

PERSONAL INFORMATION

Lucia Manni



CURRENT POSITION

Since 01/11/2010 Associate professor, Department of Biology, University of Padova, Italy
Since 2011 - Member of the Scientific Community of the Stazione Zoologica "A. Dohrn" di Napoli (Italy)
Since 2024 – Member as "socia corrispondente" of the Accademia Galileiana, Class of Mathematical, Physical and Natural Sciences (Decreto 396, 19/09/2024).

PREVIOUS POSITION

- February 2019, July 2019, and February 2020 - Visiting scientist for the study of stem cells in development and regeneration of colonial ascidians at Hopkins Marine Station, Stanford University, CA, USA in collaboration with Dr. A. Voskoboynik and Prof. I. Weissman.
- May 2018 - Visiting Professor at ASSEMBLE Interuniversity Institute of Marine Sciences, Eilat (Israel) thanks to a Plus Transnational Access grant "Nervous system regeneration and development in the solitary ascidian Polycarpa mytiligera" for research collaboration with Prof. Noa Shenkar Lab.
- 2009-2011 Several periods as Visiting Scientist in the frame of the British-Italian partnership programme for young researchers 2008-2009 "A new chordate animal model for the study of adult stem cells and regenerative mechanisms" – Grant for multiple missions for a research collaboration with Dr. S. Shimeld at Oxford University (UK)
- 2010 – Several periods as Visiting Scientist in the frame of the Italian-German researcher exchange program Vigoni 2010 "Hair cell evolution in Chordates". Grant for multiple missions for a research collaboration with Dr. T. Stach at Humboldt-Universität zu Berlin
- April 2004 / May 2004 Visiting Scientist at the Friday Harbor Laboratories - University of Washington (collaboration with Prof. G. Mackie)
- 1998-2019 Tenure-track Researcher, DiBio@UNIPD, Italy
- 1995-1996 PostDoc at DiBio@UNIPD
- 1990 - 1991 Erasmus PhD student, Laboratory of Biologie Cellulaire - Université Paris XI, France Supervisor: Prof. A. Adoutte.

EDUCATION AND KEY QUALIFICATIONS

20/10/1995 PhD in Evolutionary Biology, Department of Biology University of Padova, Italy.
Supervisor: Prof. Paolo Burighel
13/07/1988 Master in Biology, *summa cum laude*
Faculty of Sciences, DiBio@UNIPD, Italy

LANGUAGE SKILLS

Mother tongue Italian
Other languages English C2

RESEARCH ACHIEVEMENTS AND PEER RECOGNITION

Research achievements (I report in bracket the citations of my papers listed below)

I am a biologist with a broad interest in ascidian biology in an evo-devo perspective. I have extensively contributed to the basic science of this group of marine invertebrates, moving from reproduction to development, from stem cell biology to biodiversity, from nervous and sensory systems to noise

pollution. My expertise quite naturally led to the questions we are addressing in WAVES.

Nervous system development, degeneration, and aging in ascidians. During my PhD, I studied ascidian reproductive strategies, that range from external to internal fertilization, from oviparity to viviparity, describing the modalities of ovulation and placentation and evidencing for the first time the parental contribution to embryo development. During my PhD I spent a research period in the Laboratory of Biologie Cellulaire (Université Paris XI, France; Supervisor: Prof. A. Adoutte). Moreover, I could win a post-grant, thanks to which I moved to the study of the nervous system in ascidians, a constant theme in my career. In the model species *Ciona robusta* and *Botryllus schlosseri*, I described the motor nerve development and pattern, and the development of the adult brain during both metamorphosis and asexual reproduction. I found in the ascidian embryo placodal-like territories, now considered homologous to vertebrate placodes (2). These data, together with the discovery of a new sensory organ (see below) led to change the common view that vertebrates evolved thanks to the neural crests and the neural placodes, classically considered exclusive to the latter. Nowadays, tunicates are believed to possess the precursors of neural crests and neural placodes. Thanks to two University Research Projects (2015, 2020) I studied the mechanisms of brain degeneration and aging. Recently, I found that *B. schlosseri* zooids display two neurodegenerative pathways: one is fast and associated with the blastogenetic cycle, the other one is slow and associated with aging. The latter is characterized by the expression of hundreds of putative genes linked to neurodegenerative disease associated pathways. The results, published in PNAS in 2022 (10) and other significant papers (Anselmi et al., 2023 Cells, Bocci et al., Bocci et al., 2024 Brain Comm), showed that cellular and molecular mechanisms of neurodegeneration are evolutionary conserved between tunicates and humans and suggested that changes in expression levels of neural stem cells associated genes also contribute to neurodegeneration.

Sensory organ evolution in ascidians. In 2003 (1), I discovered a new mechanosensory organ, the coronal organ. For embryonic origin, morphology and molecular features, development and function, its cells are considered homologues to vertebrate the hair cells of the inner ear and lateral line system. Since the coronal organ derives from an embryonic placodal-like area, I prompted a revision of the vertebrate origin theory. Thanks to these breakthrough results, I was invited to symposia in international meetings (7), such as three Neural Crest and Cranial Placodes Gordon Research Conferences. Our article (4), in which I was the research validator, was recommended in "F1000prime" for the Developmental Biology area in the Article Recommendation section of the journal Hearing Research. Thanks to my knowledge of tunicate mechanoreceptors, I am the coordinator (7 partners; 4 countries) of the European consortium DeuteroNoise involved in studying the effect of noise as an emergent pollutant in European sea basins (JPI OCEAN. PROPOSAL NoiseInTheSea-2022-0011). Previously, I was financed in 2009 by the Italian University&Research Ministry-MUR, and in 2010 by Italian-German researcher exchange program Vigoni.

Ascidian formalization. My passion for *C. robusta* and *B. schlosseri* brought me re-described the two species, being cryptic. In 2013-2017, I coordinated a working group formed of more than 10 researchers from the Museo di Storia Naturale di Venezia, Uni. of Milan, Uni. of Bari (Italy), Uni. of Oxford (UK), Humboldt-Universität zu Berlin (Germany), McGill Uni. (Canada), and Uni. of Vienna (Austria) for the taxonomic revision of the model ascidian *Ciona intestinalis*, evidencing that under this name two cryptic species (*Ciona robusta* and *Ciona intestinalis*) were hidden. This revision was significantly challenging for the tunicate community, raising awareness about the undetected risk of working with different species when collecting wild animals from different seas around the world (6). The topic was discussed during the Round Table "Taxonomy of *Ciona* sp" at the International Tunicate Meetings in 2015 (led by myself), and in International Tunicate Meetings in 2017 and in 2019. My article Pennati et al., 2015 PLoS ONE was mentioned as among the top 10% most cited PLoS ONE paper published in 2015. Combining classical taxonomical observations with molecular analyses, in 2018-2020, I also described the model species *Botryllus schlosseri*, since under this name five different clades have been molecularly recognized. Coordinating international teams with researchers from several institutions (Keio Uni., Japan; Bioself Communication, France; Stanford Uni., USA; Sorbonne Uni., France; Observatoire Oceanographique, Villefranche-sur-Mer, France), I elaborated the anatomical and developmental ontologies of the two species (5, 8), thus promoting their standardized use around the world. The ontologies are publicly available in the main dedicated portals (Biportal web portal; Tunicate portal). I am continuing this research field within the framework of the PNRR. Spoke 1, Line 1 "National Biodiversity Future Center".

Stem cell biology. Ascidians exhibit different developmental strategies, ranging from the mosaic embryogenesis to different kinds of asexual reproduction and extensive regeneration. *B. schlosseri* can reproduce by budding from a pluripotent epithelium of the body wall and from pluri/multipotent circulating stem cells (whole body regeneration). I contributed to unveiling the developmental and regenerative pathways of this species in evo-devo perspective, publishing several papers and reviews. For its impact, my article Manni L. et al., 2007 Dev Dyn (3), was selected as "Highlights in DD". In collaboration with the laboratory of Dr. Irv Weissman (Institute for Stem Cell Biology and Regenerative Medicine, Stanford Uni.), I contributed to identify the hematopoietic stem cells (Rosental et al., 2018, Nature). Moreover, in collaboration with the same research group, I evidenced that tissue

specific stem cells participate in organogenesis during both budding and embryogenesis (9). For this research field, I was financed by DiBio@UNIPD in 2021, by Italian University&Research Ministry-MUR in 2015, and previously by the British-Italian partnership programme for young researchers in 2008.

10 Selected References from my research. # Corresponding author; *co-last author.

I published 93 peer-reviewed publications and 13 reviews in Q1 journals, with 240 international co-authors; 2 publications are accepted and 3 are submitted. From Scopus on 10.16.2025: H index=29; citation: 2,491 by 1,272 documents.

- (1) Burighel P., Lane N.J., Gasparini F., Tiozzo S., Zaniolo G., Candia Carnevali M.D., Manni L., 2003. A novel, secondary sensory cell organ in ascidians: in search of the ancestor of the vertebrate lateral line. *J Comp Neurol* 461: 236-249.
- (2) Manni L., Lane N. J., Joly J.S., Gasparini F., Tiozzo S., Caicci F., Zaniolo G., Burighel P. 2004. Neurogenic and non neurogenic placodes in ascidians. *J Exp Zool (Mol Dev Evol)* 392B: 483-504.
- (3) Manni L.#, Zaniolo G., Cima F., Burighel P., Ballarin L. 2007. *Botryllus schlosseri*: a model ascidian for the study of asexual reproduction. *Dev Dyn* 236: 335-352.
- (4) Gasparini F., Caicci F., Rigon F., Zaniolo G., Burighel P., Manni L. 2013. Cytodifferentiation of hair cells during the development of a basal chordate. *Hear Res* 304:188-199.
- (5) Manni L., Gasparini F., Hotta K., Ishizuka K.J., Ricci L., Tiozzo S., Voskoboynik A., Dauga D. 2014. Ontology for the asexual development and anatomy of the colonial chordate *Botryllus schlosseri*. *PLoS ONE* 9(5): e96434.
- (6) Pennati R., Ficetola G.F., Brunetti R., Caicci F., Gasparini F., Griggio F., Sato A., Stach T., Kaul-Strehlow S., Gissi C., Manni L. # 2015. Morphological differences between larvae of the *Ciona intestinalis* species complex: hints for a valid taxonomic definition of distinct species. *PLoS ONE* 10(5): e0122879. doi: 10.1371/journal.pone.0122879.
- (7) Manni L., Anselmi C., Burighel P., Martini M., Gasparini F. 2018. Differentiation and induced sensorial alteration of coronal organ in asexual life of a tunicate. *Int Comp Biol* 58: 317-328.
- (8) Hotta K., Dauga D., Manni L.# 2020. The ontology of the anatomy and development of the solitary ascidian *Ciona*: the swimming larva and its metamorphosis. *Sci Rep* 10:17916.
- (9) Kowarsky M., Anselmi C., Hotta K., Burighel P., Zaniolo G., Caicci F., Rosental B., Neff N.F., Ishizuka K.J., Palmeri K.J., Okamoto J., Gordon T., Weissman I.L., Quake S.R., Manni L.#*, Voskoboynik A. 2021. Molecular and morphological signatures of chordate development: two distinct pathways, one tunicate. *Cell Reports* 34: 108681. (10) Anselmi C., Kowarsky M.A., Gasparini F., Caicci F., Ishizuka K.J., Palmeri K.J., Ravel T., Sinhar R., Neff N., Quake S.R., Weissman I.L., Voskoboynik A., Manni L.*. 2022. Two distinct evolutionary conserved neural degeneration pathways characterized in a colonial chordate. *PNAS* 119(29): e2203032119.

Peer recognition

Grant as PI (selected out of 18; participant in additional 9 grants; total amount: 3.900.563€; > 25 persons supervised (excluding bachelor and master students); >20 research units managed as coordinator).

PRIN 2022, Italian University&Research Ministry-MUR "NoDe: The impact of anthropogenic noise on marine invertebrate deuterostomes: development, behavior and resilience". (Associated investigator, Research Unit PI). Budget: 54.700€

JPI OCEANS 2021. Proposal NoiseInTheSea-2022-0011 "Characterization of maritime noise in different european basins and its impact on ecological relevant deuterostome invertebrates - DeuteroNoise" (Noiseinthesea-2022-0011) Budget: 1.391.947 €. Consortium Coordinator

BIRD-PRID 2021 DiBio@UNIPD "The astonishing stem cells of the ascidian *Botryllus schlosseri*: establishing new cell culture methods for the study of stemness and differentiation" Budget: 50.000€

BIRD-PRID 2020 DiBio@UNIPD "Biological signals regulating nervous system development in the cyclical budding ascidian *Botryllus schlosseri*: the role of SoxB1 and C3 genes". Budget: 48.000€

PRIN 2015, Italian University&Research Ministry-MUR "From cell fate plasticity to tissue homeostasis to longevity: insights from two emerging model invertebrates, the "immortal jellyfish" *Turritopsis dohrnii* and the budding ascidian *Botryllus schlosseri* (Associated investigator, PI of a Research Unit). Budget: 77.200€

University Research Project 2015 DiBio@UNIPD - "Inflammation and neurodegeneration: evolution and clues from ascidians". Budget: 50.000€

PRIN 2009, Italian University&Research Ministry-MUR "Hair cell development in *Ciona intestinalis* (Tunicata): an Evo-Devo approach". Budget: 63.500€

Italian-German researcher exchange program Vigoni 2010 "Hair cell evolution in Chordates" for a research collaboration with Dr. T. Stach at Humboldt-Universität zu Berlin. Budget: 4450€

British-Italian partnership programme for young researchers 2008-2009 "A new chordate animal model for the study of adult stem cells and regenerative mechanisms" for a research collaboration with Dr. S. Shimeld at Oxford Uni. (UK). Budget: 4200€.

Awards and recognitions

1987-1988 – Grant "Collegio Arquà" for scholastics merits as student in DiBio@UNIPD

2015 - Coordinator of the Round Table "Taxonomy of Ciona sp", 8th Int. Tunicate Meeting, Aomori (Japan).

2013, 2015, 2022 - Chair at the International Tunicate Meetings in Naples, Aomori (JP), Kobe (JP)

2021 - Leader of the TUNICA team that took part in the "Start Cup Veneto 2021" business plan competition, coming second in the final, first place in the "CleanTech&Energy" category.

- Gasparini et al., 2013 Hear Res, in "F1000prime" for the Dev. Biol. area in the Article Recommendation section (10.3410/f.718045959.793482648)

- Manni L. et al., 2007 Dev Dyn, selected as "Highlights in DD"

- Pennati et al., 2015 PloS ONE among the top 10% most cited PloS ONE paper published in 2015.

Membership in national and international societies

2014-2019 - Member of the General Assembly of LifeWatch-Italy on behalf of the University of Padua

2015-2019 - Official Representative of the GEI-Società Italiana di Biologia dello Sviluppo e della Cellula at the International Society of Developmental Biology

Since 2015 - Member of EuroMarine, the European Marine Research Network

Since 2017 - Member of the CORILA (Consortium Coordination Res Activities Venice Lagoon System)

Since 2018 - Member of CoNISMa, the International Interuniversity Consortium for Marine Sciences

Since 2021 - Member of CESNE - Centro Studi per la Neurodegenerazione, UNIPD.

Since 2022 - Member of ERGA for genome sequencing. Participant in the genome sequencing ERGA Pilot project of the two ascidian species *Botryllus schlosseri* and *Botryllus gaiae*; referent in the genome sequencing ERGA-BGE project for the ascidian species *Trididemnum cereum*.

Invited Conferences' speaker and invited Seminars Presentations (Selected out of 36):

2002 Institut Fessard CNRS, Gif-sur-Yvette, (France). Seminar.

2004 7° Int Congr Vert Morphol. Boca Raton (Florida, USA). Invited, Plenary Lecture

2004 3° Int Tunicate Meeting. Santa Barbara (California, USA). Invited speaker

2007 4° Int Tunicate Meeting. Villefranche-sur-Mer (FR). Invited speaker

2010 British Soc Dev Biol. DB Autumn Meeting. Oxford (UK). Invited, Plenary Lecture

2011 6° Int Tunicate Meeting. Montreal (Canada). Invited speaker

2013 7° Int Tunicate Meeting. Napoli (Italy). Invited speaker

2015 8° Int Tunicate Meeting. Aomori (Japan). Invited speaker

2016 Euro Evo Devo Meeting. Uppsala (Sweden). Invited speaker

2017 9° Int Tunicate Meeting. New York (USA). Invited speaker

2017 Neural Crest & Cranial Placodes Gordon Res Conference Ventura (USA). Invited, Plenary Lecture

2018 Int Comp Biol Meeting. San Francisco (USA). Invited, Plenary Lecture

2019 Neural Crest & Cranial Placodes Gordon Res Conference Lucca (Italy) Discussion Leader

2022 11° Int Tunicate Meeting. Kobe (JP) Invited speaker

2024 31st Conf Eur Comp Endocrinology. Ancona (Italy). Invited speaker

2025 Neural Crest & Cranial Placodes Gordon Res Conference Lucca (Italy) Invited, Plenary Lecture

ADDITIONAL INFORMATION

Other contributions to the research community

2014 - Member of the PhD Collegiate of the PhD School in Biosciences, curriculum Cell Biology and Physiology; since 2023, member of the Didactic Commission of the PhD School in Biosciences

2017-2021 - President of the Degree Course (Bachelor's Degree Course) in Natural Sciences and of the Degree Course (Master Degree Course) in Natural Sciences

Supervision of Graduate students, PhD students and postdoctoral Fellows

Tutor and co-tutor of 78 Bachelor's Degree thesis and 41 master's degree Course thesis. Tutor of 4 PhD thesis; co-tutor of 2 PhD thesis; scientific collaborator in additional 7 PhD thesis.

Coordinator/Participant of 12 post-doc Fellowships and 8 pre-doc fellowships.

Moreover, she was Supervisor of the 1) Horizon Europe MSCA post-doctoral fellow Dr. A. Zeke, Call Horizon-MSCA-2023-PF-01. Project title: "TuniPeps - Discovering a new family of hypermodified antimicrobial peptides from marine tunicates and exploring their potential applications"; 2) post-doctoral fellow Dr. C. Anselmi, financed by MSCA Seal of Excellence @UniPD 2023 - Call PF 2022. Project title: "ANARCHORD - The Ancestral origin of Neurodegeneration: Applied insight from a unique colonial CHORDate"; 3) post-doctoral fellow Dr. T. Gordon (proponent), financed by MSCA Seal of Excellence @UniPD 2022 - Call PF 2021. Project title: "HAMLET - Uncovering the evolution of chordate stem cells and regeneration by a comparative study". These three high-recognized fellowships were granted with an overall budget of more than 400,000€.

Reviewer activity for research proposal for the following institutions: University of Milan, Italy; MUR Grant proposal evaluation for the FIRB (Fund for Basic Research Investments); University of Palermo, Italy; W. M. Keck Foundation, USA; The Israel Science Foundation, Israel; George S. Wise Faculty of Life Sciences, Tel Aviv University; French National Research Agency – ANR, France

Reviewer activity for journals: J Exp Zool part B Mol. Dev. Biol., Zool Sci, Inv Biol, Eur J Histochem, Italian J Zool, Dev Biol, Biol Bull, J Exp Biol, Zoomorphol, Nanotoxicol, Sci Rep, J Morphol

International Meeting organization

Member of the Scientific Committee: 2013, 7° Int. Tunicate Meeting, Naples, Italy; 2024, 8° Inter. Tunicate Meeting, Aomori, Japan; 2022, 9° Int. Tunicate Meeting, Kobe, Japan; 2026, 11° Int. Tunicate Meeting, Berlin, Germany.

Member of the Scientific Committee: 2022, Euro-Evo-Devo Meeting, Naples, Italy; 2024, Mid-term review meeting of the Projects financed by JPI OCEANS 2021, Call NoiseInTheSea-2022. Scientific Committee

Relevant outreach activities in the last 3 years (in Italian)

2024: Italian Public TV (TGR Veneto) for the paper Bocci et al., 2024 Brain Comm; 2023: Italian Public TV Science program interview (TGR Leonardo) for the paper Anselmi et al., 2023 Cells; 2022: article on the Green Economy Agency website for the grant DeuteroNoise (JPI Oceans).

Personal Data

Autorizzo il trattamento dei miei dati personali ai sensi del Decreto Legislativo 30 giugno 2003, n. 196 "Codice in materia di protezione dei dati personali".