

Japan-US Brain Research Cooperation Program
The Dispatch of Joint Researcher Report in 2003 fiscal year

[f i e l d :]

1. Affiliation/ Title/ Name:

Laboratory for Mathematical Neuroscience
RIKEN Brain Science Institute, 2-1 Wako, Saitama, 351-0198, Japan
Researcher / Hiroyuki Nakahara

2. The Project Title: A study of decision-making and motivation through eye movement

3. U.S. Investigator's Name, Title, and Affiliation:

Okihide Hikosaka, (MD, PhD) Chief, Section of Neuronal Networks,
Laboratory of Sensorimotor Research, National Eye Institute, National Institute of Health
49 Convent Drive, Bldg. 49, Rm. 2A50 Bethesda, MD 20892-4435, U.S.A.

4. The Term of Research: From 2003 October 16 To 2004 January 5 (3Months)

5. The Abstract, the Result and the Significance of Research(300 Words):

Foremost, I like to express my sincere gratitude to this Program for giving me the opportunity to stay at my host laboratory, Laboratory of Sensorimotor Research (LSR), NEI, NIH. My stay at LSR was very useful and stimulating. I could make a significant progress on the research not only with my direct host, Dr. O. Hikosaka but also with other members of LSR, namely Drs. R. Wurtz and L. Optican. Furthermore, during my stay at LSR, I had fruitful discussions with Drs. B. Richmond, D. Plenz, and F. Miles.

Under the theme "A study of decision-making and motivation through eye movement", I worked on the project with Dr. Hikosaka to investigate a role of dopamine in reward prediction, by combining experimental and computational approaches. Although it is known that the activities of dopamine (DA) neurons seem to represent reward prediction error, its detailed mechanism remains to be examined. We found that DA neurons can take account of a relevant context in reward prediction (Nakahara et al, Neuron 2004). Reward prediction can be improved by using relevant context. Our findings contribute to the investigation of motivational learning and/or motor control, since DA neurons and/or the basal ganglia circuit are involved in these functions and since an improved reward prediction would facilitate these functions.

With Drs Wurtz and Optican, we started a project on the dynamics of neural activities on the superior colliculus (SC). They are among leading scientists in the world on the studies of the SC. Through the discussions with them, I could have learned about the studies in the past and present. We now investigate how the intrinsic dynamics of the SC activities can contribute to the functions of the SC in eye movement control. I hope to report on this work in near future.

6. The Others (Practical Issues, Special Mention Matters):

None