# Krieg Cortical Kudos 2002

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## The Cortical Discoverer Awards

The highest level award, the Cortical Discoverer prize ($5000), is given to a senior scientist who has contributed significantly to our understanding of the cerebral cortex. There were two awards in this category this year, and they were presented to Drs Thomas A. Woolsey and David Van Essen. Both of these scientists have demonstrated a lifetime of achievements in the understanding of cortical structure and function.

**Thomas A. Woolsey** was recognized for his pioneering work of mapping the mouse sensory fields in the cerebral cortex. He discovered that the tactile map was dominated by the whiskers and further showed that each whisker is represented by a ring-like structure in layer IV, that he and Dr Hendrik Van der Loos called a barrel. Dr Woolsey has spent his career analyzing the structure and function of barrels using cellular morphology, physiology, connectivity, development, histochemistry, plasticity, modeling and vascularization. His lecture was entitled, 'Whiskers and Barrels'.

Tom's beginning in neuroscience started much earlier than probably any other scientist in this field. Most scientists talk about lineage or pedigree in terms of whom we trained with. It is important to point out that Tom's lineage was biological: his father was Clinton Woolsey, the pioneer of mapping the sensory cortical fields electrophsyiologically in a wide variety of mammals. As a result of his father's advice, Tom chose a thesis project at Johns Hopkins Medical School to map the mouse sensory fields. Indeed, the mouse somatosensory cortex had not been mapped with electrophysiological methods prior to Dr Woolsey's work. As mentioned above, this region of cortex is dominated by the whiskers, overwhelming the rest of the body in its spatial expanse. Using detailed neuroanatomical methods (Woolsey and Van der Loos, 1970), Tom and Hendrik showed that rings of neuronal somata were present in tangential sections of layer IV. After reconstructing the rings from several sections, they saw a pattern that resembled the rows of whiskers on the snout. Of course, they recognized that the rings of neurons looked like the barrels in a Breughel engraving, and thus gave them the name that has catalyzed many cortical discoveries. The correspondence of whiskers and barrels has become a symbol for the modern understanding of the relationship between structure and function in the cerebral cortex.

Tom's training after Johns Hopkins University continued with a postdoctoral fellowship at the Department of Anatomy at Washington University in St Louis, Missouri in 1970. Only a year later, he was appointed an Assistant Professor and he rapidly climbed the academic ladder to become Full Professor in 1983. A year later, he was appointed the Director of the James L. O'Leary Division of Experimental Neurology and Neurological Surgery and the George H. and Ethel R. Bishop Scholar in Residence in Neuroscience at Washington University.

In papers subsequent to this initial discovery of barrels, Tom showed that lesions of several whiskers in a row or across rows caused the corresponding 'barrels' in the cortex to be affected; these barrels did not develop. Also as a result, the remaining barrels grew larger. Dr Woolsey also described in Golgi preparations how the neurons in the wall of the barrel sent their dendrites into the hollow of each barrel where a plume of thalamocortical axons terminated. Other studies have employed metabolic markers to show how repetitive stimulation of a single whisker correlated with high activity in its corresponding barrel. His most recent work focused on the vascular pattern in barrels and how activity affects the size of the capillary bed. In addition to these excellent studies, Tom has published findings on other aspects of barrels. These studies appear in over 90 papers in outstanding journals and in many book chapters.

Another measure of Dr Woolsey's influence on the field of somatosensory research is the fact that a professional society – the Barrels Club – has come into being whose focus is on his work and on subsequent findings. This organization owes its existence to the work of Tom Woolsey, much as the Cajal Club owes its to Santiago Ramón y Cajal. It should be noted that the annual meetings of the Barrels Club are held in association with the Society for Neuroscience meetings. They recently convened their 14th annual meeting, making it the longest running satellite meeting of the Society for Neuroscience. Both Tom and Hendrick birthed the first such meeting, and its tremendous success over the years, as evidenced by annual attendance exceeding 100 participants, is due to Tom's continuing commitment, engagement and leadership. It also needs to be noted that two other Krieg Cortical Kudos Discoverers have won prizes for their work on barrels, Drs Herbert Killackey and Edward White.

The Krieg Cortical Kudos is not the first award that Tom has received for his exciting research discoveries. In 1982, he was given a McKnight Neuroscience Development Award. In 1993, he was bestowed with a Javits Neuroscience Investigator Award. Other notable activities include being Editor-in-Chief of the journal *Somatosensory and Motor Research* since 1995, and being a Fellow of the American Association for the Advancement of Science since 2000. In addition, he served as the President of the Cajal Club in 1995–1996 and was honored by the Cajal Club for his outstanding research when he was selected its Pinckney J. Harman Lecturer in 1987. Tom has been available for



Cerebral Cortex Feb 2003;13:215–218; 1047–3211/03/$4.00

**Figure 1.** From left to right are the recipients of the 2002 Krieg Cortical Kudos Awards (Thomas Woolsey, László Acsády, Michelle Adams, David Van Essen and Gábor Tamás) and the President of the Cajal Club (Charles Ribak).

consultation during my tenure as President of the Cajal Club and I personally thank him for the time he spent teaching me the nuances of how the Club operates. From all of the preceding, it is only fitting and proper for the Cajal Club to present the Cortical Discoverer Award to Dr Thomas Woolsey in 2002.

**David Van Essen** was honored for his contributions to our understanding of the visual areas of the primate cerebral cortex. He not only mapped multiple visual areas within the parietal and temporal lobes of the cerebral cortex but also formulated a hierarchial model of cortical connectivity through his analysis of the interconnections of these various visual areas. He elucidated the functional specializations of numerous visual areas and proposed a tension-based mechanism for morphogenesis of the central nervous system. David is currently the Edison Professor of Neurobiology and Department Head of Anatomy and Neurobiology at Washington University School of Medicine. The title of his talk was, 'Mapping Structure and Function in Cerebral Cortex: A Cortical Cartographer's View of the Past, Present and Future'.

David started his secondary education at the California Institute of Technology (Cal Tech) in Pasadena, California where he earned his bachelor of science degree in chemistry in 1967. He then went to Harvard Medical School and obtained his Ph.D. in 1971 in neurobiology under Dr John Nicolls, an expert in electrophysiology of the leech. He then remained at Harvard for a two-year postdoctoral fellowship with Nobel Laureates Drs David Hubel and Torsten Wiesel before traveling to Oslo, Norway where he worked with Dr J. Jansen. While at Harvard Medical School, David collaborated on some pioneering work with James Kelly in which they correlated the morphology of simple and complex neurons in the cat visual cortex with stellate and pyramidal cell morphology. After a brief one-year fellowship with Dr S.M. Zeki, David became an Assistant Professor at Cal Tech in 1976.

This Cal Tech phase of David's career allowed him to pursue his interests in the visual system. His interests began in earnest with his discovery of the middle temporal visual area (MT) in the macaque in 1981. He used sophisticated tract tracing methods and electrophysiology to map the connections of the MT with primary visual areas and to determine the functional properties of neurons in this region, respectively. He also went back to the primary visual cortex and did a further mapping of ocular dominance columns during this period, following in the footsteps of Drs Hubel and Wiesel. David's next foray was the secondary and tertiary visual cortices, affectionately referred to as V2 and V3, respectively. Later in 1986, he discovered that regions of the parietal cortex also had visual representation. These studies capped his notion of the existence of multiple visual cortical areas outside the occipital lobe and led to an important paper in 1990 on the 'Modular and hierarchial organization of extrastriate visual cortex in the macaque monkey' (Van Essen *et al.*, 1990).

Shortly after this publication, Dr Van Essen was recruited to Washington University to become the Department Head of Anatomy and Neurobiology in 1992. At this institution, David continued his studies of the extrastriate visual areas by performing additional research on what appears to be his favorite cortical area, MT. In addition, he used computational methods for reconstructing and unfolding the cerebral cortex. One of the difficulties involved in this mapping is the fact that these visual areas are usually buried in complex and irregular sulci. Both the depth and irregularity of cortical convolutions have been a chronic impediment to visualizing spatial relationships among the complex mosaic of visual areas. David showed how surface-based atlases could be used to analyze cortical organization. By first blowing up the brain and all of its sulci into a globe and then using cartographic tools, he demonstrated a flat map of the primate cerebral cortex. More recently, he has explored functional specializations of the human cerebral cortex through functional and structural mapping of its surfaces. This work on the extrastriate visual cortex shows that the human has an expanded area as compared to the monkey, particularly in the parietal lobe. Finally, as one of his nominees writes, 'his seminal hypothesis regarding mechanical tension during morphogenesis can account for many previously puzzling aspects of cortical convolutions. Altogether, Dr Van Essen has deeply influenced our current understanding of the structure, function and development of the primate cerebral cortex.'

It should be noted that David Van Essen has published over 80 research papers in outstanding journals and over 35 invited book chapters. He has served on many editorial boards including the *Journal of Neuroscience*, *Neuroscience Research* and *Cerebral Cortex*. His honors include being elected a Fellow of the American Association for the Advancement of Science and

several teaching awards at Washington University. He has served on several boards, including the Howard Hughes Medical Institute and the Society for Neuroscience. The Cajal Club was pleased to present one of two Cortical Discoverer Awards for 2002 to Dr David Van Essen.