Cardiovascular disease associated with myocardial infarction (heart attack) or pressure overload (high blood pressure) frequently progresses to heart failure, a disease in which the ability of the heart to pump blood is diminished (contractile dysfunction). Heart failure is a leading cause of mortality worldwide. The molecular and biochemical changes associated with heart failure include development of arrhythmias and loss of heart cells due to cell death from changes in oxygen and calcium. The ISHR Congress covered all aspects of heart research that inform our understanding of how the contractile function, ion (calcium, sodium) channel activity, mitochondrial function and cell death are regulated in the heart. Drug approaches are used to treat heart failure but other ways to prevent or improve cardiac function are under study. The importance of regenerative medicine and the use of stem cells to repair the heart and to improve loss of functioning myocardium and survival of heart cells (myocytes) cannot be overestimated. We were privileged to have more than 16 talks, from the most preeminent investigators in this area at the ISHR XXI Congress. We are extremely grateful to CIRM for contributing to our ability to support these speakers and the conference.