This special issue of the *General Physiology and Biophysics* contains invited and peer-reviewed papers presented at the international scientific conference entitled “Current Trends in Physiological Sciences” held on 17–18 December 2008 in Belgrade, Republic of Serbia. It was organized under the auspices of the *Federation of European Physiological Societies*. The conference was organized through activity of the *Serbian Physiological Society* to honor Professor Richard Burian (1871–1954). He was the founder of the Institute of Medical Physiology, School of Medicine, University of Belgrade and one of the most internationally recognized physiologists at the beginning of the 20th century. Guest editors for this special issue were Vladimír Štrbák (Bratislava, Slovak Republic), Dragan Djurić (Belgrade, Republic of Serbia) and Vladimir Jakovljević (Kragujevac, Republic of Serbia). *Serbian Physiological Society* and the organizers of this conference express their gratitude to the *Institute of Molecular Physiology and Genetics* of the *Slovak Academy of Sciences*, editors of the *General Physiology and Biophysics*, and to the honorary chairman of the conference Vladimír Štrbák for their understanding and invaluable support.