Lawrence Salkoff is professor of neurobiology and professor of genetics at Washington University School of Medicine, St Louis, Missouri, USA. In 1979 he received a Ph.D. in neurogenetics from the University of California, Berkeley, USA. During postdoctoral work at Yale University, New Haven, Connecticut, USA, in the laboratory of Robert Wyman, he initiated voltage-clamp studies in *Drosophila*, showing that the *Drosophila Shaker* gene encoded an A-type potassium channel. After moving to San Francisco, California, USA, he initiated a project to clone the *Shaker* gene in the laboratories of Lily Jan and Pat O'Farrell. The project was interrupted by accepting an offer to join the faculty at Washington University as an assistant professor. The Salkoff laboratory has revealed a large, conserved, extended gene family encoding potassium channels, and cloned family members including the mammalian *Slo1* and *Slo3* genes, and the *slo-2* gene from *Caenorhabditis elegans*. The Salkoff lab also revealed that the elusive sodium-activated potassium channel is the mammalian SLO2.2 channel (also known as Slack) and has undertaken a variety of structure–function studies of SLO family channels. Other projects have involved the cloning of genes encoding potassium channels in *C. elegans* and the functional characterization of mutants affecting these channels. Most recently, the laboratory has studied the modulation of mammalian SLO2 channels by the GqPCR pathway and its possible importance in the long-term modulation of neuronal excitability ***[AU: edits for length OK?]***.

Alice Butler is staff scientist in the laboratory of Larry Salkoff at Washington University School of Medicine, St Louis, Missouri, USA. She obtained her B.A. in biology from Brandeis University, Waltham, Massachusetts, USA, in 1982. Soon after, in 1984, she joined the Salkoff laboratory in St. Louis and helped to initiate molecular cloning experiments in *Drosophila* and *Caenorhabditis elegans*. Other projects she has been involved with include the cloning of the first mammalian 'big' potassium (BK) channel, and the unusual calcium- and chloride-activated SLO2 potassium channel from *C. elegans*. She continues to be involved in all aspects of projects involving cloning and molecular biology. In addition, she has been involved in structure–function studies of most of the channels studied in the lab, as well as *C. elegans* green fluorescent protein-promoter fusion studies, and *C. elegans* mutagenesis screens.

Gonzalo Ferreira is assistant professor of biophysics at the School of Medicine in Montevideo, Uruguay. He is also an investigator from the Uruguayan Program for Development of Basic Sciences (PEDECIBA), adjunct honorary professor from CECS, Valdivia, Chile and a regular visiting professor at the Salkoff lab at Washington University School of Medicine, St Louis, Missouri, USA. He received his M.D. from the University of the Republic, Montevideo, complementing those studies with physics and mathematics. He obtained a M.Sc. and a Ph.D. in biophysics from PEDECIBA, supported by the United Nations. He undertook initial postdoctoral studies in ion channel biophysics with Gustavo Brum and Gonzalo Pizarro in Uruguay. He then continued his postdoctoral studies with Eduardo Rios at Rush University, Chicago, Illinois, USA, where he studied the gating mechanisms in L-type Ca^{2+} channels, Ba^{2+}-dependent inactivation, and the multiplicity of mechanisms of voltage-dependent inactivation. Since becoming interested in K^+ channels, he worked for a short time in Ramon Latorre's lab in Chile, and later spent a sabbatical year at the Salkoff lab at Washington University School of Medicine. During this time he contributed to revealing the differential modulation of SLO2 channels by the GqPCR pathway and its possible importance in long-term neuromodulation of neuronal excitability. He is currently at the School of Medicine in Montevideo.

Celia M. Santi is currently senior scientist at Washington University School of Medicine, St Louis, Missouri, USA. She received her M.D. from the University of the Republic, Montevideo, Uruguay in 1992 and her Ph.D. in 1998 from the National Autonomous University, Mexico City, Mexico. During her Ph.D. she studied the role of calcium channels in the physiology of sperm. In 1998, she received a postdoctoral fellowship from the Human Frontiers Science Program to do her postdoctoral training in the laboratory of Terry Snutch at the University of British Columbia, Canada, where she studied the biophysical properties and pharmacology of T-type calcium channels. In 2001 she started working as a research associate in Lawrence Salkoff's lab at Washington University School of Medicine, where she received a fellowship from the McDonnell Foundation for Brain Research to initiate the study of the SLO2 potassium channel family in *Caenorhabditis elegans* and mammals. In 2005 she was awarded the title of senior scientist and is now embarking on a project studying the role of the novel SLO3 potassium channel in sperm physiology.

Aguan D. Wei is research assistant professor of neurobiology in the Department of Anatomy and Neurobiology at Washington University School of Medicine St Louis, Missouri, USA. He received an A.B. in neurobiology from the University of California, Berkeley, USA, in 1978, and a Ph.D. in biology from the University of Oregon, Eugene, USA, in 1985. In Oregon, he studied motor pattern generators in the locust with the late Graham Hoyle, an early pioneer of invertebrate neurobiology. Following his graduation, he joined Lawrence Salkoff at Washington University School of Medicine as a postdoctoral fellow, where he developed his present interest in the functional genetics and biophysical diversity of potassium channels in model organisms. He was instrumental in the cloning of various gene family members in *Drosophila*, *Caenorhabditis elegans* and mammals. He has also participated in various structure–function studies of SLO family channels, characterizing their modular structure and ion-sensing domains. Other projects in which he has participated have involved the cloning of novel genes encoding potassium channels in *C. elegans* and the functional characterization of mutants affecting these channels. His work has been supported by the National Science Foundation and the McDonnell Foundation.

Online Summary

- Identification of the *Slo* gene family came on the heels of new advances in molecular cloning, and involved *Drosophila melanogaster* neurogenetics as well as numerous physiological and biophysical studies. These biophysical studies**[Au: ok?]** had identified Ca^{2+}-dependent K^+ currents in many systems, as well as unusually large (maxi-K) Ca^{2+}- and Na^+-dependent single channel currents. The key to identifying the genes underlying these phenomena turned out to be the *Drosophila slowpoke (slo)* mutant.
- The structures of the α-subunits of SLO family channels resemble those of voltage-gated K^+ channels. However, they differ from those of voltage-gated ion channels in that they have an extensive carboxyl extension — the 'tail' — which is thought to confer distinctive properties, such as calcium-sensing, to SLO1 channels, whereas the 'core' domain containing the membrane-spanning segments confers voltage sensitivity.
- Voltage-dependent channels are gated (opened and closed) in response to changes in transmembrane voltage. In ligand-gated channels, the binding of a ligand, such as a neurotransmitter, causes a conformational change of a 'ligand-binding domain' that is