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Curriculum Vitae of Igor Kagan

Personal

Date of birth: June 01, 1972.

Place of birth: St. Petersburg (previously Leningrad), Russia.

Citizenship: Israel.

Education

1996-2003 Ph.D. in Biomedical Engineering, Technion – Israel Institute of Technology, Haifa, Israel, and Schepens Eye Research Institute, Harvard Medical School, Boston, MA (advisors Prof. Moshe Gur and Prof. Max Snodderly). Thesis: Responses of cells in striate cortex of alert monkeys: neuronal properties and effects of eye movements.

1992-1996 B.Sc. in Biology, Faculty of Life Sciences, Tel Aviv University, Israel.

1989-1991 Department of Biophysics, Faculty of Physics and Mechanics, St. Petersburg State Technical University (former Polytechnic Institute), Russia.

Research interests

Investigations of visuomotor functions in primates, focusing on the distributed processing of visual information for action planning and decision making in the context of goal-directed behavior. Human-monkey cross-species comparison using functional imaging and behavioral approaches. Neuronal basis of fMRI signals. Neurophysiology of active vision in visual cortex.

Working experience

2009-present Senior Research Fellow, Richard Andersen Lab, Caltech, Pasadena, CA. Collaboration with Dr. Melanie Wilke on combination of pharmacological brain inactivation and fMRI to study spatial awareness and neglect. Electrophysiological recordings for comparison with fMRI data, and bilateral recordings for investigation of inter-hemispheric communication.

2003-2008 Postdoctoral scholar, Richard Andersen Lab, Caltech, Pasadena, CA. Development and application of advanced functional event-related fMRI techniques (4.7T vertical scanner lab) to study visuomotor cognitive functions in behaving monkeys, and direct cross-species comparison with humans imaging (3T scanner). Structural scans for planning and visualization of recording chambers, injection cannulae and multi-electrode arrays.

1998-2003 Graduate student, Max Snodderly Lab, Schepens Eye Research Institute, Boston, MA, and Moshe Gur Vision Research Lab, Technion, Israel. Development of visual neuroscience system for neurophysiological experiments in alert behaving monkeys.

1999-2001 Programmer, Animal Cardiology Lab, Department of Biomedical Engineering, Technion; Neufeld Cardiology Research Institute, Sheba Medical Center, Tel HaShomer; Bnai-Zion Medical Center, Haifa, Israel. Design and implementation of OmniLab software package for physiological labs (LabVIEW, MATLAB, C).

1997 Programmer, Neufeld Cardiology Research Institute, Sheba Medical Center, Tel HaShomer, Israel. Development of data acquisition and retrieval software for Windows (LabVIEW, C) and data analysis programs (MATLAB, C),

1995-1997 Research assistant, Mark L. Shik Electrophysiology Lab, Faculty of Life Sciences, Tel Aviv University, Israel. Electrical stimulation and single unit recordings in the brain of amphibians during evoked locomotion. Development of software in C, LabVIEW, MATLAB and Perl for data acquisition and analysis, experimental records database.

Professional skills

Event-related functional MRI experiments in behaving monkeys and humans: design, setup, data acquisition and analysis (BrainVoyager, SPM, MIPAV). Extensive experience with different MR systems (Bruker 4.7T and 7T, Siemens 3T), scanner and RF hardware and software expertise and troubleshooting, knowledge of NMR physics, development and optimization of imaging methods for fast high-resolution functional imaging.

Visual and motor neurophysiology experiments with alert monkeys: electrodes' construction, craniotomy and electrode implantation, single- and multi- electrode extracellular recording, electrical micro-stimulation, and pharmacological inactivation. Behavioral training and maintenance of monkeys.

Neurophysiological data analysis and visualization, signal and image processing, statistical analysis of experimental results (MATLAB, LabVIEW, C/C++).

Extensive programming skills, including programming visual stimuli using custom (C/C++, DirectX, OpenGL) and Cambridge Research Systems (VSG SDL scripts and VSL) software. Programming data acquisition systems and behavioral control software (C/C++, RPvds real-time DSP circuits, LabVIEW Real-Time).

Modeling responses of cortical cells using analytical methods and computer simulations.

Surgical procedures: headpost, recording chamber, and cannulae implantations, eye coil implantation. Surgery planning using high-resolution structural MRI scans and frameless stereotaxic systems.

Invited talks

- 2009 BOLD dynamics of visuomotor representations in free-choice and reward-based decision. Okinawa Institute of Science and Technology, Japan.
- 2008 Saccades and drifts differentially modulate neuronal activity in V1: effects of retinal image motion, position, and extraretinal influences. Active Sensing Workshop, Weizmann Institute of Science, Israel.
- 2006 High-field event-related functional MRI in alert behaving monkeys during goal-directed saccades. National Institutes of Health, MD.
- 2006 High-field functional MRI in alert behaving monkeys during goal-directed saccades. Department of Biomedical Engineering, Technion, Israel.
- 2005 Functional MRI and neurophysiology in alert behaving monkeys. Neurophilosophy: The State of the Art - McDonnell Project Workshop, Caltech, CA.
- 2002 Effects of fixational eye movements and nonlinear response properties in V1 of alert monkeys. Institute for Brain Science, Brown University, RI.

Teaching experience

Graduate courses: Brain and computer, Biological signal processing lab, Introduction to measurement and processing of physiological signals – Technion, Israel.

Undergraduate courses: Basic bio-electrical design – Technion, Israel.

Memberships and professional activities

Society for Neuroscience, Visual Sciences Society, Israel Society for Neuroscience, Japan Neuroscience Society
Ad-hoc reviewer for: Vision Research

Languages

Russian, English, Hebrew, German (reading)

Publications

- Kagan I., Iyer A., Lindner A., Andersen R.A. Contralaterality of space representation is greater in monkeys than in humans. *PNAS*, *in final revision*.
- Iyer A., Lindner A., Kagan I., Andersen R.A. Motor preparatory activity in posterior parietal cortex is modulated by subjective absolute value. *PLOS Biology*, *in revision*.
- Lindner A., Iyer A., Kagan I., Andersen R.A. Where to reach and what to avoid: distinct roles of human posterior parietal cortex in movement preparation. *Journal of Neuroscience*, *in revision*.
- Kagan I., Gur M., Snodderly D. M. (2008). Saccades and drifts differentially modulate neuronal activity in V1: Effects of retinal image motion, position, and extraretinal influences. *Journal of Vision* **8(14):19**: 1-25.
- Gur M., Kagan I., Snodderly D.M. (2005). Orientation and direction selectivity of neurons in V1 of alert monkeys: Functional relationships and laminar distributions. *Cerebral Cortex* **15 (8)**: 1207-1221.
- Kagan I., Shik M.L. (2004). How the mesencephalic "locomotor region" recruits hindbrain neurons. *Progress in Brain Research* **143**: 221-230.
- Kagan I., Gur M., Snodderly D.M. (2002). Spatial organization of receptive fields of V1 neurons of alert monkeys: a comparison with responses to gratings. *Journal of Neurophysiology* **88**: 2557-2574.
- Snodderly D.M., Kagan I., Gur M. (2001). Selective activation of visual cortex neurons by fixational eye movements: Implications for neural coding. *Visual Neuroscience* **18 (2)**: 259-277.
- Bar-Gad I., Kagan I., Shik M.L. (1999). Behavior of hindbrain neurons during the transition from rest to evoked locomotion in a newt. *Progress in Brain Research* **123**: 285-294.

In preparation

- Kagan I., Wilke M., Lindner A., Iyer A., Andersen R.A. Time-courses of fMRI BOLD signals in frontal and parietal cortex reflect monkeys' decisions in a free-choice oculomotor task. *In preparation*.
- Kagan I., Iyer A., Lindner A., Andersen R.A. Event-related fMRI of delayed response saccades in monkeys and humans: spatially-specific and non-specific preparatory signals. *In preparation*.
- Kagan I., Wilke M., Andersen R.A. Internal biases and reward modulation in spatial decisions. *In preparation*.
- Kagan I., Gur M., Snodderly D.M. Stimulus-response relationships of complex cells in V1 of behaving monkeys. *In preparation*.

Abstracts and conference presentations

- Wilke M., Kagan I., Andersen R.A. BOLD responses during pharmacologically induced hemi-neglect in the parietal cortex. *SfN 2009*.
- Kagan I., Wilke M., Andersen R.A. fMRI dynamics in monkeys reflect spatial decisions and preferences in free-choice and reward context tasks. *SfN 2009*.
- Wilke M., Kagan I., Andersen R.A. BOLD signal changes associated with reversible visual neglect in monkeys. *Japan Neuroscience Society 2009*.
- Kagan I., Wilke M., Andersen R.A. (2009). BOLD fMRI dynamics in monkeys reflects spatial decisions in free-choice and reward context tasks. *Japan Neuroscience Society 2009*.
- Snodderly D.M., Kagan I., Gur M. (2008). Stimulus-response relationships of complex cells in V1 of behaving monkeys. *SfN 2008*.
- Lindner A., Kagan I., Iyer A., Andersen R.A. (2008). Prospective coding of alternative actions in human parietal and premotor cortex. *FENS 2008*.

- Kagan I., Lindner A., Iyer A., Wagner S., Andersen R.A. (2007). Time-courses of fMRI BOLD signals in frontal and parietal cortex reflect monkeys' decisions in a free-choice oculomotor task. *SfN 2007*.
- Lindner A., Kagan I., Iyer A., O'Doherty J.P., Schultz W., Andersen R.A. (2007). Expected reward magnitude modulates fMRI-activity in monkey ventral and dorsal cortical streams and the striatum during a goal-directed saccade task. *SfN 2007*.
- Kagan I., Lindner A., Iyer A., Wagner S., Andersen R.A. (2007). Time-courses of fMRI BOLD signals in frontal and parietal cortex reflect monkeys' decisions in a free-choice oculomotor task. *SfN 2007*.
- Kagan I., Iyer A., Lindner A., Andersen R.A. (2007). Event-related fMRI of goal-directed behavior in alert monkeys and humans: spatially-specific and nonspecific signals during delayed response tasks. *CoSyNe 2007*.
- Snodderly D.M., Kagan I., Gur M. (2007). Modulation of neuronal activity in V1 by fixational and voluntary eye movements: Separating effects of retinal image motion, retinal image position, and extraretinal influences. *SfN 2007*.
- Kagan I., Lindner A., Iyer A., Andersen R.A. (2007). fMRI of eye movements in monkeys and humans: spatially-specific and non-specific preparatory signals for memory- and visually-guided saccades. *ECEM2007*.
- Kagan I., Iyer A., Lindner A., Wagner S., Andersen R.A. (2006). Event-related fMRI in alert behaving monkeys and humans during visually-guided and memory saccades. *SfN 2006*.
- Kagan I., Iyer A., Lindner A., Andersen R.A. (2005). Functional MRI in alert behaving monkeys during goal-directed saccades. *SfN 2005*.
- Kagan I., Gur M., Snodderly D.M. (2005). Complementary functions of saccadic, position/drift, and extraretinal responses to eye movements in V1 neurons. *ASSC9 symposium*.
- Ersoy B., Kagan I., Snodderly D.M., Rucci M. (2004). Predicting the responses of V1 complex cells in alert monkeys. *SfN 2004*.
- Gur M., Kagan I., Snodderly D.M. (2004). Response variability of single cells in V1 of alert monkeys. *SfN 2004*.
- Ersoy B., Kagan I., Rucci M., Snodderly D.M. (2004). Modeling the responses of V1 complex cells to natural temporal inputs. *VSS 2004*.
- Gur M., Kagan I., Snodderly D.M. (2004). Lack of short-term adaptation in V1 cells of the alert monkey. *VSS 2004*.
- Kagan I., Gur M., Snodderly D.M. (2004). Modeling complex cells in V1 of alert monkeys. *CoSyNe 2004*.
- Kagan I., Gur M., Snodderly D.M. (2003). Position vs. saccade responses in V1 of alert monkeys. *SfN 2003*.
- Gur M., Kagan I., Snodderly D.M. (2003). Early generation of stimulus specificity in V1 of alert monkeys. *SfN 2003*.
- Kagan I., Przybyszewski A.W., Gur M., Snodderly D.M. (2003). Responses of macaque V1 neurons to fixational and voluntary eye movements correlate with receptive field properties. *VSS 2003*.
- Gur M., Kagan I., Snodderly D.M. (2003). Orientation selectivity in V1 of alert monkeys. *VSS 2003*.
- Przybyszewski A.W., Kagan I., Snodderly D.M. (2003). Eye position influences contrast responses in V1 of alert monkey *Perception* **32**: 76-77 Suppl. S
- Kagan I., Gur M., Snodderly D.M. (2002). Diversity of responses to gratings in V1 of alert monkey. *SfN 2002*.
- Kagan I., Gur M., Snodderly D.M. (2002). Analysis of responses to drifting and stationary gratings in V1 of alert monkey. *VSS 2002*.
- Snodderly D.M., Kagan I., Gur M. (2002). Receptive fields and quasi-linear response modulation in V1 of alert macaques. *VSS 2002*.

- Kagan I., Gur M., Snodderly D.M. (2001). In V1 duplex cells, the form of responses to gratings depends on temporal frequency. *Neural Plasticity* **8 (3)**: 180
- Snodderly D.M., Kagan I., Gur M. (2000). Simple cells and other cells in striate cortex of alert monkeys. *ARVO 2000*
- Shik M.L., Kagan I. (2000). Persistent instability of firing of hindbrain neurons during extended latency of evoked locomotion in salamander. *Eur. J. Neurosci.* **12**: 163-163 Suppl. S 2000
- Gur M., Kagan I., Snodderly D.M. (1999). "Duplex", not simple, cells are the major cell type in striate cortex of alert monkeys. *Soc. Neurosci. Abstr.* **29**: 1548
- Kagan I., Gur M., Snodderly D.M. (1999). The influence of fixational eye movements on grating-elicited responses of V1 neurons. *Neuroscience Letters* **54**, Suppl.: S22-S22
- Kagan D., Kagan I., Shik M.L. (1999). Behavior of hindbrain neurons during latency of evoked locomotion in salamander. *Fifth IBRO World Congress of Neuroscience Proceedings*, **88**
- Kagan I., Gur M., Snodderly D.M. (1998). "Duplex", not simple, cells are the major cell type in striate cortex of alert monkeys. *Neuroscience Letters* **51**, Suppl.: S20-S21
- Kagan I., Shik M.L. (1996). Responses of hindbrain neurons to the threshold repetitive stimulation of the mesencephalic "locomotor region" in urodele. *Israel J. of Med. Sci.* **32**, Suppl.: S34
- Bar-Gad I., Kagan I., Shik M.L. (1995). Responses of single neurons in the hindbrain of the newt to threshold repetitive stimulation of the mesencephalic "locomotor region". *Israel J. of Med. Sci.* **31**: 762