**Dimitrios K Papadopoulos, PhD, Assoc. Prof.**
**Research Group Leader**
*School of Sciences and Engineering, University of Crete, Voutes University Campus, P.O. Box 2208, 70013 Heraklion, Crete, GR | Karolinska Institute, Department of Clinical Neuroscience, Center for Molecular Medicine, CMM L8:01, 17176 Stockholm, Sweden | @dim_papad*

## SKILLS & EXPERTISE

- Gene expression and regulation, **transcription factors**, *in vivo* binding kinetics of transcription factors to chromatin, **mRNA/protein variability**, **protein biophysics**, biomolecular condensates, **genetics of human disease**, **developmental biology**
- Extensive background in **single-molecule fluorescence microscopy** and biophysical methodologies to characterize fast, dynamic processes in live cells/organs/tissue/ organisms (**Confocal, Fluorescence Correlation Spectroscopy (FCS), STED, SPIM, Lattice Light-sheet modalities; FRAP, FRET, FLIM**)
- **International collaborations** on diverse projects (completed and ongoing)
- Experience in **teaching at the undergraduate and graduate levels**
- Talented in **motivating, enthusing, and driving researchers to thrive** in science
- Diverse research experience: tissue culture, organoids, mouse, *Drosophila*, zebrafish, plants

## WORK HISTORY

| | |
|---|---|
| 09.2022–present | Associate Professor, Department of Biology, School of Sciences and Engineering, University of Crete, Greece |
| 07.2021–present | Visiting Researcher, Department of Clinical Neuroscience, Karolinska Institute, Stockholm, Sweden |
| 08.2017–06.2021 | Research Group Leader (Chancellor's Fellow), Institute of Genetics and Cancer (IGC), MRC Human Genetics Unit (HGU), University of Edinburgh, UK |
| 02.2014–08.2017 | Postdoctoral Researcher, Max-Planck Institute of Molecular Cell Biology and Genetics, Dresden, Germany. Supervisor: Dr. Pavel Tomancak |
| 07.2011–01.2014 | Postdoctoral Researcher, Stockholm University, Sweden. Supervisor: Prof. Christos Samakovlis |
| 07.2010–06.2011 | Postdoctoral Researcher, University of Basel, Switzerland. Supervisor: Prof. Walter J. Gehring |
| 10.2006–06.2010 | Ph.D. Genetics, University of Basel, Switzerland. Supervisor: Prof. Walter J. Gehring, Grade: Summa Cum Laude |
| 10.2004–03.2005 | Erasmus student exchange program, University of Valencia, Spain |
| 09.2001–03.2006 | Diploma in Biology, University of Crete, Greece; Grade: 10/10, Ranking 3/70; Diploma Thesis supervisor: Prof. Kyriakos Kotzabasis |

## SCIENTIFIC ACCOMPLISHMENTS

### As a Chancellor's Fellow

1. *In vivo* dissection of the chromatin-binding kinetics of the pioneer/'stemness' TFs Oct4, Sox2 and Nanog (endogenously-tagged by CRISPR/Cas9) during the earliest embryonic gene expression
2. Characterization of the aberrant molecular/biophysical function of PAX6 and SOX2 disease variants, causing aniridia/anophthalmia in patients
3. Study of the molecular behaviour of TDP-43 pathogenic variants (causing Motor Neuron

Disease – MND) through novel animal models
4. Derivation of novel growth control mechanisms of the YAP oncoprotein in non-dividing, respiratory epithelial cells
5. Development of a unique microscopic setup for massively-parallel FCS (mpFCS) for simultaneous characterization of absolute concentrations and diffusion of fluorescent proteins across cells/tissues (matrix of 1024 detectors)
6. Identification of a novel mechanism of Nonsense-Mediated Decay (NMD) of mRNA at the Endoplasmic Reticulum (ER)

**During my postdoctoral research**

8. Identification of the molecular mechanism of interaction of DONSON (mutations of which cause microcephalic dwarfism) with the replication fork
9. Discovery of RNA function in the dynamic behaviour of FUS, a major player in neurodegenerative disorders [Acute Lateral Sclerosis (ALS), Motor Neuron Disease (MND)]
10. Characterization of tunable, auto-regulatory mechanisms of TFs to control the intrinsic and extrinsic gene expression noise
11. Establishment of novel regulators underlying the intracellular trafficking of Crumbs (a key player in defining apical epithelial polarity) in the respiratory system

**During my PhD**

12. Pioneer discovery of 'how TFs find their binding sites in eukaryotic genomes', which led to a paradigm-shift regarding the unappreciated role of non-specific/electrostatic binding to chromatin (an 'old problem' in developmental biology)
13. Derivation of functional synthetic TFs to investigate TF chromatin-binding kinetics at single-molecule resolution

## SUPERVISION

[a total of **21** scientists]

| | | | |
|---|---|---|---|
| Postdoctoral fellows | 2 | Masters students | 5 |
| PhD students | 8 | Diploma Thesis students | 2 |
| Technical assistants | 2 | Visiting (summer) students | 2 |

## REVIEWER ACTIVITY

- ◆ **Science**
- ◆ **Current Biology**
- ◆ Molecular BioSystems
- ◆ BBA – Molecular Cell Research
- ◆ Disease Models and Mechanisms
- ◆ **Development**

## INTERNATIONAL COLLABORATIONS (DIVERSE PROJECTS)

1. Edinburgh, UK (IGC-HGU and SCRM, University of Edinburgh): ◆Wendy Bickmore ◆Andrew Jackson ◆David Fitzpatrick ◆Nick Gilbert ◆Duncan Sproul ◆Andrew Wood
2. ◆Ian Chambers ◆Javier Caceres ◆Davide Michieletto
3. Birmingham, UK (University of Birmingham): ◆Grant Stewart

4. IL, USA (Northwestern University): ◆Richard Carthew
5. Dresden, Germany (Max-Planck Institute CBG): ◆Pavel Tomancak ◆Simon Alberti ◆Christoph Zechner ◆Anthony Hyman
6. Stockholm, Sweden (Karolinska Institute): ◆Vladana Vukojevic ◆Lars Terenius
7. Freiburg, Germany (University of Freiburg): ◆Wolfgang Driever ◆Daria Onichtchouk
8. Basel, Switzerland (Friedrich-Miescher Institute – FMI): ◆Botond Roska

## TALKS (conferences and invited speaker)

1. Biozentrum Symposium, Basel, Switzerland (25.01.2008)
2. Nobel Symposium "Single Molecule Spectroscopy in Chemistry, Physics and Biology", Sånga-Säby, Sweden (01–06.06.2008)
   **This has been a rare distinction as only Nobel Laureates are normally able to participate in these symposia, but I was invited to present my work as a PhD student.**
3. "Frontiers in the New Biology" WCN Symposium on Functional Genomics 2008, Uppsala, Sweden (29.09.2009)
4. Biozentrum Symposium, Basel, Switzerland (18.12.2008)
5. Cells into Organs Symposium "Tissue Specification and Organogenesis", Lisbon, Portugal (04–06.02.2009)
6. Symposium in honor of the 70th anniversary of Prof. Walter Gehring: "Molecular mechanisms of development", Biozentrum, University of Basel, Switzerland (2021.03.2009)
7. 12th Carl Zeiss sponsored workshop on "Fluorescence Correlation Spectroscopy and related methods", Cargese, France (12–16.10.2009)
8. 17th EMBO Drosophila Workshop, Kolympari, Greece (20–26.06.2010)
9. Invited speaker, labs of Profs. Bart Deplancke and Demetri Psaltis, EPFL, Lausanne, Switzerland (01.09.2010)
   **Invited speaker**
10. 13th Carl Zeiss sponsored workshop on "Fluorescence Correlation Spectroscopy and related methods", Singapore (25–27.10.2010)
    **Invited speaker**
11. Lab of Dr. Boris Adryan Department of Genetics, University of Cambridge, UK (03.05.2012
    **Invited speaker**
12. Kick-off meeting for the KAW funded Center for Dynamic Nanotechnology, Albanova University, Stockholm, Sweden (25.01.2013)
    **Invited speaker**
13. EMBO conference on "Allosteric interactions in cell signaling and regulation", Institute Pasteur, Paris, France (14–17.05.2013)
14. Symposium in honor of the 75th anniversary of Prof. Walter Gehring: "Molecular mechanisms of development", Biozentrum, University of Basel, Switzerland (21–22.03.2014)
15. EMBO conference on "Upstream and downstream of Hox genes", Center for Cellular and Molecular Biology (CCMB), Hyderabad, India (14–17.12.2014)
    **Invited speaker**
16. Invited speaker, 24th European Drosophila Research Conference (EDRC), Heidelberg,

Germany (09–12.09.2015)
**Invited speaker**
17. German Drosophila Meeting, University of Cologne, Germany (08–09.09.2016)
18. 58th Annual Drosophila Research Conference, San Diego, USA (28.03–02.04.2017)
**Invited speaker**
19. EMBO conference on "Awakening of the genome: The maternal-to-zygotic transition," Max-Planck Institute of Molecular Cell Biology and Genetics (MPI-CBG) (23–26.04.2017)
**Invited speaker**
20. Edinburgh Super-Resolution Imaging Consortium (ESRIC) Interdisciplinary Consortium Meeting, IGMM, University of Edinburgh, UK (23.01.2018)
**Invited speaker**
21. The Dynamic Cell III, British Society for Cell Biology, University of Manchester, UK (19–21.03.2018)
22. British Society for Developmental Biology Annual Spring Meeting, University of Warwick, UK (15–18.04.2018)
23. Edin Fish Tech conference, Royal College of Physicians, Edinburgh, UK (28–30.08.2019)
**Invited speaker**
24. Hokkaido Summer Institute on 'Advanced Microscopy Methodologies', Sapporo, Japan (09–15.09.2019)
**Invited speaker and summer school instructor**
25. EMBO conference on "Awakening of the genome: The maternal-to-zygotic transition", Prague, Czech Republic (15–18.05.2019)
**Invited speaker**
26. 19th International European Light Microscopy Initiative (ELMI) meeting, Brno, Czech Republic (04–07.06.2019)
**Invited speaker**
27. EMBO Workshop "Awakening of the genome: The maternal-to-zygotic transition," Vienna, Austria (18–21.05.2022)
28. 22nd EMBO Workshop "Molecular and Developmental Biology of Drosophila," Kolympari, Greece (19–25.06.2022)

## PUBLICATIONS

[**18 articles**, of which: **8 as a first/co-first author**, **5 as a corresponding author**, **2 as last author**; **1,012 citations** (December 2022); **h-index 11**]

1. **Papadopoulos DK**, Vukojevic V, Adachi Y, Terenius T, Rigler R, Gehring WJ. Quantitative study of synthetic Hox transcription factor-DNA interactions in live cells. ***Proc Natl Acad Sci USA*** 2010;107(9);4087-4092.

2. Vukojevic V*, **Papadopoulos DK*** (*joint with VV), Terenius T, Rigler R, Gehring WJ. Function and specificity of synthetic Hox transcription factors in vivo. ***Proc Natl Acad Sci USA*** 2010;107(9);4093-4098.
*In this article, using biophysics with single-molecule sensitivity in live tissue, we discovered how eukaryotic transcription factors find their specific binding sites in large genomes. They engage in a series of rapid, electrostatic interactions with chromatin of transient nature in a purely trial-and-error manner.*

3. **Papadopoulos DK**, Reséndez-Pérez D, Cárdenas-Chávez DL, Villanueva-Segura K, Canales-del-Castillo R, Felix DA, Fünfschilling R, Gehring WJ. Functional synthetic Antennapedia genes and the dual roles of YPWM motif and linker size in transcriptional activation and repression. ***Proc Natl Acad Sci USA*** 2011;108(29);11959-11964.

4. **Papadopoulos DK**, Skouloudaki K, Adachi Y, Samakovlis C, Gehring WJ. Dimer formation via the homeodomain is required for function and specificity of Sex combs reduced in Drosophila. ***Dev Biol*** 2012;367(1);78-89.
*In this paper, in which I function as a first author, I pursued an original idea I had during my PhD in Walter Gehring's lab, namely, to inquire whether the Hox transcription factor Sex combs reduced forms higher order homocomplexes in flies, and whether these are important for its function. I confirmed both hypotheses and found that Sex combs reduced homodimers are indispensable for its homeotic function in Drosophila.*

5. Krmpot AJ, Nicolic SN, Vitali M, **Papadopoulos DK**, Oasa S, Thyberg P, Tisa S, Kinjo M, Nilsson L, Gehring WJ, Terenius L, Rigler R, Vukojevic V. Quantitative confocal fluorescence microscopy of dynamic processes by multifocal fluorescence correlation spectroscopy. **V. *Proc. SPIE* 9536**, Advanced Microscopy Techniques IV; and Neurophotonics II 2015;95360O.

6. **Papadopoulos DK*** (*corresponding author), Krmpot AJ, Nikolic SN, Krautz R, Terenius T, Tomancak P, Rigler R, Gehring WJ, Vukojevic V. Probing the kinetic landscape of Hox transcription factor-DNA binding in live cells by massively parallel Fluorescence Correlation Spectroscopy. ***Mech Dev*** 2015;138 Pt 2;218-225.
*In this article, in which I function as a first and corresponding author, we have performed a pilot study using a prototypic instrument for massively parallel Fluorescence Correlation Spectroscopy to gain insight into the absolute concentration and chromatin-binding dynamics of transcription factor molecules in live tissue simultaneously at the single-molecule level, using a matrix of 1024 detectors.*

7. Reynolds JJ, Bicknell LS, Carroll P, Higgs MR, Shaheen R, Murray JE, **Papadopoulos DK**, Leitch A, Murina O, TarnauskaitE Z, Wessel SR, Zlatanou A, Vernet A, von Kriegsheim A, Mottram RM, Logan CV, Bye H, Li Y, Brean A, Maddirevula S, Challis RC, Skouloudaki K, Almoisheer A, Alsaif HS, Amar A, Prescott NJ, Bober MB, Duker A, Faqeih E, Seidahmed MZ, Al Tala S, Alswaid A, Ahmed S, Al-Aama JY, Altmüller J, Al Balwi M, Brady AF, Chessa L, Cox H, Fischetto R, Heller R, Henderson BD, Hobson E, Nürnberg P, Percin EF, Peron A, Spaccini L, Quigley AJ, Thakur S, Wise CA, Yoon G, Alnemer M, Tomancak P, Yigit G, Taylor AM, Reijns MA, Simpson MA, Cortez D, Alkuraya FS, Mathew CG, Jackson AP, Stewart GS. Mutations in DONSON disrupt replication fork stability and cause microcephalic dwarfism. ***Nat Genet*** 2017;49(4):537-549.

8. Maharana S, Wang J*, **Papadopoulos DK*** (*joint with JW), Richter D, Pozniakovsky A, Poser I, Bickle M, Rizk S, Guillén-Boixet J, Franzmann TM, Jahnel M, Marrone L, Chang YT, Sterneckert J, Tomancak P, Hyman AA, Alberti S. RNA buffers the phase separation behavior of prion-like RNA binding proteins. ***Science*** 2018;360(6391);918-921.
*In this paper, in which I function as a second co-author, we discovered that RNA plays a condensate-diluting role for prion-like proteins that undergo phase separation, and thus*

*exerts a protective function in neurons.*

9. Skouloudaki K*, **Papadopoulos DK*** (*joint with KS), Tomancak P, Knust E. The apical protein Apnoia interacts with Crumbs to regulate tracheal growth and inflation. ***PLoS Genet*** 2019;15,1,p.e1007852.
   *In this article, in which I function as a first co-author, we have identified a novel gene, which we termed apnoia, involved in controlling the inflation of the fly respiratory tubes by regulating the intracellular recycling and subapical localization of the Crumbs apical determinant.*

10. **Papadopoulos DK*** (*corresponding author), Skouloudaki K, Engström Y, Terenius L, Rigler R, Zechner C, Vukojević V, Tomancak P. Control of Hox transcription factor concentration and cell-to-cell variability by an auto-regulatory switch. ***Development*** 2019;146(12).
    **[Most read paper of *Development* in 2019]**
    *In this article, in which I function as a first and corresponding author, I have characterized the molecular numbers and chromatin-binding behavior of 14 fly transcription factors at the single-cell and single-molecule level in live organs (fly imaginal discs). We uncovered a model by which the Hox transcription factor Antennapedia functions sequentially as an activator and a repressor of its own transcription, thus dampening the cell-to-cell variability of transcription factor numbers. Additionally, by teaming up with mathematicians, we were able to derive a model that successfully predicts the switch of this transcription factor from an activating to a repressive function and dampens variability over time.*

11. **Papadopoulos DK*** (*corresponding author), Tomancak T. Gene Regulation: Analog to Digital Conversion of Transcription Factor Gradients. ***Curr Biol*** 2019;29(11);R422-R424.

12. Skouloudaki K, Christodoulou I, Khalili D, Tsarouhas V, Samakovlis C, Tomancak P, Knust E, **Papadopoulos DK*** (*corresponding author). Yorkie controls tube length and apical barrier integrity during airway development. ***J Cell Biol*** 2019;218(8):2762-2781.
    *In this paper from my lab, in which I function as a last and corresponding author, we have discovered how Yorkie (the fly ortholog of the YAP tumor suppressor transcriptional coactivator) functions in non-proliferating cells such as the ones of the fly respiratory system. This is done by its interaction with the actin-severing protein Twinstar (the fly Cofilin) in the cytoplasm, thereby controlling the size of the apical membrane of tracheal cells and thus respiratory tube length.*

13. Krmpot AJ, Nicolic SN, Oasa, S, **Papadopoulos DK**, Vitali M, Oura M, Mikuni S, Thyberg P, Tisa S, Kinjo M, Nilsson L, Terenius L, Rigler R, Vukojević V. Functional Fluorescence Microscopy Imaging: Quantitative Scanning-Free Confocal Fluorescence Microscopy for the Characterization of Fast Dynamic Processes in Live Cells. ***Anal Chem*** 2019;91(17):11129-11137.

14. Giri R, **Papadopoulos DK**, Posadas DM, Potluri HK, Tomancak T, Mani M, Carthew RW. Ordered patterning of the sensory system is susceptible to stochastic features of gene expression. ***eLife*** 2020;9:e53638;doi: 10.7554/eLife.53638.

15. Longman D, Jackson-Jones KA, Maslon MM, Murphy LC, Young RS, Stoddart JJ, Hug N, Taylor MS, **Papadopoulos DK*** (*senior co-author), Caceres JF. Identification of a localized nonsense-mediated decay pathway at the endoplasmic reticulum. ***Genes Dev*** 2020;34(15-16):1075-1088.
    **[Featured the Cover of *Genes & Development*]**
    *In this collaborative project, in which I exert a main role as one of the senior authors, we have identified a novel nonsense-mediated decay mRNA pathway, which operates specifically at the ER.*

16. Skouloudaki K, **Papadopoulos DK,** Hurd WT. The Molecular Network of YAP/Yorkie at the Cell Cortex and their Role in Ocular Morphogenesis. ***Int J Mol Sci*** 2020;21(22):8804.

17. Auer JMT, Stoddart JJ, Christodoulou I, Lima A, Skouloudaki K, Hall HN, Vukojevic V, **Papadopoulos DK*** (*corresponding author). Of numbers and movement - understanding transcription factor pathogenesis by advanced microscopy. ***Dis Model Mech*** 2020;13(12):dmm046516.
    *This paper, in which I function as a senior and corresponding author, provides thorough insight into the advanced, state-of-the-art microscopy methodologies deployed in providing a quantitative understanding of transcription factor molecular numbers and transcription factor gene haploinsufficiencies during development and disease.*

18. Giri R, Brady S, **Papadopoulos DK**, Carthew RW. Single-cell Senseless protein analysis reveals metastable states during the transition to a sensory organ fate. ***iScience*** 2022;25:105097.

## RESEARCH FUNDING

[a total of **€1,811,310** from core & external funders for my research]

1. EMBO Short-term Fellowship (ASTF 499.00-2010), Karolinska Institute, Stockholm, Sweden (2010); €9,302
2. Swiss National Science Foundation (SNSF) Long-term Fellowship (PBBSP3-138700) (2011-2012); €43,410
3. Federation of European Biochemical Societies (FEBS) Long-term Fellowship (2012-2014); €59,893
4. Springboard 'seed' funding from the Academy of Medical Sciences (AMD) (2019-2020); €120,460
5. Institutional Strategic Support Fund (ISSF3) from Wellcome Trust (2018-2019); €42,161
6. Chancellor's Fellowship from the University of Edinburgh (2017-2022); €719,187
7. Medical Research Council (MRC) PhD studentship award for my lab (2017-2021); €119,538
8. MRC High Science Fund (2017-2020), €107,281
9. Wellcome Trust Collaboration Fund (2019-2020), €12,046
10. Eurolife and University of Edinburgh Travel Grants (2017-2021), €3,600
11. MRC Research Grant with Grant Stewart, University of Birmingham (2021-2026), €574,432

## PREVIOUS RESEARCH ACTIVITIES

Throughout my research, I have sought to understand the molecular behavior of transcription factors (TFs) *in vivo*, at the single-molecule level. During my PhD in Walter Gehring's lab in the Biozentrum, Basel, I investigated the dynamic behavior of TF molecules at endogenous levels in eukaryotic cells, tissue, organs, and whole embryos. By studying their chromatin-binding kinetics in live cells, **I derived for the first time the mechanism of how TFs find their specific binding sites in eukaryotes** (***PNAS***, 2010a; ***PNAS***, 2010b). For this, I used biophysical single-molecule methodologies, such as Fluorescence Correlation Spectroscopy (FCS) and quantitative imaging, to measure the molecular movement and absolute concentration of fluorescently labelled TFs in flies. In sharp contrast to prokaryotes, whose TFs typically 'slide' one-dimensionally along naked DNA to find their specific sites, I found that **eukaryotic TFs exhibit transient, 'trial-and-error' binding behavior of electrostatic, non-specific interactions with chromatin**. How important and widespread this non-specific binding process is for TF function has become evident in **disease haploinsufficiencies** (***Dis Model Mech***, 2020) and **mitotic bookmarking**, which, in turn, contributes to **transcriptional memory**.

During my postdoc at Stockholm University/Karolinska Institute and the MPI-CBG in Dresden, I derived **functional synthetic TFs** (***PNAS***, 2011), designed tools for visualizing **TF homodimerization on native binding sites** in cell nuclei of live organs (***Dev Biol***, 2012) and developed large-scale FCS modalities to study **entire 'landscapes' of TF chromatin binding and concentration** across cells (***Mech Dev***, 2015; ***Anal Chem***, 2019). I discovered how **TFs can switch between auto-activating and auto-repressing states to confer transcriptional uniformity across cells** (equalization of concentration, hence dampening of cell-to-cell variability) (***Development***, 2019; most-read paper of *Development* in 2019). I also investigated the importance of **controlling TF variability/noise at the mRNA/protein level for proper patterning of sensory neurons** (***eLife***, 2020; ***iScience***, 2022). My curiosity to understand how TFs regulate development so precisely in space and time motivated me to investigate the emergence of the earliest transcription in animals. I found how the fly **pioneer TF Zelda**, through the **formation of condensates**, **synchronizes the awakening of the zygotic genome** across syncytial nuclei, to allow the embryo to seize control of its own development (***in preparation***).

I became a junior PI in Edinburgh before completing my postdoc projects. So, concurrently with finalizing/publishing this work, I sought to further dissect TF function quantitatively, by characterizing TF numbers and mobility in the early zebrafish embryo and in ocular organoids (derived from mouse ES cells). I strived to understand why the eye-specification TFs Pax6 and Sox2 show particular dependence on precise levels for proper function in the eye field, and not in other organs – pancreas, brain, such that both higher and lower Pax6/Sox2 levels than wild type cause eye disease. To understand this, I started by asking why heterozygous missense mutations of patients with aniridia, anophthalmia, or coloboma, render the wild type allele/protein insufficient for function. I found that, apart from bearing altered biophysical properties, **the mutant TFs also impair the function of the wild type TF—its concentration, relative stoichiometry, and chromatin-binding kinetics during the induction and maintenance of the eye field**. Such Pax6/Sox2 dominant-negative effects on their wild type counterparts underline the existence of **organ-specific requirements to ensure proper TF function** (***in preparation***).

So far, my expertise in genetics and FCS fostered important collaborative projects with research groups in the UK, Sweden, Germany, and the USA. Therewith: **(a)** I have been

studying the dynamics of TF/protein molecular movement, their interactions with their binding partners and their critical functional concentrations during development and disease; **(b)** I identified novel regulators required for the **maintenance of epithelial tubes of the respiratory system** (***PLoS Genet***, 2019); **(c)** I found how **cell-proliferation regulators use the actin cytoskeleton to control expansion of the airways**, whose cells do not divide (***J Cell Biol***, 2020); **(d)** I discovered how the prion-like protein **FUS binds RNA** to block the formation of biomolecular condensates and **prevent neurodegeneration** (***Science***, 2018); **(e)** I showed how **DONSON**, whose mutations cause **microcephalic dwarfism**, interacts with the **replication fork** (***Nat Genet***, 2017), and whose function we continue to address biophysically and biochemically as co-investigators with Grant Stewart in Birmingham, funded by an MRC grant; and **(f)** I characterized a specialized, **ER-specific Nonsense-Mediated-Decay (NMD) pathway**, which featured the cover of Genes & Development (***Genes Dev***, 2020). Ongoing collaborative work has derived novel methodology for **labeling enhancers by dCas9 and TALENs** (***in preparation***).

A major endeavor in my research is to understand the mechanisms that control cell-to-cell variability of TF concentrations at the genetic, molecular, and biophysical level (as I recently summarized – ***Dis Mod Mech***, 2020). Although the relatively high *versus* low variability in TF concentrations plays a decisive role in developmental decisions (e.g., differentiation *versus* maintenance of tissue identity and/or transcriptional synchrony), our understanding of the mechanisms that control such cell-to-cell heterogeneities remains in its infancy.

## TEACHING EXPERIENCE

Throughout my career, I have engaged in teaching at the undergraduate level (as an assistant in University of Basel 'Grundkurs' lectures and laboratory practical sessions on fly genetics during my PhD years; teaching Honors students as a PI in Edinburgh); directly supervised the projects and hands-on experimental work of postgraduate scientists at the bench (Masters and visiting students during my postdoc years in Stockholm and Dresden; PhD students, postdocs, Masters students, summer interns and technical assistants as a junior PI in Edinburgh); taught in international Advanced Microscopy workshops (Hokkaido, Japan); and supervised collaborative work of scientists of diverse levels of seniority at the microscope and at the bench, whether in research institutes I was based in or during visits to collaborating groups abroad. These experiences allowed me to develop and enhance my abilities in imbuing enthusiasm to and stimulating the curiosity of junior scientists, which I believe is the first step towards scientific excellence.

My own research questions allowed the scientists I supervised to acquire transferrable skills from diverse disciplines (ranging from developmental biology and genetics to protein biophysics), which has paid off in terms of them broadening their horizons and enhancing their conceptual understanding of complex studies and data interpretation. In addition, as a postdoc and, even more systematically, as a PI, I have invested major effort in the discussion of scientific findings through years of weekly Journal Clubs, during which, we have scrutinised the scientific work of our peers and focussed on: a) understanding control experiments; b) asking valid scientific questions; c) drawing correct tentative conclusions; d) interpreting data; e) identifying the strengths and limitations of diverse experimental methodologies; and f) understanding which experiments are appropriate for answering which research hypotheses—just to name a few.

Moreover, I have put a lot of emphasis on training young scientists in data dissemination

(through lab-based rehearsals prior to seminars and conference talks, as well as individualised training in explaining one's own research in lay terms in a laconic, to-the-point fashion). This endeavour bore fruit in that students learned to take initiatives to ask questions during seminars, grew confident about their own research findings, and kept up with the literature in their specific fields of interest.

Leading a research group has taught me to adjust my teaching and training strategies to the mentality and the needs of every individual group member, while considering their learning pace and capabilities, as well as the career aspirations of every scientist. In fact, I have supervised scientists who sought an academic career path or one in the private biotech/pharmaceutical sector alike, and my effort to train them more broadly and not strictly according to the minimal needs of their research projects has been well received and appreciated.

My research vision (and ethics) to foster an as-liberal-as-possible research environment in my lab eventuated in recruiting outstanding graduate students. I have had the honour of hosting the two best graduate students of Biology of Edinburgh University of their year (2019), who started their PhD and Masters projects, respectively, in my lab within the same year. Also, I was able to collaborate with the best PIs in my home institute during my postdoc and group leader research work. This has allowed me to 'grow' scientifically and learn from the best.

Finally, in the more recent years of my career, I have put substantial effort into involving members of my lab in collaborative projects with other labs. This practice helped them depart from their comfort zone and exposed them to novel problems/challenges. As a result, I noticed that, not only has this been well received, but it has paid off by allowing them to feel deeply stimulated, accelerating their own research projects, and prompting them to interpret their own findings in unexpected and different ways. Admittedly, they have come to acknowledge the opportunity of having been exposed to diverse research themes as a very beneficial experience which aided them in their scientific development.

## LANGUAGES

- **English** Full professional proficiency (work in the UK; Certificate of Proficiency in English (C2), University of Cambridge, UK)
- **German** Full professional proficiency (work in Switzerland and Germany; German citizenship; Kleines Deutsches Sprachdiplom (C1), Goethe Institut Athen)
- **Spanish** Full professional proficiency (studies in Spain; Diploma Básico (B2), Instituto Cervantes)
- **Greek** Mother tongue; full professional proficiency (studies in Greece)