The external world seems immediately available to our senses. Unlike other "higher" cognitive functions like memorizing or problem solving, the act of perceiving does not seem to require any effort. Yet the feat achieved by the perceptual system becomes immediately clear when one tries to build an artificial system that can perceive. Today, we can build a computer to defeat chess grandmasters and jeopardy champions, yet no computer system can outperform a 3-year old human child on any general vision task. Why is it so?
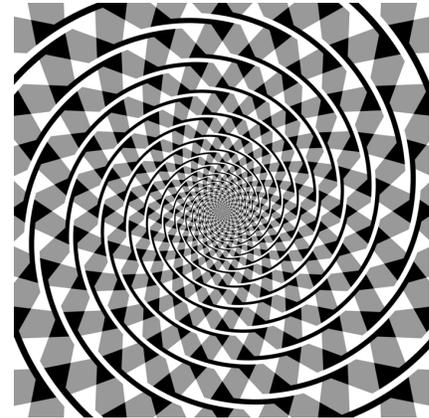
Through this course, we will gain some appreciation of the enormous task of perception and the underlying processes that realize it. The central question we investigate is the following: how do our senses transform the external world into information that our brains/minds can understand and reliably interpret?

Sensation and Perception is an area of scientific inquiry that spans psychology, biology, chemistry, physics, and computer science. We will examine the perceptual process at a number of different levels, from single neurons, to neural systems, to behavior and subjective experience. You will have the opportunity to find answers to many questions about yourself and the world around you. Most of all, you will have the opportunity to gain practical knowledge about perception that can enrich your everyday life.

Basic info.:

Time:	Monday & Wednesday 10:20-11:40 pm
Place:	119 Psychology Building
Instructor:	Taosheng Liu PhD
Email:	tsliu@msu.edu
Office:	Psychology Building, 289A
Office hours:	Thursday, 12:30 – 2:00pm and by appointment
Textbook:	Sensation and Perception, S. Yantis, Worth Publisher, 2nd Edition

Evaluation criteria:

Exams (.16*low+.22*med+.26*high)	64%
Lab report	15%
Final paper	18%
Class attendance	3%

Exams:

There will be three in-class exams. Each exam will be composed of three parts: 1) multiple choices; 2) definitions; 3) short answers. *Make-up exams are not given except under emergency situations. You may take a makeup exam in case of: 1) a documented medical emergency, or 2) a schedule conflict that you know about in advance such as a religious holiday or sports travel. In either case, please inform me identifying the emergency ASAP. In case of a schedule conflict, you must inform me at least a week in advance of exam day. Do not assume I have gotten your email unless I have responded to you.*

Grade scale:

Letter grade:	4.0	3.5	3.0	2.5	2.0	1.5	1.0	0

Raw percentage: 100------92------85------78------71------64------57------50

The upper bound is exclusive and the lower bound is inclusive (e.g., 3.0=78.00%-84.99%)

In addition to exams, there will be a number of short (~10 min) quizzes in selected class sessions. These quizzes do not count toward your grade but serve as an exercise for test preparation. They do not appear on the schedule so it will be of your interest to attend class.

Writing requirements:
You are to write two papers for this class. The first paper is an empirical paper based on an experiment you will run (separate handouts will be available). For the second paper, you need to do a literature review concerning a topic of your choice and propose an experiment to test a new hypothesis (more details next page).

Class schedule (tentative schedule, subject to change)

Date	Topic	Reading
Aug 30	Introduction	Chap 1
Sept 6 & 11	Physiology and Psychophysics	Chap 1
Sept 13 & 18	Eye and Retina	Chap 2
Sept 20	Lateral inhibition and lightness	Chap 2
Sept 25	LAB: *Berkey Hall 216 computer lab*, **Group assigned**	
Sept 27 & Oct 2	Visual cortex	Chap 3
Oct 4	*Exam 1* ***Lab report initial draft due***	
Oct 9 & 11	Object recognition	Chap 4
Oct 16 & 18	Color	Chap 5
Oct 23 & 25	Depth	Chap 6
Oct 30 & Nov 1	Motion & Action	Chap 7, 8
Nov 6	Attention	Chap 9
Nov 8	*Exam 2* ***Lab report final draft due***	
Nov 13 & 15	Sound, auditory system, pitch	Chap 10
Nov 20	Sound localization and auditory scene ***Paper topic due at beginning of class***	Chap 11
Nov 22	Discussion of final project	
Nov 27	Speech and music	Chap 12
Nov 29	Body senses	Chap 13
Dec 4	Olfaction	Chap 14
Dec 6	***Exam 3***	
Dec 12	***Final paper due by 12 noon***	
Dec 15	7:45-9:45 final Q & A	

Final Paper: literature review and experimental proposal

The goal of this assignment is for you to gain experience in reading and evaluating original research articles, designing new experiments, as well as presenting ideas to your peers. You can choose either to do this project by yourself, or with another student in the class to form a two-person group. In the latter case, you still need to write your own final report (i.e., no co-writing). There are two stages of this assignment.

- Stage 1: topic selection and background research
      First, the group will need to select a topic in Sensation and Perception. You are free to choose any topic broadly defined as Sensation and Perception. Then each group will read a number of related journal articles on this topic. I recommend *at least 2 but no more than 4* empirical research articles. These are easily identifiable because they always contain a Methods and Results section. *Do not use a review article that summarizes the progress of a field.* But feel free to read review articles for background information, which could help you to get a sense of what's out there and narrow down your topic and article selection. *You should select articles published after 1990.*
      There are two key aspects of getting on a good start here: First, you should select a number of *related* articles on a specific topic. The articles need to address the same psychological question, although the methods could vary. For example, the studies might all address how salient objects capture attention, with some using fMRI while others using behavioral methods. Second, when reading the papers, you should think critically about each study. This does not mean you have to find fault with it. Rather, you are to evaluate if the experimental manipulations provided a good test of the authors' hypotheses. Were the methods sufficient to rule out alternative explanations? Can you think of alternative explanations to account for the data? In the end, you should be able to evaluate if the studies provide converging results, or whether they end up supporting conflicting ideas. The best way to achieve a good understanding of a research topic is through talking to others. Feel free to discuss with your other group member, your friends, or me.
      After you understand a particular topic, you need to come up with either 1). a hypothesis that addresses disagreement/inconsistency/controversy among the articles you read; or, 2). a new hypothesis related to the studies you read, to test new ideas that have not been addressed in previous studies.

- Stage 2: design new experiments
      After generating a hypothesis, your next task is to design an experiment to test it. You need to think through all the common issues involved in doing an experiment: rationale, method, possible outcome and their interpretation. Again you should work in groups to come up with the best experiment. One experiment is sufficient. But if there are multiple aspects of your hypothesis/theory, feel free to propose more than one (but no more than three) experiments. For obvious reasons, we do not have the opportunity to run your experiment and collect actual data. But this exercise is meant to give you a sense of how scientific research is conducted and hone your critical thinking skills.

- About the final paper
      The final product of this exercise is a paper that summarizes what you have done. The first part of the paper would be a summary of the articles you have read, including their main methods, results, and interpretations. Pay special attention to how they are related, i.e., how one articles' results impact the interpretation of another article. The second part of the paper is your experimental proposal. Make

sure you write about three things: 1) Rationale: an explanation of why the experiment you propose is worthwhile; this is part of your critical analysis after reading the studies on the topic of your choice. 2) Methods: write down the procedures of the experiment with reasonable detail; imagine you will actually conduct such an experiment and are following the procedures as a recipe. 3) Discussion: here you write about possible outcomes and their interpretations. As you will not run the experiment, there will be no actual results; but you should entertain possible results, and discuss the meaning of each outcome, with respect to the studies you read, and with respect to the overall topic of your interest (i.e., the big picture).

More guidelines
1. It is critical to find a number of *related* papers on a particular topic. A good place to start could be the textbook reference section, and feel free to use examples from the reading list at the end of each chapter. You should also make use of the wonderful electronic search engines available today. A few commonly used ones are: PubMed (www.pubmed.gov), Google scholar (scholar.google.com), and PsychInfo/PsychLit (the first two are freely accessible; the last one is available through the MSU library website).
2. Any topic in the board area of sensation and perception is acceptable. But there are some topics that you should avoid. Do not use topics that are focusing on clinical questions such as "Treatments for Parkinson's Disease" or "Biological Basis of Schizophrenia".
3. Because the importance of topic selection, I require you to contact me about your choice of topics. You should start your group discussion early in the semester and settle down on a particular topic. Then email me your topic and brief summary of your readings. I am also happy to meet with any team to discuss topics.
4. *Each person is to write their own paper*, with the following specifications: **title page, abstract (less than 200 words), main text (7 pages max), reference, double-spaced, 12-point font, reasonable margin**. The paper should be a cohesive body of work of what you read (literature review) and what you think should be done (experimental proposal). Each person is to work on his/her paper independently. Although the content will be the same for members of a team, the particular approaches to convey ideas will not be identical and will reflect your own thinking.
5. For two-person teams, I expect every group member will contribute meaningfully in this process. Team work is a pervasive fact of modern society and you will likely work with your peers in the future. I trust the team members will work out each individual's duty and achieve a genuine collaboration. I hope this will be a fun, in addition to educational, experience. I do not intend to intervene on how each team works, but if there is a concern/complaint about the behavior of a particular team member, do let me know and I will take appropriate action.
6. The following is a guideline for how we will grade the final paper with the percentages indicating the relative importance of each aspect of the paper (out of 100%). Do not write your paper as a line by line answer to this guideline. This guideline is intended to give a sense of the different components your paper should include. The final product should be an integrated, cohesive paper.

5%	Describe the big question. Why is it interesting?
30%	Summarize the research articles.
10%	Discuss the relationship among the articles
10%	Rationale of your experiment
25%	Procedure of your experiment
15%	Possible outcome and interpretation of your experiment
5%	Overall writing

More details about deadlines you should know:

1. **Sept 27**: This is the date to finalize group assignments for the paper. You should have contacted and worked with your partner well before this date to confirm compatibility. You can also work alone if you prefer.

2. **Nov 21**: Topic and articles approval by email. Email topic information so that I can evaluate the appropriateness of your choices. In this email, include information about your articles (year, author, journal, abstract), and write a brief statement of what you are going to write about. Students who do not get approval will have 15 point reduction on their final paper. Please copy/paste the abstracts in the email as text; *do not send me hyperlinks to the articles; do not send attachments.* If you are in a team, only one team member needs to send me the email, *please cc the other member when doing so.* I always respond to your email, usually within a day or two. If you don't hear from me, do not assume I got your email. Please check with me again (previously some students thought they sent their emails but they actually didn't, due to software glitches etc.).

3. The paper is due at **12 noon on Dec 12**. Late papers will be penalized 7 points per day.