervous System. Neurosci Lett. 652, 82-93.

14.- Edwards-Faret, G., Muñoz, R., Méndez-Olivos, E., Lee-Liu, D., Tapia, V.S. and **Larraín, J.** *(2017) Spinal cord regeneration in Xenopus laevis*. Nature Protocols 12, 372-389.

15.- Tapia, V.S., Herrera-Rojas, M. and **Larrain, J**. (2017) JAK-STAT pathway activation in response to spinal cord injury in regenerative and non-regenerative stages of *Xenopus laevis.* Regeneration 4, 21-35 (**with Cover**).

16.- Faunes, F., Guzmán-Gundermann, D., Muñoz, R., Bruno, R. and **Larraín, J.** (2017) “The heterochronic gene Lin28 regulates amphibian metamorphosis through disturbance of thyroid hormone homeostasis” Dev. Biol. 425, 142-151.

17.- Méndez-Olivos, E., Muñoz, R. and **Larraín, J**. (2017) Spinal cord cells from pre-metamorphic stages differentiate into neurons and promote axon growth and regeneration after transplantation into the injured spinal cord of non-regenerative *Xenopus laevis* froglets. Frontiers Cellular Neuroscience, 11: 398.

18.- Lee-Liu, D., Sun, L., Dovichi, N. and **Larraín, J**. (2018) Quantitative proteomics after spinal cord injury in a regenerative and a non-regenerative stage in *Xenopus laevis.* Molecular and Cellular Proteomics. 17, 592-606.

19.- Edwards-Faret, G., Cebrián-Silla, A., Méndez-Olivos, E.E., González, K., García-Verdugo, J.M. and **Larraín, J.** (2018) Cellular composition and organization of the spinal cord central canal during metamorphosis of the frog *Xenopus laevis*. J. Comparative Neurology, 526: 1712-1732.

20.- Bermedo-García, F., Ojeda, J., Méndez-Olivos, E.E., Marcellini, S. Larraín, J. and Henríquez, J.P. (2018) The neuromuscular junction of *Xenopus* tadpoles: revisiting a classical model of early synaptogenesis and regeneration. Mechanism of Development (in press)

21.- González-Itier, S., Contreras, E.G., Larraín, J., Glavic, A., and Faunes, F. (2018) A role for Lin-28 in growth and metamorphosis in *Drosophila melanogaster.* Mechanism of Development (in press)

**For a Full List of Publications please see:**

https://www.ncbi.nlm.nih.gov/sites/myncbi/1hEjoKp085b55/bibliography/49256739/public/?sort=date&direction= descending