The cytoskeleton in neurons is made up of three interacting structural complexes: microfilaments (MFs), neurofilaments (NFs), and microtubules (MTs). They serve multiple roles in neurons. First, they provide structural organization for the cell interior, helping to establish metabolic compartments. Second, they serve as tracks for intracellular transport, especially axonal transport, which is critical for neuronal survival. Finally, the cytoskeleton comprises the core framework of neuronal morphologies. Disorganization of the cytoskeleton network is a prominent cytopathological feature of several neurodegenerative disorders, including amyotrophic lateral sclerosis (ALS), infantile spinal muscular atrophy (SMA), and Alzheimer diseases. Our major focus is to elucidate biological functions of cytoskeletal associated proteins in neurons and to define the cellular and molecular basis for how these proteins contribute to the structure and function of neurons. Cellular and molecular approaches are being employed both in vitro and in vivo. Our experimental models include:

1) transfection assays,
2) primary neuron cultures,
3) in vitro protein-protein interaction assays,
4) yeast two-hybrid screening,
5) specific gene targeting in mice. Defining the biological functions of cytoskeletal organizing proteins would significantly advance our understanding of pathogenesis of neurodegenerative disorders.

Teaching

COURSES

2018-19

• Intracellular Trafficking and Neurodegeneration: NENS 67N (Win)
• Neurobiology of Disease Seminar: NENS 205 (Win)

2017-18
• Intracellular Trafficking and Neurodegeneration: NENS 67N (Win)

2016-17

• Intracellular Trafficking and Neurodegeneration: NENS 67N (Win, Sum)

• Neuroscience Core Curriculum: Translational Neuroscience: NENS 207, NEPR 214 (Spr)

2015-16

• Intracellular Trafficking and Neurodegeneration: NENS 67N (Win, Sum)

• Neuroscience Core Curriculum: Translational Neuroscience: NENS 207 (Spr)

STANFORD ADVISEES

Postdoctoral Faculty Sponsor

Ivan Millan

GRADUATE AND FELLOWSHIP PROGRAM AFFILIATIONS

• Neurosciences (Phd Program)

Publications

PUBLICATIONS

• Giant axonal neuropathy  CELLULAR AND MOLECULAR LIFE SCIENCES
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• Retrolinkin, a membrane protein, plays an important role in retrograde axonal transport  PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA
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• A dysfunctional desmin mutation in a patient with severe generalized myopathy *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*
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• Developmental expression of BPAG1-n: Insights into the spastic ataxia and gross neurologic degeneration in dystonia musculorum mice *DEVELOPMENTAL BIOLOGY*
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  Yang, Y. M., Dowling, J., Yu, Q. C., Kouklis, P., Cleveland, D. W., Fuchs, E.
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• SEQUENTIAL REQUIREMENT OF HEPATOCYTE GROWTH-FACTOR AND NEUREGULIN IN THE MORPHOGENESIS AND DIFFERENTIATION OF THE MAMMARY-GLAND *JOURNAL OF CELL BIOLOGY*
  Yang, Y. M., Spitzer, E., Meyer, D., Sachs, M., Niemann, C., Hartmann, G., Weidner, K. M., Birchmeier, C., BIRCHMEIER, W.

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