

Emerging Concepts of the Neuronal Cytoskeleton V Workshop Report

This report corresponds to the fifth edition of our series initiated in 2011. The concept behind our workshop is that small meetings, focused on a specific issue, while very useful to improve the training of young researchers, are hard to attend to Latin American graduate students, postdocs and even some young principal investigators. Our solution to this paradox was to bring many of the most renowned scientists in the cytoskeleton field in neurons to South America, allowing direct interaction and discussion with all attendees.

This year our workshop again provided a great opportunity for Latin American scientists to meet with and share science with leading researchers on the neuronal cytoskeleton coming from North America, Europe and Asia. We defined four major goals for our series which are: 1) to bring top international researchers to Latin American, along with their own students to discuss the neuronal cytoskeleton, a central research area in cell biology that has a strong tradition in the; 2) to further training and education of Latin American students by providing them with a valuable opportunity to interact with leading scientists in this field; 3) to provide an opportunity for the formation of new collaborations between Latin American and foreign scientists; and 4) to offer Latin American students the opportunity to make the connections necessary to arrange rotations, research visits, and postdoctoral fellowships in leading foreign laboratories.

The organizing committee was formed by Dr. Christian Gonzalez-Billault (Universidad de Chile, Chile), Dr. Patricia Garcez (Universidade Federal do Rio de Janeiro, Brazil) and Dr. Subhojit Roy (University of Wisconsin-Madison, USA).

Attendees and demographics

The workshop took place at Hotel Park Lake, Villarrica, Chile during April 14-18, 2019. We had 95 attendees from Latin America, US, Europe and Asia. The nationality of the participants was as follows: Argentina (9), Belgium (1), Brazil (4), Chile (24), Germany (9), Finland (1), France (5), United Kingdom (6), India (1), Japan (2), Mexico (1), Netherlands (2), New Zealand (1), Peru (1), Portugal (5), United States (23).

For Workshop Program please see Annexe-1 (abstract book)

Keynote Lecture (Chair: Subhojit Roy)

The Keynote Lecture on this edition was presented by **Vann Bennett** where he provided a historical perspective of ankyrins functions in the brain, including new data implication giant ankyrin-B in autism syndrome disorders

Session 1: Super-resolution imaging in neurons (Chair: Anthony Brown)

This first session was a novel subject in our conference. We started our meeting showing some of the latest advances in the utilization of super resolution microscopy in neurons. The session was opened by **Christophe Leterrier** that presented correlative super-resolution and electronic microscopy to describe

the nanoscale organization of the axonal cytoskeleton. In the second talk of the session **Marina Mikhaylova** shared unpublished results that showed the intertwined functions of membrane-derived organelles and actin microfilaments for dendritic functions. Then, **Monica Sousa** described the molecular mechanisms that couple actin dynamics and spectrin/adducin signaling in determining axonal caliber. Finally, **Daniel Choquet** beautifully showed the organization at the nanolevel of the post-synaptic compartment describing exquisite molecular mechanisms involved in AMPA receptor delivery, glutamate dendritic spine assembly and behavior in mature neurons.

Session 2: Neuronal polarity (Chair: Patricia Garcez)

The second session, was opened by **Christian Gonzalez-Billault** that described the coupling between exocytosis mechanisms with actin dynamics which are important to determine axon specification. The second talk was presented by **Naoyuki Inagaki** that described two novel roles for the shootin 1 protein associated with axonal pathfinding and neuronal migration during brain development. The third talk was presented by **Froylan Calderon de Anda**, that described the organization of actin filaments in neurites during early polarization. Finally, **Sebastian Dupraz** challenged the dogma that RhoA was a molecule that negatively regulate axon elongation.

Session 3: Cytoskeleton in Neuronal Migration and Axonal Guidance (Chair: Francisca Bronfman)

In the third session, cellular and molecular mechanisms linking cytoskeleton functions with neuronal migration and axonal guidance were discussed. In first term, **Kazunori Nakajima** provided an overall view of cerebral cortex development including precursors proliferation, differentiation and migration of neurons in rodents. **Laurent Nguyen** addressed mechanisms involved in tangential migration of interneurons, and the role of microtubules. **Fiona Francis**, presented the effect of mutations in different genes associated to neuronal cytoskeleton and their consequences over migration and cortex formation. In the same line, **Emily Bates** presented a talk addressing how mutations in tubulin subunits induced cytoskeleton remodeling that impaired normal brain development. Finally, **Maria Paz Marzolo**, showed novel results linking lipid carriers and their signaling mechanisms during axonal guidance and neuronal migration.

Session 4: Physiological trafficking and transport in neurons (Chair: Claudia Almeida)

The first speaker in this session was **Bettina Winckler** that presented a provoking talk addressing the role of intermediate filaments for neuronal functions. **Eric Dent** discussed physical and molecular mechanism that regulate membrane forces required to support neurite growth and endocytosis. The third talk on this session was presented by **Subhojit Roy** and showed recent findings that indicate an unexplored role for the alpha synuclein at the presynaptic terminal. Finally, **Francoise Coussen** showed how AMPA receptor trafficking is important to determine the LTP and LTD responses during synaptic plasticity.

Session 5: Pathological trafficking and transport in neurons (Chair: Maria Paz Marzolo)

The first talk of this session was presented by **Sandhya Kousika** that discussed how actin dynamics is essential to support axonal transport in nematodes in healthy and injured axons. Then, **Zu-hang Sheng** discussed the role of mitochondria anchoring proteins during neurodegenerative diseases and in regeneration establishing a model involved in mitochondria quality control in axons. In the third talk, **Claudia Almeida** described the molecular mechanisms that control APP sorting and intra cellular processing and the involvement of actin relating proteins in such processing. Finally, **Shawn Ferguson** explored the role of lysosomes distribution in axons, providing compelling evidences that links lysosome transport with normal and pathological functions in neurons.

Session 6: Actin and microtubule cytoskeleton in neurons (Chair: Elias Spiliotis)

This session was opened by **Nicholas Boyer** (from Stephanie Gupton laboratory) and described a novel mechanism that involved the participation of two different E3 ubiquitin ligases during Netrin-1 dependent axonal guidance. This talk was followed by **Matthew Dalva** talk that described novel mechanisms controlling the establishment of synapses during neural plasticity. **James Zheng** presented a novel actin dependent mechanism that involved the participation of G-actin and phosphoinositides as key molecular elements in dendritic spine formation. The last talk in this session was presented by **Marvin Bentley** where he discussed a novel approach to address the contribution of molecular motors from the kinesin superfamily toward axon and dendrite development.

Session 7: Spectrin, Septins and Ankyrins in neuronal functions (Chair: Fiona Francis)

This was a totally new subject in our conference intended to recognize the importance of less known cytoskeleton elements such as Spectrins, Spetins and Ankyrins. In the first talk, **Damaris Lorenzo** evaluated the contribution of beta II spectrin to axonal elongation and stability. Then, **Elias Spiliotis** showed evidences for a role of septins during neuronal polarity acquisition as spatial regulator of motor derived transport. Later on, **Robin Scharrenberg** discussed the role of TAOK2 gene in autism spectrum disorder, associated to neuronal migration deficiency.

Session 8. The next generation of cytoskeleton researchers (Chair: Peter Baas)

In this last session, as we did in 2017 edition, we invited young and promising researchers that are part of the new generation of cytoskeleton researchers. In first term, **Patricia Garcez** discussed the role of CENPJ protein during proliferation, migration and axon pathfinding by regulating microtubule functions. Then **Laura Gumy** presented a novel function for the microtubule-associated 2 protein as a regulator of axonal transport. **Maria Elena Avale**, discussed the molecular mechanism involved in the differential splicing of the tau mRNA that give rise to different isoforms that can be linked to physiological and pathological aspects in neurons. **Meng-meng Fu** discussed the role of the Golgi outpost protein TPPPP in oligodendrocytes and its consequences over neuronal myelination. **Alyson Twelvetrees** presented evidences that suggest a coupling

between the movement of dynein and kinesin motors in neuronal cells. **Cecilia Conde** evaluated the contribution of the recycling endosome protein Rab11 to the assembly of dendritic spines and its role during mice behavior paradigms. **Maria Magiera** presented the functions of polyglutamylation in neuronal microtubules. Her findings indicate that abnormal polyglutamylation induced neurodegeneration in mice and humans. Finally, **Carlos Wilson** presented a novel twist into neuronal polarity that involved the participation of an enzyme that controls epigenetic marks in neurons.

Conclusions and Opportunities

In addition to the scientific sessions, we had two poster sessions where 61 posters were presented. We split the group in two, to allow all poster presenters have time to visit other posters too. We also had a technical lecture presented by Georg Wieser from Zeiss, where he discussed the applications and benefits of super resolution microscopy and its applications in neurobiology and cytoskeleton research.

On the last evening we conducted a business meeting to discuss future plans for the workshop, to complete a survey (**Annex 3**), and to get some ideas to keep attendees in contact after the workshop. Although the location was acknowledged as excellent by most of the attendees, it was decided that the sixth Emerging Concepts of the Neuronal Cytoskeleton Workshop would be held in Santa Cruz, Chile during April-May 2021. For the next round we selected a brand new organizing committee with organizers based in Europe (Dr. Christophe Leterrier, University of Marseille, France), USA (Dr. Stephanie Gupton, University of North Carolina at Chapel Hill, USA) and Latinamerica (Dr. Carlos Wilson, Instituto Mercedes y Martin Ferreyra, Argentina). We expect that by maintaining a female chair for the next edition will contribute to recruit more female participants. It is part of the spirit in our conference to seek for gender parity. Of note, during the present edition 50% of speakers were female researchers at different stages of their career. In addition, we will keep encouraging the participation of young people. One of the goals for the next edition is to increase the cap on attendance at the meeting by 15% if sufficient funding can be obtained.

We would like to bring the attention to the Conference Committee that in this edition we provided travel grants to attendees that otherwise would not be able to participate in our conference.

It was agreed to continue to require that speakers and the rest of participants pay their flight costs in order to keep costs down and channel limited resources towards attracting students and young researchers. It was also agreed to continue to ensure that all the participants share hotel and meals throughout the whole meeting, to maximize opportunities for interactions with the speakers.

Financial Report

ISN funds

We used the funding provided by ISN to defray lodging and meals of young participants and speakers at the Conference. The names, origin and amount allocated on each case is listed below:

A.- Attendees

1.- Makarena Muñoz
Universidad Santo Tomás
Chile
US\$600

2.- Jayne Aiken
University of Colorado-Denver
USA
US\$600

3.- Gabriela Pinheiro
Universidade Federal do Rio de Janeiro
Brazil
US\$600

4.- Ricardo Viais
Institute for research in Biomedicine of Barcelona
Spain
US\$600

5.- America Chandia
Universidad Catolica de Chile
Chile
US\$600

6.- Marcia Liz
Universidade do Porto
Portugal
US\$600

7.- Marcelo Marucho
University of Texas at San Antonio
USA
US\$600

8.- Nicolas Martinez
Fundacion Ciencia y Vida
Chile
US\$600

9.- Esteban Retamales
Pontificia Universidad Catolica
Chile
US\$600

10.- Victoria Rozes-Salvador
INIMEC-CONICET
Argentina
US\$600

11.- David Villarroel
University College London
UK
US\$600

12.- Janet Paluh
State University of New York
USA
US\$600

13.- Oscar Lazo
University College London
UK
US\$ 600

14.- Robin Scharrenberg
ZMNH Hamburg
Germany
US\$600

15.- Evelyn Smith
University of Sheffield
UK
US\$600

16.- Francisca Rojo
Pontificia Universidad Catolica
Chile
US\$600

17.- Ankita Patil
Drexel College of Medicine
USA
US\$600

18.- Xingxiu Pan
University of Utrecht
Netherlands
US\$600

19.- André Voelzmann
University of Manchester
UK
US\$600

20.- Dasfne Lee-Liu
Universidad de Chile
Chile
US\$600 (partial support)

B.- Speakers

1.- Matthew Dalva
Thomas Jefferson University
USA
US\$1,070

2.- Kazunori Nakajima
Keio University
Japan

US\$1,070

3.- Elias Spiliotis
Drexel College of Medicine
USA
US\$1,070

4.- Subhojit Roy
University of Wisconsin-Madison
US\$1,070

5.- Bettina Winckler
University of Virginia
USA
US\$1,070

6.- Christophe Leterrier
University of Marseille
France
US\$1,070

7.- Zu-hang Sheng
NINDS
USA
US\$1,070

8.- James Zheng
Emory University
USA
US\$1,070