JACK COWAN'S 50TH CELEBRATION
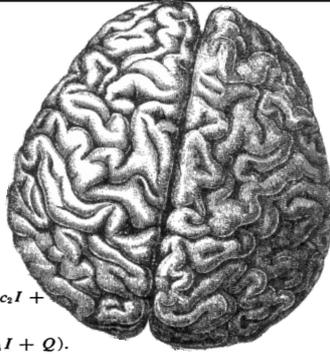
$$\tau_e \frac{dE}{dt} = -E + (k_e - r_e E)\mathcal{S}_e(c_1 E - c_2 I +$$

$$\tau_i \frac{dI}{dt} = -I + (k_i - r_i I)\mathcal{S}_i(c_3 E - c_4 I + Q).$$

FRIDAY
MAY 11, 2018

KNAPP CENTER FOR BIOLOGICAL DISCOVERY
ROOM 1103

50 Years of Modeling Neural Activity at the University of Chicago

10:30   Registration and Welcome

11:00   Beyond Hyperchaos in the Spatial Wilson-Cowan Equations
Hugh Wilson (York University)

11:45   Understanding vision through the lens of prediction
Stephanie Palmer (University of Chicago)

12:30   Lunch and Poster Session

2:00   Embodied Neural Dynamics: Putting the Brain Back Into the Body
Peter Thomas (Case Western University)

2:45   Spatio-temporal dynamics in the Wilson-Cowan equations
Bard Ermentrout (University of Pittsburg)

3:30   Break and Poster Session

4:30   Discussion
Jack Cowan

JACK COWAN'S BIO

Professor Jack D. Cowan received his undergraduate training in Physics at Edinburgh University and received a B.Sc degree in 1955. Subsequently, he worked in the field of Electrical Engineering and received an M.S degree from MIT in 1960 and a Ph.D from Imperial College (London) in 1967. During this period he interacted with, and was influenced by, an impressive group of scientists that included Norbert Wiener, Claude Shannon, Warren McCulloch, Walter Pitts, and Dennis Gabor, the recipient of the 1971 Nobel Prize in Physics. Fifty years ago (!), based on his work on designing reliable neural networks with unreliable elements (with fellow MIT student Shmuel Winograd), and his work on applying the methodology of statistical mechanics to neural networks, he was appointed as Professor of Mathematical Biology and Chairman of the Committee on Mathematical Biology at the University of Chicago. During his tenure at the University of Chicago, his official job title has changed multiple times, but his work and principal interest have remained focused on activity patterns in neuronal networks. With his postdoctoral student, Hugh Wilson, he wrote two seminal papers on the dynamics of neuronal populations, published in 1972 and 1973. Although it took a fairly long time before the importance of this work was recognized, these studies have inspired investigators of brain dynamics worldwide, and are still the basis for the neuronal network models today. In working with graduate student Bard Ermentrout, Bard and Jack introduced the methods of bifurcation theory to neural modeling, and developed a theory for the formation of hallucinatory images in the visual brain in 1979. In 2001, Jack worked with Paul Bressloff and Marty Golubitsky, and his two students, Matthew Wiener and Peter Thomas, on an extension of the Ermentrout-Cowan hallucinations model to incorporate visual feature-detecting elements. Currently, Jack continues to work on this model with graduate student Zilly Burstein. In the 1990s, Jack worked with graduate student Toru Ohira on a stochastic theory of neuronal activation that extends the Wilson-Cowan equations, using the methodology of Quantum Field Theory. This latter work was further developed with another student Michael Buice, and it ultimately showed that a well-known phase transition called "directed percolation" occurs in stochastic neural networks. More recently, Jack worked with his colleague Wim van Drongelen, and two graduate students, Mark Benayoun and Edward Wallace, to develop another statistical approach to neural network behavior that exhibits self-similar power laws. Currently Jack and graduate student Graham Smith investigate the possibility that the Wilson-Cowan equations actually have a closed-form exact mathematical solution.

Students and postdoctoral scientists that worked with Jack have gone on to have significant careers of their own, and three of them will give talks during the celebration: Hugh Wilson, Peter Thomas, and Bard Ermentrout. During his career, Jack has served as advisor for many graduate students and postdoctoral scientists, in addition to lecturing on multiple aspects of modeling neuronal activity and on mathematics for the physical sciences. And these activities are still ongoing! To make a long story short, Jack is a role model for any scientist and we thank you for celebrating his 50th anniversary in Chicago!