60 Years of the Hodgkin-Huxley Model

CONFERENCE PROGRAMME

Day One

9:00am **Welcome and Introduction and Logistics**

(All Day 1, morning lectures will be held in the Wincanton Lecture Theatre, Trinity College).

9:20am **Historical overview and context**

chaired by **James Bower**

James Bower, University of Texas Health Science Center, San Antonio.

The relationship between experiment and theory, as manifest in the history of the Hodgkin Huxley Model


9:40 am **Wilfrid Rall** retired NIH, Bethesda, Maryland and **Gordon M. Shepherd**, Yale University.

From Hodgkin & Huxley to the central nervous system: first steps in building biophysically-realistic excitability into central neurons and their dendrites.

10:20am **Daniel Gardner**, Cornell University, NY.

Sixty Years of Membrane Current in Nerve.

10:40am **Tea Break**

11:00am **Biophysics and Biology**

Part 1: The Action Potential Today

Energetics

chaired by **Indira Raman** ?

11:00am **TBA**

11:20am **Biswa Sengupta**,

Enegetically optimum action potentials

11:40am **Bruce Bean**, Harvard Medical School.

12:00pm **David Attwell**, UCL, London

12:30pm **Lunch**

(In Trinity College Hall)

1:30pm **Unveiling of a commemorative plaque**

(To be held at the Entrance of Physiological Laboratory, University of Cambridge)

Keynote Lecture

(To be held in the Physiological Laboratory Hodgkin Huxley Seminar Room, University of Cambridge)

1:45pm **Bertil Hille**, University of Washington.

The context, conception, and impact of Hodgkin and Huxley's action potential model: 1936-1970.

2:40pm **Biophysics and Biology**

(To be held in the Wincanton Lecture Theatre, Trinity College Cambridge)

Part 2: Molecular dynamics of ion channels

chaired by **Bruce Bean** ?

2:40pm **Indira Raman** Northwestern University,

The sodium Channel.

3:00pm **Peter Jonas**, IST, Austria.

3.20pm **Lorin Milescu** ,University of Missouri

Sodium channels in pacemaker neurons

3:40 pm **Ilya A. Fleidervish**, Ben-Gurion University, Beer-Sheva, Israel

Shedding light on sodium fluxes and action potential initiation in cortical pyramidal neurons

4:00pm William L. Kath, Northwestern University

A sodium channel model with slow recovery from inactivation

4:20pm **5 Minute Previews of Presented Posters**

(To be held in the Wincanton Lecture Theatre, Trinity College Cambridge)

Chaired by James Bower

5:30pm Poster Session /Pre Dinner Drinks

(Poster session in Trinity College Old Kitchens and Pre Dinner Drinks in the adjoining Nevile's Court)

7:30pm Conference Banquet

(To be held in Trinity College Hall)

60 Years of the Hodgkin-Huxley Model

CONFERENCE PROGRAMME

Day Two

9:00am **Biophysics and Biology**

(All Day 2 lectures will be held in the Wincanton Lecture Theatre, Trinity College, Cambridge)

Part 3: Evolutionary considerations

chaired by **David Attwell** ?

9:00am **Bertil Hille**, University of Washington.

Ion channel evolution: basic mechanisms and results.

9:20am **Harold Zakon**, University of Texas at Austin

Adaptive evolution of Na channels in pain receptors.

9:40am **Modulation of and by ion channels**

chaired by **Michael Häusser**

9:40am **Michele Migliore**, CNR, Palermo.

On the mechanisms underlying the depolarization block in the spiking dynamics of CA1 pyramidal neurons

10:00am **Susanne Schreiber**, Humboldt-Universität zu Berlin and Bernstein Center for Computational Neuroscience Berlin, Germany

Grasshopper neurons keep cool in hot situations: temperature-compensated spike rates can be achieved in single neurons at no additional energetic cost

10:20am **Andreas Herz**, BCCN Munich

From sub-threshold to super-threshold to in vivo

10:50am **Hans A. Braun**, University of Marburg, Germany.

Conductance-Based Computer Models with Hodgkin-Huxley-Type Neurons and Synapses Adjusted to Experimental and Clinical Tasks.

11:10am Tea Break

11:30pm **Developments in Modelling the HH equations**

Chaired by **James Bower**

11.30pm **Idan Segev**, Hebrew University, Jerusalem?

From a single H&H spike to a family of spike patterns

12:00pm **Cengiz Günay**, Emory University.

Simulated compensation of experimental artifacts for Hodgkin-Huxley type ion channel parameter fitting

12:20pm **Lyle N. Long**, The Pennsylvania State University

Efficient and Scalable Neural Network Simulations for Engineering Applications using the Hodgkin-Huxley Equations

12.40pm **TBA**

Reduced forms

1:10pm Lunch

(Trinity College Hall)

2:10pm **Ion channels and computation**

Chaired by **Idan Segev**

2:10pm **Sungho Hong**, Okinawa Institute of Science and Technology.

Adaptive Computation of Neurons with Hodgkin-Huxley Mechanisms

2:30pm **Yuguo Yu**, Yale University and Fudan University, Shanghai.

Does Hodgkin-Huxley theory need to upgrade for mammalian cortical neurons?

2:50pm **Fernando R. Fernandez**, University of Utah.

Understanding neuronal input-output transformations in the context of in vivo-like membrane voltage conditions

3:10pm **Michael Häusser**, UCL, London.

Dendrites

3:40pm **Fred Wolf**, Max Planck Institute for Dynamics and Self-Organization, Göttingen, Germany;

How Details Matter - Computational Capabilities of Neocortical Networks Reflect the Physiology of Action Potential Initiation

4:10pm **Tea Break**

4:30pm **Stochastics, Noise and Chaos**

(To be held in the Wincanton Lecture Theatre, Trinity College Cambridge)

Chaired by **TBA**

4:30pm **Christian Finke**, University of Oldenburg, Germany.

Effects of different noise implementations in a Hodgkin-Huxley-type cold receptor model with subthreshold oscillations

4:50pm **Kazuyuki Aihara**, Institute of Industrial Science, University of Tokyo.

Chaos and Bifurcations in the Hodgkin-Huxley Equations and Squid Giant Axons

5:10pm **Michele GIUGLIANO**, University of Antwerp.

Accurate and fast simulation of channel noise in conductance-based model neurons

5:30pm **L. S. Borkowski**, Adam Mickiewicz University, Poznan, Poland.

Multimodal transition and stochastic coherence antiresonance in the periodically stimulated Hodgkin-Huxley model with noise

5:50pm **Alessandro Torcini**, CNR, Florence.

Coherent response of the Hodgkin-Huxley model in the high-input regime

6:10pm **Henry C. Tuckwell**, Max Planck Institute, Leipzig, Germany

Inverse stochastic resonance and long-term firing properties in stochastic Hodgkin-Huxley systems

6:30pm **Meeting evaluation and final comments**