Roel Nusse PhD
Professor & Chair, Department of Developmental Biology; Member, Institute for Stem Cell Biology and Regenerative Medicine, Stanford University, School of Medicine. Virginia and Daniel K. Ludwig Professor of Cancer Research. Investigator, Howard Hughes Medical Institute

Canada Gairdner International Award 2020

"For pioneering work on the Wnt signaling pathway and its importance in development, cancer and stem cells."

The work:

Dr. Nusse's research has elucidated the mechanism and role of Wnt signaling, one of the most important signaling systems in development. There is now abundant evidence that Wnt signaling is active in cancer and in control of proliferation versus differentiation of adult stem cells, making the Wnt pathway one of the paradigms for the fundamental connections between normal development and cancer.

Among Dr. Nusse's contributions is the original discovery of the first Wnt gene (together with Harold Varmus) as an oncogene in mouse breast cancer. Afterwards Dr. Nusse identified the Drosophila Wnt homolog as a key developmental gene, Wingless. This led to the general realization of the remarkable links between normal development and cancer, now one of the main themes in cancer research. Using Drosophila genetics, he established the function of beta-catenin as a mediator of Wnt signaling and the Frizzleds as Wnt receptors (with Jeremy Nathans), thereby establishing core elements of what is now called the Wnt pathway. A major later accomplishment of his group was the first successful purification of active Wnt proteins, showing that they are lipid-modified and act as stem cell growth factors.

The impact:

Wnt signaling is implicated in the growth of human embryos and the maintenance of tissues. Consequently, elucidating the Wnt pathway is leading to deeper insights into degenerative diseases and the development of new therapeutics. The widespread role of Wnt signaling in cancer is significant for the treatment of the disease as well. Isolating active Wnt proteins has led to the use of Wnts by researchers world-wide as stem cell growth factors and the expansion of stem cells into organ-like structures (organoids).