I am a Team Leader at The Paris Brain Institute (ICM) in Paris, France, and is the institute's Scientific Director and deputy general director. I obtained his Bachelor of Science degree in Biology at the American University of Beirut, Lebanon, and my Ph.D. in Molecular Genetics at The Ohio State University, U.S.A in 1996. Between 1996 and 2001 I was an HHMI (Howard Hughes Medical Institute) and an NIH (National Institutes of Health) Postdoctoral Fellow at Baylor College of Medicine in Houston, Texas working on the transcriptional mechanisms of early neurogenesis in *Drosophila* and mouse. In 2001, I was recruited to VIB (Flemish Institute of Biotechnology) and the University of Leuven Medical School in Belgium to establish the first *Drosophila* lab in the country. I worked at VIB and the University of Leuven as a Group Leader and Professor until the end of 2015.

In 2016, I was recruited to the Institut du Cerveau – Paris Brain Institute (PBI) to establish the laboratory of Brain Development, and was then appointed as the PBI's Scientific Director, Director of Core Facilities and Deputy Executive Director in 2019. In 2003, I received the European Molecular Biology Organization (EMBO) Young Investigator award and in 2009 he was elected EMBO member. In January 2016, I was named the Einstein Visiting Fellow at the Charité and the Freie Universität Berlin, in Berlin, Germany. In March 2016 I received the Allen Distinguished Investigator by the Paul G. Allen Frontiers Group and was the 2019 laureate of the Roger De Spoelberch Prize for our work linking brain development to neurodegeneration.

Research in the lab focuses on understanding the genetic mechanisms that regulate the early development of the nervous system from cell fate specification to neural circuit formation, using fruit fly, mouse and human iPS models. His research deals with the role that transcriptional regulation and cell-cell signaling shape the identity and connectivity of neurons. Recent work from the Hassan lab has revealed unexpected insights into the regulation of time during early brain development, as well as the role of stochastic processes in brain wiring that challenge previously held assumptions about the emergence of specificity in neural circuit architecture.

The central question of the lab research is: how does the genome build the brain to be functional and resilient? A complex functional biological system is the emergent property of the self-organizing capacity of molecular networks. The most fundamental of these networks is the genome. The most sophisticated is the brain. The genomic network produces a set of instructions that builds the neuronal network to be functional over a lifetime and to be resilient and robust. We try to understand what that set of instructions is. Yet sometimes this network

succumbs to disease and degeneration. Why? Our work tries to understand how developmental mechanisms lead to resilience and how defects in them predispose to degeneration. In total, our work has resulted in over 100 publications contributing important insights into these questions.

At one end during developmental time, there is cell fate specification. At the other end, there is the formation of precise neuronal connections. Because each neuron is characterized by specific connections, the two features must be linked. Over the past decade, we have made major contributions to understanding these questions. We have unraveled the gene regulatory basis of cell fate specification in the fly retina (Aerts et al., 2009, 2010; Quan et al., 2016; Ramaekers et al., 2019) and the fly and mouse brain (Mora et al., 2018; Zhang et al., 2021). On the other hand, we began a long-term effort towards understanding the mechanisms that regulate the specificity, variability, and robustness of brain wiring. Our data clearly show that wiring the brain is a more complex and plastic process than has been appreciated in studies using the fly PNS as a model. We have concentrated on how single neurons integrate various attractive and repulsive signals during brain wiring, and how they interact with one another to make wiring choices (Srahna et al., 2006; Langen et al., 2013; Zschaetzsch et al., 2014; Oliva et al., 2016, Dutta et al., 2023) and how that influences behavioral individuality (Linneweber et al., 2020; Bengochea et al., 2023). Many genes that regulate brain wiring are associated with human disease. We have unraveled the roles of the *Drosophila* homologues of the Fragile X protein (Morales et al., 2002; Reeve et al., 2005, 2008; Okray et al., 2015; Franco et al., 2017) and the Amyloid Precursor Protein in axonal growth and guidance (Leyssen et al., 2005; Soldano et al., 2013, Liu et al., 2021), neuro-glial communication (Kessissoglu et al., 2020) and human specific features of cortical neurogenesis (Shabani et al., 2023).

10 selected senior author publications

1. Shabani K, Pigeon J, Benaissa Touil Zariouh M, Liu T, Saffarian A, Komatsu J, Liu E, Danda N, Becmeur-Lefebvre M, Limame R, Bohl D, Parras C, Hassan BA. The temporal balance between self-renewal and differentiation of human neural stem cells requires the Amyloid Precursor Protein. Science Adv. 2023 in press.
2. Linneweber GA, Andriatsilavo M, Bias Dutta S, Bengochea M, Hellbruegge L, Liu G, EjsmontRK, Straw AD, Wernet M, Hiesinger PR, Hassan BA. A neurodevelopmental origin of behavioral individuality in the Drosophila visual system. Science. 2020. 367 (6482):1112-1119.
3. Ramaekers A, Claeys A, Kapun M, Mouchel-Viehl E, Potier D, Weinberger S, Grillenzoni N, Cuménal D, Yan J, Wolf R, Flatt T, Buchner E, Hassan BA. Altering the temporal regulation of one transcription factor drives sensory trade-offs. Dev Cell. 2019. 50(6):780-792.
4. Mora N, Oliva C, Fiers M, Ejsmont R, Soldano A, et al. A Temporal Transcriptional Switch Governs Stem Cell Division, Neuronal Numbers, and Maintenance of Differentiation. Dev Cell. 2018. 45(1):53-66.
5. Quan XJ, Yuan L, Tiberi L, Claeys A, De Geest N, et al. Post-translational Control of the Temporal Dynamics of Transcription Factor Activity Regulates Neurogenesis. Cell. 2016. 164(3):460-75.
6. Hassan BA, Hiesinger PR. Beyond Molecular Codes: Simple Rules to Wire Complex Brains. Cell. 2015. 163(2):285-91.

7. Langen M, Koch M, Yan J, De Geest N, Erfurth ML, et al. Mutual inhibition among postmitotic neurons regulates robustness of brain wiring in Drosophila. Elife. 2013. 2:e00337.
8. Choi CM, Vilain S, Langen M, Van Kelst S, De Geest N, et al. Conditional mutagenesis in Drosophila. Science. 2009. 324(5923):54.
9. Quan XJ, Denayer T, Yan J, Jafar-Nejad H, Philippi A, et al. Evolution of neural precursor selection: functional divergence of proneural proteins. Development. 2004. 131(8):1679-89.
10. Morales J, Hiesinger PR, Schroeder AJ, Kume K, Verstreken P, et al. Drosophila fragile X protein, DFXR, regulates neuronal morphology and function in the brain. Neuron. 2002. 34(6):961-72.