

Department of Health and Human Services

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1. TITLE OF PROJECT (Do not exceed 56 characters, including spaces and punctuation.)

Spatiotemporal Maps &amp; Interactions in Directional Cells

2. RESPONSE TO SPECIFIC REQUEST FOR APPLICATIONS OR PROGRAM ANNOUNCEMENT OR SOLICITATION  NO  YES  
(If "Yes," state number and title)

Number:

Title:

3. PRINCIPAL INVESTIGATOR/PROGRAM DIRECTOR

New Investigator  No  Yes

3a. NAME (Last, first, middle)

Livingstone, Margaret S.

3b. DEGREE(S)

Ph.D.

3c. POSITION TITLE

Professor

3d. MAILING ADDRESS (Street, city, state, zip code)

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3e. DEPARTMENT, SERVICE, LABORATORY, OR EQUIVALENT

Neurobiology

3f. MAJOR SUBDIVISION

Harvard Medical School

3g. TELEPHONE AND FAX (Area code, number and extension)

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4. HUMAN SUBJECTS RESEARCH

4a. Research Exempt  No  Yes

If "Yes," Exemption No.

 No Yes

4b. Human Subjects Assurance No.

4c. NIH-defined Phase III Clinical Trial

 No  Yes5. VERTEBRATE ANIMALS  No  Yes

5a. If "Yes," IACUC approval Date

12/20/2003

5b. Animal welfare assurance no.

A3431-01

**Species and numbers of animals:** 3 rhesus macaque monkeys per year.

**Rationale for appropriateness and numbers:**

This is a study of vision, and we use primates because we are studying parts of the visual system that are well developed only in primates. We record from each monkey for at least 6 months, and we plan to use 3 physiology set ups to record from 3 monkeys simultaneously.

**Procedures to ensure minimum discomfort and distress:**

All surgical procedures are done under full surgical anesthesia (1.5 to 2% isoflurane). The animals are not paralyzed, so if the anesthesia becomes too light the animal will withdraw to painful stimuli. We monitor withdrawal reflexes, ECG, and expired CO<sub>2</sub> throughout the surgery, to insure adequate ventilation and anesthesia. The animal is given prophylactic antibiotics for 10 days postoperatively (2.5 mg/kg Baytril, bid), and is given postoperative analgesics for 1 to 2 days postoperatively (Torbutrol, 0.25mg/kg, q12 hours).

The monkey is initially reluctant to be restrained in a primate chair, but we gradually accustom him to the restraint by giving copious fruit and peanut rewards while he is in the chair. For the recording we restrain the monkey for up to 6 hours, but only if the monkey is willing. We need the monkey to fix his gaze on a small dot on a TV monitor; if the monkey is uncomfortable he will not do this. We always stop the experiment when the monkey stops fixating more than 50% of the time, and this usually happens after 3-5 hours.

The monkeys are water deprived in order to motivate them to perform the fixation task. The animals are given ad lib water on Saturdays, and 40cc/kg water on Sundays. Mondays through Fridays the monkeys obtain water or juice only during the recording session. We monitor the amount of fluid they take, and it is always at least 40cc/kg/day. The animals are weighed weekly to be certain they maintain body weight.

Extensive precautions are taken to prevent infections. All surgical procedures are performed under sterile conditions. The monkeys are given prophylactic antibiotics daily for 10 days postoperatively. The electrodes and all parts of the electrode advancer that may come in contact with the inside of the recording chamber are decontaminated with Nolvasan daily. The

## **f. Vertebrate Animals**

Species and numbers of animals: 5 rhesus macaque monkeys purchased the first year for fMRI and single-unit recording.

### **Rationale for appropriateness and numbers:**

We use primates because we are studying face recognition, which is an aspect of visual perception that is well developed only in primates. We plan to record from 2 monkeys simultaneously. The other monkeys will be used for fMRI recording for 1 or more years, and then they will be switched to single-unit recording.

### **Procedures to ensure minimum discomfort and distress:**

All surgical procedures are done under full surgical anesthesia (1.5 to 2% isoflurane). The animals are not paralyzed, so if the anesthesia becomes too light the animal will withdraw to painful stimuli. We monitor withdrawal reflexes, ECG, and expired CO<sub>2</sub> throughout the surgery, to insure adequate ventilation and anesthesia. The animal is given prophylactic antibiotics for 10 days postoperatively, and is given postoperative analgesics for 2 days postoperatively (Torbutrol, 0.25mg/kg, q12 hours). All surgical procedures are done under aseptic conditions under surgical anesthesia. Inhalation anesthetic (1.5 to 2% isoflurane in oxygen) is used for the duration of the procedure. The monkey is monitored until full recovery of consciousness, and given prophylactic antibiotics (2.5 mg/kg Baytril, bid), 10 days postoperatively and analgesics for 1 to 2 days postoperatively (Torbutrol, 0.25mg/kg, q12 hours).

The monkeys are initially reluctant to be restrained in a primate chair, but we gradually accustom them to the restraint by giving copious fruit and peanut rewards while they are in the chair. For the recording we restrain the monkey for up to 5 hours, but only if the monkey is willing. We need the monkey to fix his gaze on a small spot on a TV monitor; if the monkey is uncomfortable he will not do this. We always stop the experiment when the monkey stops fixating more than 50% of the time, and this usually happens after 2-4 hours.

The monkeys are water deprived in order to motivate them to perform the fixation task. The animals are given ad lib water on Saturdays, and 40cc/kg water on Sundays. Mondays through Fridays the monkeys obtain water or juice during the recording session. We monitor the amount of fluid they take, and supplemental fluid is given if the intake is not at least 40cc/kg/day. The animals are weighed weekly to be