

Section 1 STRUCTURAL AND MOLECULAR BASES OF ION CHANNEL FUNCTION

- 1. Voltage-gated sodium channels and electrical excitability of the heart*
- 2. Voltage-gated calcium*
- 3. Voltage-gated potassium channels*
- 4. Structural and molecular bases of cardiac inward rectifier potassium channel function*
- 5. Mammalian calcium pumps in health and disease*
- 6. Structural and molecular bases of sarcoplasmic reticulum ion channel function*
- 7. Organellar ion channels and transporters*
- 8. Molecular organization, gating, and function of connexin-based gap junction channels and hemichannels*

Section 2 BIOPHYSICS OF CARDIAC ION CHANNEL FUNCTION

- 9. Structure-function relations of heterotrimeric complexes of sodium channel α and β subunits*
- 10. Regulation of cardiac calcium channels*
- 11. Inhibition of phosphoinositide 3-kinase and acquired long QT syndrome*
- 12. Structural determinants and biophysical properties of hERG1 channel gating*
- 13. Molecular regulation of cardiac inward rectifier potassium channels by pharmacologic agents*
- 14. Cardiac stretch-activated channels and mechano-electric coupling*
- 15. Biophysical properties of gap junctions*
- 16. Excitation-contraction coupling*

Section 3 INTERMOLECULAR INTERACTIONS AND CARDIOMYOCYTE ELECTRICAL FUNCTION

- 17. Ion channel trafficking in the heart*
- 18. Microdomain interactions of macromolecular complexes and regulation of the sodium channel Nav1.5*
- 19. Fibroblast growth factor homologous factors modulate cardiac calcium channels*
- 20. Macromolecular complexes and cardiac potassium channels*
- 21. Reciprocity of cardiac sodium and potassium channels in the control of excitability and arrhythmias*

22. The intercalated disc: A molecular network that integrates electrical coupling, intercellular adhesion and cell excitability

23. Function and dysfunction of ion channel membrane trafficking and post translational modification

24. Feedback mechanisms for cardiac-specific microRNAs and cAMP signaling in electrical remodeling

Section 4 CELL BIOLOGY OF CARDIAC IMPULSE INITIATION AND PROPAGATION

25. Stem cell-derived nodal-like cardiomyocytes as a novel pharmacologic tool: Insights from sinoatrial node development and function

26. Gene therapy and biologic pacing

27. Intercellular communication and impulse propagation

28. Mechanisms of normal and dysfunctional sinoatrial nodal excitability and propagation

29. Cell biology of the specialized cardiac conduction system

30. Cardiac remodeling and regeneration

Section 5 MODELS OF CARDIAC EXCITATION

31. Ionic mechanisms of atrial action potentials

32. Genetic algorithms to generate dynamical complexity electrophysiological models

33. Calcium signaling in cardiomyocyte models with realistic geometries

34. Theory of rotors and arrhythmias

35. Computational approaches for accurate rotor localization in the human atria

36. Modeling the aging heart

Section 6 NEURAL CONTROL OF CARDIAC ELECTRICAL ACTIVITY

37. Innervation of the sinoatrial node

38. Mechanism for altered autonomic and oxidant regulation of cardiac sodium currents.

39. Pulmonary vein ganglia and the neural regulation of the heart rate

40. Neural activity and atrial tachyarrhythmias

41. Sympathetic innervation and cardiac arrhythmias

Section 7 ARRHYTHMIA MECHANISMS

42. The molecular pathophysiology of atrial fibrillation

43. Myofibroblasts, cytokines, and persistent atrial fibrillation

- 44. *Role of the autonomic nervous system in atrial fibrillation*
- 45. *Rotors in human atrial fibrillation*
- 46. *Body surface frequency-phase mapping of atrial fibrillation*
- 47. *Panoramic mapping of atrial fibrillation from the body surface*
- 48. *Mechanisms of human ventricular tachycardia and human ventricular fibrillation*
- 49. *Genetics of atrial fibrillation*

Section 8 MOLECULAR GENETICS AND PHARMACOGENOMICS

- 50. *Mechanisms in heritable sodium channel diseases*
- 51. *Genetic, ionic, and cellular mechanisms underlying the J-wave syndromes*
- 52. *Inheritable potassium channel diseases*
- 53. *Inheritable phenotypes associated with altered intracellular calcium regulation*

Section 9 PHARMACOLOGIC, GENETIC, AND CELL THERAPY OF ION CHANNEL DYSFUNCTION

- 54. *Pharmacologic bases of antiarrhythmic therapy*
- 55. *Pharmacogenomics of cardiac arrhythmias*
- 56. *Gene therapy to treat cardiac arrhythmias*
- 57. *Highly mature human iPSC-derived cardiomyocytes as models for cardiac electrophysiology and drug testing*
- 58. *Cardiac repair with human induced pluripotent stem cell-derived cardiovascular cells.*

Section 10 DIAGNOSTIC EVALUATION

- 59. *Assessment of the patient with a cardiac arrhythmia*
- 60. *Electrocardiography of tachyarrhythmias: Differential diagnosis of narrow and wide QRS complex tachycardias*
- 61. *Electroanatomic mapping for arrhythmias*
- 62. *Computed tomography for electrophysiology*
- 63. *Magnetic resonance imaging for electrophysiology*
- 64. *Intracardiac echocardiography for electrophysiology*
- 65. *Exercise-induced arrhythmias*
- 66. *Cardiac monitoring: short- and long-term recording*
- 67. *Head-up tilt table testing*
- 68. *Autonomic regulation and cardiac risk*

69. *T-wave alternans*

70. *Noninvasive electrocardiographic imaging of human ventricular arrhythmias and Electrophysiological Substrate*

71. *Genetic testing*

Section 11 SUPRAVENTRICULAR TACHYARRHYTHIAS: MECHANISMS, CLINICAL FEATURES, AND MANAGEMENT

72. *Sinus node abnormalities*

73. *Atrial tachycardia*

74. *Atrial tachycardia in adults with congenital heart disease*

75. *Typical and atypical atrial flutter: Mapping and ablation*

76. *Atrial fibrillation*

77. *Preexcitation, atrioventricular reentry, variants*

78. *Electrophysiological characteristics of atrioventricular nodal reentrant tachycardia: Implications for the reentrant circuits*

79. *Junctional tachycardia*

Section 12 VENTRICULAR TACHYARRHYTHMIAS: MECHANISMS, CLINICAL FEATURES, AND MANAGEMENT

80. *Premature ventricular complexes*