The Cortical Explorer Awards:

The Cortical Explorer prize ($3000) is usually awarded to a scientist at an intermediate stage of their career for achievements within six years of receiving an advanced professional degree (Ph.D./MD). This year, two awards were also made in this category, one to Dr László Acsády and one to Dr Gábor Tamás. Both of them have made many contributions to our understanding of cortical structure and function.

László Acsády was recognized for his contributions to the neuroanatomical connections of interneurons in the hippocampal formation. Using intracellular labeling with immunocytochemistry, he revealed an important organizational principle for the mossy fiber system. He has made other contributions about the structure and function of hippocampal neurons. His talk was entitled, 'A Unique Gyrus – Unusual Properties of the Neocortex–Archicortex Interface'.

Dr Acsády was born and educated in Budapest, Hungary. He had summer research positions in both the 1st Department of Anatomy at Semmelweis University and the Institute of Experimental Medicine while attending the Eötvös Lóránd University for his master of science degree in biology. He earned his Ph.D. at the same university in 1996 under the direction of Dr Tamás Freund, a former Krieg Cortical Kudos Discoverer and Explorer Awardee. The title of László's thesis was: 'The synaptic connectivity and subcortical afferentation of hippocampal interneurons'. According to Dr Freund, the 'backbone' of his thesis involved untangling the connections of the VIP-containing neurons in the hippocampus. This subset of GABAergic neurons was shown to innervate other GABAergic interneurons and principal neurons of the hippocampus.

After obtaining his Ph.D. degree, László worked in the laboratory of Dr Gyorgy Buzsáki (last year's Krieg Cortical Kudos Discoverer Awardee) at Rutger's University for a year where he combined intracellular labeling with immunocytochemistry for an analysis of the mossy fiber system. He examined synapses made by mossy fibers in the rat hippocampus and identified the postsynaptic cell type and the complexity of the synapse. In a landmark publication in the *Journal of Neuroscience* (Acsády *et al.*, 1998), he and his associates reported that the GABAergic neurons in the rat hippocampus are the major postsynaptic targets of mossy fibers. In this study, they showed that the co-called 'mossy fibers' formed only 11–15 synapses with CA3 pyramidal cells and 7–12 synapses with hilar mossy cells. However, the small, specialized terminal appendages of these mossy fibers formed ten times the number of synapses with GABAergic neurons. These findings suggested that granule cells innervate inhibitory GABAergic neurons more than excitatory neurons in the hippocampus. Also, they showed that granule cells form different types of terminals to innervate GABAergic neurons and pyramidal cells. These findings may explain the physiological observation that increased activity of granule cells suppresses the overall excitability of the CA3 recurrent system.

Following this postdoctoral period, Dr Acsády returned in 1997 to the Institute of Experimental Medicine in Budapest, Hungary as a Senior Research Fellow. Currently, he works on the functional neuroanatomy of the thalamocortical system. His most recent findings indicate that a novel GABAergic afferent pathway exists that specifically targets higher-order and intralaminar thalamic nuclei. It is clear that László has the potential to make many important contributions in his future.

It should also be noted that László Acsády has won several other prizes for his research. These include the Academy Prize for Young Scientist in 1996 and the Janos Bolyai Scholarship in 1998, both from the Hungarian Academy of Sciences and the 2000 Prize from the Hungarian Electron Microscopic Society. He also serves as a Deputy Editor of the *European Journal of Neuroscience* for the section on cytology, cellular and systems neuroscience.

Gábor Tamás, the other Cortical Explorer for 2002, was honored for his systematic and pioneering contributions to the quantitative synaptic definition of functionally characterized cortical circuits in the visual cortex of cats. In his studies, he identified chemical and electrical synapses between pairs of cortical neurons using combined physiological, morphological and immunocytochemical techniques in slices. The title of his talk was 'Processing of Convergent Information in Identified Cortical Networks'.

Dr Tamás was born in 1969 in Dunaujvaros, Hungary, close to the Danube River. He earned his masters in science degree from the Attila József University in Szeged, Hungary under the direction of Dr Norbert Halasz. He then continued his education with Ph.D. training at two universities, Attila József University in Szeged, Hungary and Oxford University, England and under the supervision of three mentors, Drs Katalin Halasy, Peter Somogyi (a former Krieg Cortical Kudos Discoverer Awardee) and Eberhard Buhl. For his thesis that he completed in 1996, he analyzed pairs of neurons in the visual cortex of cats. In the course of this analysis, one of his thesis advisors, Dr Peter Somogyi, stated, 'He has identified and analyzed the largest known sample of electron microscopically identified chemical and electrical synapses between pairs of cortical neurons that were functionally characterized for their effects.' Using acute cortical slices *in vitro*, Gábor and his colleagues combined physiological, morphological and immunocytochemical techniques for the identification of neurons and the nature of their synaptic interactions. An example of his elegant analysis was shown in his paper in *Nature Neuroscience* (Tamás *et al.*, 2000) where he identified both chemical and electrical synapses formed between two GABAergic neurons. This electron microscopic study revealed spatial proximity of gap junctions and GABAergic chemical synapses on somata and dendrites of pairs of GABAergic neurons and indicated that they could provide an important basis for the synchronization of cortical interneurons.

Gábor Tamás continued his studies at Oxford University with Drs Buhl and Somogyi as a Visiting Research Scholar in 1996–1997. Then, he returned to Hungary in 1997 as a lecturer at Attila József University before being appointed an Assistant Professor and János Bolyai Research Scholar at the University of Szeged. During this period (1996–2000), Gábor showed how networks of GABAergic neurons might synchronize activity at gamma frequencies (30–70 Hz) in the rat somatosensory cortex using electrophysiological and electron microscopic methods. His elegant studies showed that the combined electrical and GABAergic synaptic coupling of basket cells instantaneously entrained gamma-frequency postsynaptic firing in layer 2/3. Also, he showed that this entrainment was mediated by rapid curtailment of gap junctional coupling potentials by $GABA_A$ receptor-mediated IPSPs. Together, these studies demonstrated precise spatiotemporal mechanisms underlying action potential timing in oscillating interneuronal networks.

It is important to note that Dr Tamás made four other significant contributions. First, he discovered a GABAergic cell

type that targets dendrites of pyramidal cells and showed conclusively that they are distinct from basket cells. Second, he discovered that dendritic spines are the major synaptic targets of double bouquet cells. Third, he showed that GABAergic neurons make large numbers of synapses with themselves, so-called autaptic junctions. And fourth, he demonstrated a network of gap junctions in the regular spiking non-pyramidal cells, another class of GABAergic neuron.

The extent and significance of these research discoveries have been noticed in that Gábor has won several prizes. They include the Young Investigator's Award in 2001 from the 34th International Congress of Physiological Sciences, the János Bolyai Research Scholarship in 2000 from the Hungarian Academy of Sciences in Budapest, and the Ferenc Joó Prize in 1997 from the Hungarian Academy of Sciences from Szeged, Hungary. We shall look forward to Gábor's future contributions in his career, and anticipate that his studies will continue to add to our understanding of the structure and function of the cerebral cortex.