

## ***CMSD 4000 – Fall 2004 – Research Experience in Speech Physiology***

**Course Title: *Sensory Physiology and the Facial Sensorium – Theory & Methods***

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### **Seminar Overview**

In this seminar, we will explore the theory and non-invasive methods underlying sensory physiology in the facial skin of adult human subjects. The seminar will be a mixture of hands-on application and readings/discussions among all participants. We will review several important papers in the sensory and psychophysics literature on normal parameters of touch and proprioception. The principle goal of the semester is for you to recruit, run, write-up and then present to a small audience of doctoral students and faculty, a data set that you will acquire using the VIBRO-2 system and methodology. In essence, you will perform a pilot study on a group of human subjects and see the completion of the process through to its written and presented conclusion. My role will be to guide you along the way and provide oversight, but the responsibility for actually performing each step along the way will rest on your shoulders. By the time we have completed our readings and hands-on practice, you will possess the basic skills to perform your own facial skin psychophysical assessment.

### **Specific Objectives**

- You will obtain hands-on experience with VIBRO-2; a comprehensive stimulation and analysis system for the assessment of vibrotactile detection thresholds in the skin.
- You will demonstrate proficiency in understanding the nature of the VIBRO-2 system and its components, its calibration, and the techniques used to acquire data from a subject.
- You will obtain experience and proficiency running and writing-up a small scale research project
  - Completing human subjects forms
  - Preparing data collection sheets and forms
  - Analysis of data

- Science writing skills
- Presentation skills
- By the end of the semester, you will have a greater sense and appreciation the complex and unique nature of facial somatosensation and it's role in functional behaviours such as speech and facial gestures.

**Specific experiences during the semester will include the following.**

1. Instruction on the use and specifications of the VIBRO-2 software and hardware.
2. Fundamentals of analog-to-digital conversion to digitize subject data.
3. Procedures for the calibration.
4. Basic electronics, the Oscilloscope, & Ohms Law
5. Subject handling and task/instruction delivery
6. Basic analysis techniques for psychophysical data
7. Sterilization and cleaning procedure for all equipment.
8. Subject etiquette and instruction delivery techniques.
9. NIH Human Subjects procedures and regulations - Online Human Subjects Training
10. Practice with scientific writing and presentation skills

**Grades**

The grading for this class is based on your direct level of participation and the quality of your project performance, write-up, and presentation. It is expected that you will be prepared each week with questions from your homework readings. It is also expected that you will participate equally with other members of the group throughout the semester.

Your write-up will consist of a 10 page paper in journal article form (Introduction, Methods, Results, Discussion). You will also prepare a PowerPoint lecture on your project and write-up, to be delivered to a small group (4-5) of departmental personnel (doc students, faculty, master's students). The oral presentation should be approximately 20 minutes long.

**Chapters**

- Barlow, Farley, & Andreatta (1999). Neural Systems in Speech Physiology. Clinical Handbook of Speech Physiology, Sand Diego: Singular.
- Bolanowski (1996). Information processing channels in the sense of touch. In Franzen et al., Somesthesis and the Neurobiology of the Somatosensory Cortex. Switzerland: Birkhauser Verlag.
- Florence (2002). The Changeful Mind: Plasticity in the Somatosensory System. In Nelson (Ed), The Somatosensory System. Boca Raton: CRC Press.
- Greenspan & Bolanowski (1996). Psychophysics of Tactile Perception and its Peripheral Physiological Basis. In Kruger (Ed.), Pain and Touch. New York: Academic Press.
- Kaas (1990). The Somatosensory System. In Paxinos, The Human Nervous System. New York: Academic Press.
- Kaas (2002). Functional Implications of Plasticity and Reorganizations in the Somatosensory and Motor Systems of Developing and Adult Primates. In Nelson (Ed), The Somatosensory System. Boca Raton: CRC Press.
- Kaas, Jain, & Qui (2002). The organization of the somatosensory system in primates. In Nelson (Ed), The Somatosensory System. Boca Raton: CRC Press.
- Moller (2003). Sensory Systems, New York: Academic Press. [Chapter 1 - Basic Psychophysics; Chapter 2 – Anatomy and Physiology of Sensory Organs]
- Stevens & Green (1996). History of Research in Touch. In Kruger (Ed.) Pain and Touch. New York: Academic Press.

**Journal Papers**

- Barlow (1987). Mechanical frequency detection thresholds in the human face. Experimental Neurology, 96, 253-261.
- Barlow (1998). Real-time modulation of speech-orofacial motor performance by means of motion sense. Journal of Communicative Disorders, 31(6), 511-534.
- Bolanowski, Gescheider, Verrillo, & Checkosky. (1988). Four channels mediate the mechanical aspects of touch. Journal of the Acoustical Society of America, 84(5), 1680-1694.
- Capra (1995). Mechanisms of Oral Sensation. Dysphagia, 10, 235-247.
- Dodd & Kelly (1991). The trigeminal system. In E.R. Kandel, J.H. Schwartz, & T.M. Jessel (Eds.), Principles of Neural Science (3rd ed.). New York: Elsevier.
- Johansson, Trulsson, Olsson, & Westberg (1988a). Mechanoreceptive afferent activity in the infraorbital nerve in man during speech and chewing movements. Experimental Brain Research, 72, 204-208.
- Johansson, Trulsson, Olsson, & Abbs (1988b). Mechanoreceptive afferent activity in the infraorbital nerve in man during speech and chewing movements. Experimental Brain Research, 72, 209-214.
- Nordin & Hagbarth (1989). Mechanoreceptive units in the human infra-orbital nerve. Acta Physiologica Scandinavica, 135, 149-161.
- Nordin & Thomander (1989). Intrafascicular multi-unit recordings from the human infra-orbital nerve. Acta Physiologica Scandinavica, 135, 139-148.
- Nordin (1990). Intrafascicular recordings of afferent multi-unit activity from the human supraorbital nerve. Acta Physiologica Scandinavica, 151, 507-514.