Problem Set 3
Due Wednesday 2/21/07 at the beginning of class

1) Peter is in a dichotic listening test, and hears the sequence {6,2,9} to the left ear, and the sequence {4,7,5} to the right ear at the same time. (a) If he were asked immediately afterward to repeat the digits, would he be more likely to say {6,2,9,4,7,5}, or {6,4,2,7,9,5}? (b) Which early selection model predicts this pattern of results. (c) Explain why the model you named in (b) predicts the results you described in your answer to (a).

2) UCSD students were asked to judge the distance between the various combinations of the following four places: RIMAC, Price Center, Geisel Library, and the Cognitive Science Building. (a) What factor or factors do you think would most affect people's reaction times in this task? (b) Construct a 4x4 matrix to represent predicted reaction times for this task. (c) Make or sketch a graph of your predicted reaction times as a function of the factor that you think would most affect people's reaction times in this task. (d) What would data like this suggest about the kind of representations used in this task.

3) Some investigators have argued that drug tolerance involves classical conditioning, and also that this sort of learning provides an example of the case where the UCR and the CR are not the same. As part of a religious ritual, Mr. Jones regularly injects himself with morphine through a vein in his leg before walking on hot coals. Although he used to be able to remain on the coals for 8 minutes, he now finds that the pain becomes too much to bear after 5 minutes. (a) What is the UCS in this example? (b) What is the UCR? (c) What is the CR? (d) What is the CS? (A biologically accurate response to (a)-(d) would be quite complex; please give a short answer that captures the gist.)

e) In a retrospective study of people hospitalized for a drug overdose (i.e. they lived to tell about it), 7 out of 10 reported changed environmental conditions at the time of the incident. How would you explain this?

4) In Part I of a study, participants simultaneously saw a single letter on a computer screen and heard a tone. They had to perform two tasks, either singly or together: Task 1 was to press a left, middle or right key according to whether the letter occurred on the left, in the middle, or the right; Task 2 was to say "One," "Two," or "Three," to signal that the tone was low, middle, or high in frequency. They averaged 300 ms for Task 1 when it was performed alone, and 310 ms for Task 1 when it was performed at the same time as Task 2; they averaged 450 ms for Task 2 when it was performed alone and 470 ms when it was performed at the same time as Task 1.

In Part II of the study, participants saw a string of 3 digits (e.g. 3, 4, 7) and either did one of the following two tasks individually, or did both at the same time. Task 1 was to judge if the first two digits add up to the third and press a key with the right index finger if they do, or the left index finger if they do not. Task 2 was to verbally report the product of the first and third numbers (e.g. "21"). The average time to do Task 1 alone was 880 ms; the average time to do Task 2 alone was 1,050 ms. The average time to do the two tasks together was 1,999 ms.

(a) Describe the difference between the findings of Part I and Part II of the study.
(b) Give an explanation for why the findings are so different.

5) Neuroscience researchers conducted a study in which tones were rapidly presented to both ears simultaneously while participants EEG (electroencephalogram) and MEG (magnetoencephalogram) were recorded. Participants' task was to detect particular rarely occurring tones (say of 1500 Hz), but only when they occurred in the left ear (in attend-left blocks) or only when they occurred in the right ear (in attend-right blocks). The study was designed so that the researchers could compare the brain response to the same physical stimulus (i.e. same tone), presented to the same channel (i.e. same ear), where the only difference was whether they had been instructed to attend to that channel or to ignore it. They found a larger response to the tones when they were presented to the ear that participants had been instructed to attend to. These differences were evident between 20-50 ms and 80-120 ms after the tone began, and effects were argued to originate in auditory cortex. (a) What model of selective attention are these results consistent with? (b) Describe the model of selective attention you answered for (a), and (c) explain why these data support it.

6) College students were seated in front of a small box with a push button on it and were told "When the tone comes on there is something you can do to stop it." The tone was loud enough to be unpleasant, but not loud enough to be harmful. In one group, (Group A), pushing the button resulted in the termination of the tone. In the other group, (Group B), the button did not work. After 30 tones, the subjects were escorted to a different room that contained a box with a knob on top that obviously slides from side to side. They were given the same instructions as in the first part of the experiment. At the sound of the tone, people in Group B were slower (on average) to pull the knob than people in Group A. (a) How would you explain this finding? (b) What phenomenon discussed in class is this similar to?