ROEL NUSSE, PH.D.
WNT SIGNALING STEM CELL CONTROL AND CANCER

APRIL 23, 2015
4:00 P.M.
208 LIGHT HALL

Upcoming Discovery Lecture:

ERIC I. KNUDSEN, PH.D.
Stanford University

April 30, 2015
208 Light Hall / 4:00 P.M.
Our laboratory is interested in the growth, development and integrity of animal tissues, with a focus on stem cells. Wnt signaling is widely implicated in stem cell control, as a mechanism to regulate the number of stem cells in tissues. Using various cell labeling methods, we have described novel populations of stem cells in various tissues, including in the liver. In that tissue, we found that hepatocytes that reside in the pericentral domain of the liver demonstrate stem cell behavior. Although these cells are functional hepatocytes, they are diploid and thus differ from the mostly polyploid mature hepatocyte population. They are active in homeostatic cell replacement and therefore distinct from oval cells, which require injury for their induction. Adjacent central vein endothelial cells provide the essential source of Wnt signals for the hepatocyte stem cells and thereby constitute the liver stem cell niche. It is noteworthy that liver cancer is often characterized by loss of function mutations in negative components of the Wnt pathway, including Axin and APC. We suggest that pericentral hepatocyte stem cells, normally controlled by a paracrine Wnt signal, are precursors to liver cancer.

We have also asked whether Wnt signals could operate in a directional, oriented manner on stem cells to orchestrate their asymmetric division. We have developed a novel technology that includes immobilized Wnt proteins on small beads and the application of these to single stem cells in culture. By this method, we were able to activate one specific side of the cell by the locally acting Wnt, follow by time-lapse imaging. Our data show that a local source of Wnt proteins sets up the orientation of cell division and the mitotic spindle. The oriented Wnt signal induces asymmetric division of stem cells: the daughter cell in contact with the Wnt source maintains pluripotency, whereas the distal cell differentiates.
The Cell and Developmental Biology Distinguished Faculty Lecture Series is an annual event in honor of the more than 80 years of excellence in research, teaching and service by the faculty of Vanderbilt University School of Medicine in the Department of Cell and Developmental Biology.

CELL AND DEVELOPMENTAL BIOLOGY PRIMARY FACULTY
[based on faculty census 1985 forward]

James W. Ward, M.D., Professor Emeritus* 1958-1993
Jack Davies, M.D., Professor Emeritus* 1963-1991
G. Rodman Davenport, Ph.D., Associate Professor* 1963-1993
Alvin M. Burt, Ph.D., Professor Emeritus 1966-2000
Loren H. Hoffman, Ph.D., Professor* 1969-1999
John A. Freeman, M.D., Ph.D., Professor 1971-1994
Vivien A. Carayannides, Ph.D., Professor 1976-present
James A. McKanna, Ph.D., Associate Professor Emeritus 1976-2002
Gary E. Olson, Ph.D., Professor Emeritus 1977-2008
Alfred G. Kassellberg, M.D., J.D., Assistant Professor 1978-2001
Jeanette J. Norden, Ph.D., Professor Emeritus 1978-2013
Paua C. Hoos, Ph.D., Associate Professor 1982-1997
Harold L. Moses, M.D., Professor 1983-2000*
W. Jackson Pledger, Ph.D., Professor 1983-1994
Edward B. Leah, Ph.D., Associate Professor 1985-1992
Lynn M. Matrissan, Ph.D., Professor 1986-2000
Stephen R. Hain, Ph.D., Professor 1986-present
Jeffrey T. Holt, M.D., Professor 1987-2002
Brígid L.M. Hogan, Ph.D., FRs, Professor 1988-2002
J. Ann Richmond, Ph.D., Professor 1989-2000*
Christopher V.E. Wright, D.Phil., Professor 1990-present
Bruce W. Eamin, Ph.D., Assistant Professor 1990-1993
Steven K. Hanke, Ph.D., Professor Emeritus 1990-2011
Susan R. Fox, Ph.D., Assistant Professor 1990-1993
Kathleen L. Gould, Ph.D., Professor 1991-present
Claude M. Nagamine, Ph.D., Assistant Professor 1991-2000
Mary Ann Arildsen, M.D., Professor Emeritus 1991-1998*
David M. Miller, Ph.D., Professor 1994-present
David I. Greenstein, Ph.D., Associate Professor 1994-2006
Peng Liang, Ph.D., Associate Professor 1995-2000
Peter A. Kedodzie, Ph.D., Assistant Professor* 1995-2005
Albert B. Reynolds, Ph.D., Professor 1996-2000*
Christopher F.J. Hardy, Ph.D., Associate Professor 1996-2000
Chin Chiang, Ph.D., Professor 1997-present
Arthos F. Davley, Ph.D., Professor 1998-present
Christopher F.J. Hardy, Ph.D., Associate Professor 2002-2009
Susan M. Wente, Ph.D., Professor** 2002-present
Daniela Drummond-Barbosa, Ph.D., Assistant Professor 2003-2009
Guojiang Gu, Ph.D., Associate Professor 2002-present
Evan Lee, M.D., Ph.D., Associate Professor 2003-present
Laurie A. Le, M.D., Ph.D., Associate Professor 2003-2014
Matthew J. Tyska, Ph.D., Associate Professor 2004-present
Irina N. Kaverina, Ph.D., Associate Professor 2005-present
Byoung J. Cha, Ph.D., Assistant Professor 2005-2009
Stacey S. Huppers, Ph.D., Assistant Professor 2005-2012
Patricia A. Laboski, Ph.D., Associate Professor 2006-2012
Ryan W. Ok, Ph.D., Associate Professor 2007-present
Melanie Ohi, Ph.D., Associate Professor 2007-present
William Tansey, Ph.D., Professor 2009-present
Andrea Page-McCaw, Ph.D., Associate Professor 2010-present
Ian G. Macara, Ph.D., Professor and Chair 2012-present
Ken Lau, Ph.D., Assistant Professor 2013-present
Jason MacGurn, Ph.D., Assistant Professor 2013-present
Dylan Burnett, Ph.D. Assistant Professor 2014-present
Marija Zunic, Ph.D. Assistant Professor 2014-present

* Chair of Cell Biology (1985-2000), Emeritus Director, Vanderbilt-Ingram Cancer Center
** Chair of Cell Biology (2002-2012), Vanderbilt University Provost and Vice Chancellor for Academic Affairs
* Department of Cell Biology, Vanderbilt University School of Medicine
* Department of Pathology, Microbiology and Immunology, Vanderbilt University School of Medicine
* Deceased