

# LORENZO A. CINGOLANI

## Affiliation

**Associate Professor** *Phone:* +39 040 5588728  
**Department of Life Science** *E-mail:* lcingolani@units.it  
**University of Trieste**  
**Trieste 34127, Italy**

## Education & scientific appointments

*Dec 2018 - present* **University of Trieste (Italy)**

**Associate Professor of Physiology** at the Department of Life Science

*Lines of research:* - Gene therapy development in neurodevelopmental disorders  
- Biomechanical regulation of synaptic transmission

Lab members: Lucia Celora (Project manager), Fanny Jaudon (Senior Postdoc), Jessica Muià (Postdoc), Sara Riccardi (PhD student), Asja Ragnini (PhD student), Anna Maienza (PhD student).

Coordinator of the International Master's degree in Neuroscience

Member of the faculty board of the PhD program in Molecular Biomedicine

Member of the Italian Society for Neuroscience

Member of the Italian Society of Physiology

Qualified as Full Professor in Physiology

*Feb 2012 - Dec 2018* **Italian Institute of Technology, Genoa (Italy)**

**Principal investigator** at the Center for Synaptic Neuroscience

*Research theme:* Molecular mechanisms of synapse specificity and function in the central nervous system

*Jan 2003 - Jan 2012* **University College London (UK)**

**Research associate** (2007 - 2012) at the MRC Laboratory for Molecular Cell Biology

**Postdoctoral fellow** (2003 - 2006) at the MRC Laboratory for Molecular Cell Biology

*Research theme:* Structural and functional determinants of synaptic plasticity

*Principal investigator:* Dr Yukiko Goda

*Nov 1998 - Sept 2002* **Max-Planck Institute, Göttingen (Germany)**

**Ph.D. in Neurobiology**, conferred by the Humboldt University of Berlin; research conducted at the Max-Planck Institute for Experimental Medicine, Göttingen. Final mark: magna cum laude.

*Title of the thesis:* Developmental Regulation of AHP Currents and SK Channel Subunit Expression in the Rat Central Nervous System.

*Supervisors:* Prof Walter Stühmer & Dr Paola Pedarzani

*Nov 1992 - July 1998* **University of Pisa (Italy)**

**M.Sc. in Molecular Biology**. Final mark: 110/110 cum laude.

## Grants

- **European Innovation Council - Horizon-Widera-2023-Access-06** (Grant ID: 101158607; *A synaptic mechanogenetic technology to repair brain connectivity - Hop-on widening with human in vitro models - SynMech-Hop on*); total funding: **545.462 €**; personal funding: **49.587 €**; Co-ordinator.
- **Cariplo Foundation** (*Exploring neuron-glia interaction in the pathophysiology of PCDH19-related epilepsy*); period: 2024-2026; total funding: **197.000 €**; personal funding: **35.000 €**; Co-applicant.
- **Ministry of University and Research - PRIN 2022** (Grant ID: J53D23011040006; *SynMech - A mechanogenetic toolkit to regulate synaptic connectivity*); period: 2023-2025; total funding: **205.213 €**; personal funding: **89.138 €**; Coordinator.
- **Telethon/Cariplo Foundations** (Grant ID: GJC22053; *Targeting Hippocalcin-like protein 4 (HPCAL4) provides new therapeutic opportunities for episodic ataxia type 2 and epileptic encephalopathy 42*); period: 2023-2025; total funding: **249.960 €**; personal funding: **179.960 €**; Coordinator.
- **European Innovation Council - Horizon-EIC-2022-Pathfinderopen-01-01** (Grant ID: 101099579; *SynMech - A synaptic mechanogenetic technology to repair brain connectivity*); total funding: **2.998.505 €**; personal funding: **898.950 €**; Coordinator.
- **Ministry of Health - Finalized Research** (*DRACULA - The role of the glutamatergic neurotransmission in post-partum depression: an integrated molecular-pharmaco-imaging study*); total funding: **450.000 €**; personal funding: **33.250 €**; Subcontractor.
- **Extraordinary grant for purchasing scientific equipment - University of Trieste** (2022); funding: **68.613 €**; Coordinator.
- **Grant equipment from the Beneficentia Stiftung foundation** (2021); funding: **34.896 €**; Coordinator
- **Cariplo Foundation** (Grant ID: 2019-3438; *DIGAP - Integrins and protocadherins in glutamatergic circuits: identification of common signaling pathways and molecular targets in anxiety and major depressive disorders*); period: 2020-2023; total funding: **300.000 €**; personal funding: **95.000 €**; Co-applicant.
- **Telethon Foundation** (Grant ID: GGP19181; *Genome-editing regulation of alternative splicing provides new therapeutic opportunities for episodic ataxia type II*); period: 2019-2023; total funding: **437.290 €**; personal funding: **279.290 €**; Coordinator.
- **Ataxia UK Foundation** (*Regulation of alternative splicing of voltage-gated Ca<sup>2+</sup> channels by CRISPR/Cas9-mediated genome editing as potential genetic therapy for episodic ataxia type 2*); period: 2019-2020; funding: **5.000 £**; Principal investigator.
- **Contribution Compagnia San Paolo** (Grant ID: 2015.0702; *Genome-editing approaches for personalized medicine in inherited diseases*); period: 2016-2018; funding: **152.000 €**; Principal Investigator.
- **European Innovation Council - Marie Curie Innovative Training Networks H2020-MSCA-ITN-2014** (Grant ID: 642881; *ECMED - The Extracellular Matrix in Epileptogenesis*); period: 2015-2018; total funding: **3.047.025 €**; personal funding: **258.061 €**; Co-applicant.
- **European Innovation Council - Marie Curie Career Integration Grants FP7-PEOPLE-2012-CIG** (Grant ID: 334218; *SynAMPAdhesion - Synaptic functions of integrin-mediated cell adhesion in physiological conditions and autism-related abnormalities in mice*); period: 2013-2017; funding: **100.000 €**; Principal Investigator.

## Patents

- Identification of genomic sequences for the treatment of ataxias and epilepsies; reference number: BI5834R; inventors. Lorenzo A. Cingolani and Fanny Jaudon; date of submission: 15 November 2023; patent office: Società Italiana Brevetti.

## Publications

- Letellier, M.\* and **Cingolani, L.A.\*** Whole-cell patch-clamp recordings in organotypic slices. The handbook of electrophysiology: a practical guide for neurophysiologists, edited by Annalisa Scimemi, Nicolas Wanaverbecq and Ian Duguid. World Scientific Publishing, *in press*.
- Vitale, C., Jaudon, F., Lujan, R., Bartolucci, M., Celora, L., Reisola, E., Ruggeri, R., Petretto, A., Thalhammer, A. and **Cingolani, L.A.\*** (2025). Dysregulated cortical excitability and tau phosphorylation in a beta3 integrin mouse model of autism. **Brain**.
- Jaudon, F. and **Cingolani, L.A.\*** (2024) Unlocking Mechanosensitivity: Integrins in Neural Adaptation. **Trends in Cell Biol** 34(12): 1029-1043
- Celora, L., Jaudon, F., Vitale, C., and **Cingolani, L.A.\*** (2023). Regulation of dendritic spine length in corticopontine layer V pyramidal neurons by autism risk gene beta3 integrin. **Mol Brain** 16, 49.
- **Cingolani, L.A.\***, Thalhammer, A.\*, Jaudon, F., Muia, J., and Baj, G. (2023). Nanoscale organization of Ca(V)2.1 splice isoforms at presynaptic terminals: implications for synaptic vesicle release and synaptic facilitation. **Biol Chem** 404, 931-937. \*Co-corresponding authors.
- Moretto, E., Longatti, A., Miozzo, F., Bonnet, C., Coussen, F., Jaudon, F., **Cingolani, L.A.**, and Passafaro, M. (2023). The tetraspanin TSPAN5 regulates AMPARs exocytosis by interacting with the AP-4 complex. **Elife** 12.
- Jaudon, F., Thalhammer, A., Zentilin, L., and **Cingolani, L.A.\*** (2022). CRISPR-Mediated Activation of Autism Gene Itgb3 Restores Cortical Network Excitability via mGluR5 Signaling. **Mol Ther - Nucleic Acids**, 29, 462-480.
- Riccardi, S., **Cingolani, L.A.\***, and Jaudon, F.\* (2022). CRISPR-Mediated Activation of alphaV Integrin Subtypes Promotes Neuronal Differentiation of Neuroblastoma Neuro2a Cells. **Front Genome Ed** 4, 846669. \*Co-corresponding authors.
- Celora, L. and **Cingolani, L.A.** (2022) Il ruolo dei recettori del glutammato nei disturbi psichiatrici. *Neuroscienze psichiatriche e computazionali*, edited by Paolo Brambilla, Edizioni Minerva Medica, 96 - 108.
- Ferrante, D., Sterlini, B., Prestigio, C., Marte, A., Corradi, A., Onofri, F., Tortarolo, G., Vicidomini, G., Petretto, A., Muia, J., Thalhammer, A., Valente, P., **Cingolani, L.A.**, Benfenati, F., and Baldelli, P. (2021). PRRT2 modulates presynaptic Ca(2+) influx by interacting with P/Q-type channels. **Cell Rep** 35, 109248.
- Jaudon, F., Thalhammer, A., and **Cingolani, L.A.\*** (2021). Integrin adhesion in brain assembly: From molecular structure to neuropsychiatric disorders. **Eur J Neurosci** 53, 3831-3850.
- Letellier, M.\* and **Cingolani, L.A.\*** (2021). Editorial: Homeostatic Synaptic Plasticity: From Synaptic Circuit Assembly to Neurological Disorders. **Front Cell Neurosci** 15, 695313.
- Jaudon, F., Baldassari, S., Musante, I., Thalhammer, A., Zara, F., and **Cingolani, L.A.\*** (2020). Targeting Alternative Splicing as a Potential Therapy for Episodic Ataxia Type 2. **Biomedicines** 8.
- Thalhammer, A., Jaudon, F., and **Cingolani, L.A.\*** (2020). Emerging Roles of Activity-Dependent Alternative Splicing in Homeostatic Plasticity. **Front Cell Neurosci** 14, 104.

- **Cingolani, L.A.\***, Vitale, C., and Dityatev, A.\* (2019). Intra- and Extracellular Pillars of a Unifying Framework for Homeostatic Plasticity: A Crosstalk Between Metabotropic Receptors and Extracellular Matrix. **Front Cell Neurosci** 13, 513.
- Thalhammer, A., Jaudon, F., and **Cingolani, L.A.\*** (2018). Combining optogenetics with artificial microRNAs to characterize the effects of gene knockdown on presynaptic function within intact neuronal circuits. **J Vis Exp**. 133, e57223.
- Thalhammer, A., Contestabile, A., Ermolyuk, Y.S., Ng, T., Volynski, K.E., Soong, T.W., Goda, Y., and **Cingolani, L.A.\*** (2017). Alternative splicing of P/Q-type Ca<sup>2+</sup> channels shapes presynaptic plasticity. **Cell Rep** 20, 333-343.
- Korotchenko, S.<sup>#</sup>, **Cingolani, L.A.<sup>#</sup>**, Kuznetsova, T. <sup>#</sup>, Bologna, L.L., Chiappalone, M., and Dityatev, A. (2014). Modulation of network activity and induction of homeostatic synaptic plasticity by enzymatic removal of heparan sulfates. **Philos Trans R Soc Lond B Biol Sci** 369. <sup>#</sup>Co-first authors.
- Kerrisk, M.E., **Cingolani, L.A.**, and Koleske, A.J. (2014). ECM receptors in neuronal structure, synaptic plasticity, and behavior. **Prog Brain Res** 214, 101-131.
- Ronzitti, G., Bucci, G., Emanuele, M., Leo, D., Sotnikova, T.D., Mus, L.V., Soubrane, C.H., Dallas, M.L., Thalhammer, A., **Cingolani, L.A.**, Mochida, S., Gainetdinov, R., Stephens, G., and Chierigatti, E. (2014). Exogenous alpha-Synuclein decreases raft partitioning of Cav2.2 channels inducing dopamine release. **J Neurosci** 34, 10603-10615.
- Thalhammer, A., and **Cingolani, L.A.\*** (2014). Cell adhesion and homeostatic synaptic plasticity. **Neuropharmacology** 78, 23-30.
- Gymnopoulos, M., **Cingolani, L.A.**, Pedarzani, P., and Stocker, M. (2014). Developmental mapping of small-conductance calcium-activated potassium channel expression in the rat nervous system. **J Comp Neurol** 522, 1072-1101.
- McGeachie, A. B., Skrzypiec, A. E., **Cingolani, L. A.**, Letellier, M., Pawlak, R. & Goda, Y. (2012)  $\beta 3$  integrin is dispensable for conditioned fear and Hebbian forms of plasticity in the hippocampus. **Eur J Neurosci** 36, 2461-2469.
- Bassani, S. and **Cingolani, L. A.\*** (2012) Tetraspanins: Interactions and interplay with integrins. **Int J Biochem Cell Biol** 44, 703-708.
- Bassani, S., **Cingolani, L. A.**, Valnegri, P., Folci A., Zapata, J., Gianfelice, A., Sala, C., Goda, Y., and Passafaro., M. (2012) TSPAN7, a protein involved in X-linked intellectual disability, promotes development of excitatory synapses and regulates AMPAR trafficking through interaction with PICK1. **Neuron** 73, 1143-1158.
- Pozo, K., **Cingolani, L. A.**, Bassani, S., Laurent, F., Passafaro, M. and Goda, Y. (2012)  $\beta 3$  integrin interacts directly with GluA2 AMPA receptor subunit and regulates AMPA receptor expression in hippocampal neurons. **Proc Natl Acad Sci USA** 109, 1323-1328.
- McGeachie, A. B., **Cingolani, L. A.**, and Goda, Y. (2011). A stabilizing influence: Integrins in regulation of synaptic plasticity. **Neurosci Res** 70, 24-29.
- Thalhammer, A., Edgington, R. J., **Cingolani, L. A.**, Schoepfer, R., and Jackman, R. B. (2010). The use of nanodiamond monolayer coatings to promote the formation of functional neuronal networks. **Biomaterials** 31, 2097-2104.
- **Cingolani, L.A.\*** and Goda, Y\*. (2009). Differential involvement of  $\beta 3$  integrin in pre- and postsynaptic forms of adaptation to chronic activity deprivation. **Neuron Glia Biol** 4, 179-187.
- **Cingolani, L. A.\*** (2008). *In vivo* glutamate receptor dynamics: lessons from the fly neuromuscular junction. **Cell Science** 5, 25-33.

- **Cingolani, L. A.\***, Thalhammer, A., Yu, L. M., Catalano, M., Ramos, T., Colicos, M. A., and Goda, Y.\* (2008). Activity-dependent regulation of synaptic AMPA receptor composition and abundance by  $\beta 3$  integrins. *Neuron* 58, 749-762. **Reviewed** in Aizenman, C. D., and Pratt, K. G. (2008). There is more than one way to scale a synapse. *Neuron* 58, 651-653. \*Co-corresponding authors.
- **Cingolani, L. A.** and Goda, Y. (2008). Actin in action: the interplay between the actin cytoskeleton and synaptic efficacy. *Nat Rev Neurosci* 9, 344-356.
- Okuda, T., Yu, L. M., **Cingolani, L. A.**, Kemler, R., and Goda, Y. (2007).  $\beta$ -Catenin regulates excitatory postsynaptic strength at hippocampal synapses. *Proc Natl Acad Sci USA* 104, 13479-13484.
- **Cingolani, L. A.**, Gymnopoulos, M., Boccaccio, A., Stocker, M., and Pedarzani, P. (2002). Developmental regulation of small-conductance  $\text{Ca}^{2+}$ -activated  $\text{K}^{+}$  channel expression and function in rat Purkinje neurons. *J Neurosci* 22, 4456-4467.
- Pedarzani, P., Mosbacher, J., Rivard, A., **Cingolani, L. A.**, Oliver, D., Stocker, M., Adelman, J. P., and Fakler, B. (2001). Control of electrical activity in central neurons by modulating the gating of small conductance  $\text{Ca}^{2+}$ -activated  $\text{K}^{+}$  channels. *J Biol Chem* 276, 9762-9769.

### Latest conference & invited talks

- *Research and treatment development in episodic ataxias*. **Invited speaker** for the American National Ataxia Foundation webinar (Jan 2024).
- *Integrin adhesion in cortical circuit assembly: From molecular interactions to neurodevelopmental disorders*. **Invited speaker** at the SINS national meeting, Turin, Italy (Sept 2023).
- *Integrin adhesion in cortical circuit assembly: From molecular interactions to neurodevelopmental disorders*. **Invited speaker** at the MaSBiC Symposium, Ancona, Italy (Sept 2023).
- *Activity-dependent regulation of presynaptic plasticity by alternative splicing of voltage-gated calcium channels*. **Invited talk** at the University of Trieste, Italy (Jan 2018).
- *Integrins in synaptic excitability: relevance for neurodevelopmental disorders*. **Invited speaker** at the Cell Physics 2017 conference, Saarbrücken, Germany (Oct 2017).
- *Matching channels to function: alternative splicing of voltage-gated calcium channels and presynaptic plasticity*. **Invited talk** at the Bordeaux Neurocampus, Bordeaux, France (Apr 2017).
- **Co-organizer** of the workshop ‘The use of virus vectors in neuroscience: Virus-mediated gene delivery into the rodent brain’, Genoa, Italy (June 2016), as part of the Marie Curie ITN ECMED network.
- *Silencing strategies with AAV in vivo*. **Speaker** at the ITN workshop ‘The use of virus vectors in neuroscience: Virus-mediated gene delivery into the rodent brain’, Genoa, Italy (June 2016).
- *Integrins in the homeostatic control of synaptic strength*. **Invited speaker** at the ‘Joint COST - DZNE Workshop on Extracellular Matrix and Homeostatic Synaptic Plasticity’ Magdeburg, Germany (Jan 2014).
- **Chair of the session** ‘ECM barriers and signalling as mechanisms of synaptic plasticity’ at the FENS satellite conference ‘Brain Extracellular Matrix in Health and Disease’ Barcelona, Spain (July 2012).

- *TSPAN7 regulates excitatory synapse development and AMPA receptor trafficking*. **Invited speaker** at the FENS satellite conference ‘Brain Extracellular Matrix in Health and Disease’, Barcelona, Spain (July 2012).
- *Homeostatic control of synaptic strength: A role for cell adhesion*. **Invited talk** at the Italian Institute of Technology, Genoa, Italy (July 2011).
- *Homeostatic control of synaptic strength: A role for cell adhesion*. **Invited talk** at the Center for Molecular Neurobiology, Hamburg, Germany (Apr 2011).
- *Homeostatic control of synaptic strength: Mechanisms and function*. **Invited talk** at the Institute of Medical Sciences, Aberdeen, Scotland (Nov 2010).
- *Integrin action at the synapse: Coupling adhesion and synaptic strength*. **Invited talk** at the Center of Functional Connectomics, Korea Institute of Science and Technology, Seoul, South Korea (May 2010).

### **Ad hoc reviewer**

*for the following journals:*

Cell Report, Embo Journal, J. of Neurosci, Cellular and Molecular Life Sciences, J. of Neurophysiology, European J. of Cell Biology, J. of Neurochemistry, J. of Biological Chemistry, Progress in Neurobiology, Molecular Brain, Neuropharmacology, Experimental Neurology, Philosophical Transaction B - Biological Sciences, Frontiers journals, Cells

*for the following grant agencies:*

European Research Council, French National Research Agency, Swiss national Science Foundation, Netherlands Organization for Scientific Research, Ataxia UK.

### **Current teaching activities**

- Advanced electrophysiology, for the students of the International Master’s degree in Neuroscience, University of Trieste
- Neuro-functional techniques, for the students of the International Master’s degree in Neuroscience, University of Trieste
- *Fisiologia*, for the students of the bachelor’s degree in *Scienze e Tecnologie Biologiche*, University of Trieste
- *Fisiologia*, for the students of the bachelor’s degree in *Infermieristica*, University of Trieste