

GESM 140g: Seminar in the Life Sciences

Science of Mind: Language

(Last modified: January 9, 2024)

Instructor: Hajime Hoji

Time: T/Th 2-3:20

Location: GFS 109

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1. Course description

This course explores how the parts of the mind that deal with language (the language faculty) can be studied by hypothesis-formation, deduction of definite predictions, and obtaining and replicating experimental results precisely in line with such definite predictions. The overarching hypothesis that will be adopted is that the core properties of the language faculty is shared by all members of the human species, and this core part specifically includes a formal system (a Computational System of the language faculty).

The discussion about scientific methods will be based on an individual student getting exposed to the process of hypothesis formation, the designing and conducting of experiments, analyses of experimental results, and most crucially participation in experiments themselves.

The predictions being tested are deduced in part by hypotheses about an individual's language faculty, as a speaker of their native language, and they are about their linguistic judgments with regard to what are possible and impossible interpretations for sentences of a particular sentence pattern in that language. An individual speaker's linguistic judgments in question are affected not only by "formal factors" about the Computational System of the language faculty (CS) but also by "non-formal factors" outside the CS or even factors outside the language faculty proper.

This necessitates the controlling for effects of non-formal factors (noise control) so as to obtain accurate experimental results. Obtaining and replicating definite experimental results, in the form of definite speaker judgments—more precisely, in the form of definite correlations of patterns of linguistic judgments precisely in line with our predictions—is sought first within an individual student and then across students in class, and beyond if that is possible. When we fail to obtain linguistic judgments as predicted by hypotheses, or fail to obtain replication of definite experimental results within a speaker or across speakers, we will formulate hypotheses (mostly) about non-formal factors (but possibly about formal factors as well), deduce and test new predictions based on such hypotheses. Obtaining "clear" and "consistent" judgments from an individual speaker is a key for being able to do this, and a major portion of our class discussion and activities is about this, along with discussion about accounts of judgmental variation within a speaker and among speakers, in relation to the hypotheses to be introduced. During the course of such activities, students will learn how we can try to accumulate knowledge about the language faculty by the basic scientific method, sometimes (or possibly often) observing failed attempts to do so, based on their own linguistic intuitions.

The main experiments we discuss in class are about individual speakers of English although the methodology to be discussed is meant to apply to speakers of any language. Existing work detailing research replicating such predicted judgments beyond speakers of English will be discussed mainly in relation to Japanese, but, to a lesser degree, in relation to Mandarin Chinese and Korean. Students will learn certain properties of Japanese necessary for understanding Japanese-specific hypotheses, and also about how Japanese-specific hypotheses were formulated and tested for noise control, along with results of experiments in Japanese.

One of the key concepts is rigorous testability, and the course will address how our hypotheses lead to rigorously testable predictions about individual speakers; crucial differences between disconfirmable prediction and confirmable predictions will be discussed. The focus of the course is on individual speakers, rather than groups of speakers; it focuses on definite and categorical predictions about an individual speaker's linguistic judgments, rather than the average of a group of speakers. This will be illustrated based on results of "large-scale" experiments, making reference to the distinction between factual knowledge (based on statistical inference) and comprehension (based on deducing, obtaining and replicating, a definite prediction) in the terms of Einstein's "Foreword", included in the readings¹. How AI research fits in this dichotomy will be briefly addressed in this connection.

Overall, students will learn about basic aspects of scientific reasoning and experimentation, based on close investigation of linguistic intuitions of their own and of others. The biggest takeaway from the course is that we can accumulate knowledge about parts of the mind (the language faculty) by the scientific method, focusing on an individual speaker and replicating their linguistic judgments within speakers of the same linguistic community and beyond. The course does not require any prior experience of linguistics but it requires an inquisitive and critical mind.

1.1. Learning Objectives

Weeks	Learning Objectives: At the end of the period, students will be able to:
1-3	State the object and the method of inquiry in LFS. State the initial hypotheses that lead to definite predictions about an individual speaker's linguistic judgments. Check their introspective judgements as to the availability of BVA in a given sentence.
4	State a generalized hypothesis, applicable to BVA, DR and Coref. State the basic logic of LFS.
5-8	Check their introspective judgements as to the availability of DR(X, Y) and Coref(X, Y) in a given sentence. Determine what choices of X and what choices of Y (of DR(X, Y) and Coref(X, Y)) are effective probes for identifying c-command effects for a given speaker at a given time.
9-11	Test the correlational prediction (and its contrapositive) for a given speaker at a given time. State the logic of LFS behind our predictions.
12	Discuss conditions on BrQrk and BeQrk in a more fully stated "generalized hypothesis".
13	State how replication is pursued in LFS. Analyze results of demonstration attempts in LFS.
14-15	State how the LFS research can be understood in wider (historical) contexts.

1.2. Readings and Optional Readings

Readings will be assigned based on how things go. See 1.4.3 "Reading-related assignments" for the current plan.

1.3. Description and Assessment of Assignments

Each experiment-related assignment is a task based on in-class activities; see the details in "Readings and Assignments", "Weekly Schedule", and "Learning Objectives". Students will start doing the task in question in class and they will complete the task in the assignment. In the case of class presentation, it will be based on in-class reports that will have taken place prior to the class presentation. Students are required to participate in on-line experiments twice in the semester. The on-line experiments are actually a pedagogical demonstration, where students will have the first experience of checking their own linguistic

¹ Einstein, A., 1953/1967. "Foreword to the English translation of Galileo's Dialogue Concerning the Two Chief World Systems, University of California Press.

intuitions about the availability of meaning relations that will be discussed in depth in the rest of the semester. The actual empirical materials (sentences with meaning relations, with specific choices of X and Y) in the on-line “experiments” will be a small subset of what will be discussed in Weeks 5-14. Participation of the on-line “experiments” will place students in a good position to appreciate discussion later in the semester about results of the same “experiments” in the past, with over 1,000 participants, and also results of analogous “experiments” in Japanese, with close to 200 participants.

As long as you fully participate in the on-line experiments, and as long as you submit a brief report on what you found interesting and what you found confusing, you get full points for the on-line “experiments”. The summary report on experiments to be submitted at the end of the semester should be based on the class presentation in Week 14, including feedback from students and the instructor. The instructor will inform students of what materials must be added in the summary report, including, but not limited to, what follow-up experiments should be conducted on oneself and/or others and what type of discussion should be included for their analyses of experimental results.

1.4. Grading Breakdown

The course grades will be based on the assignments as indicated below:

1.4.1. Five experiment-related assignments (each 6 points)

- Finding choices of X and Y of $BVA(X, Y)$ (and other factors) that lead to a c-command pattern and those that do not.
- Finding choices of X and Y of $DR(X, Y)$ (and other factors) that lead to a c-command pattern and those that do not.
- Finding choices of X and Y of $Coref(X, Y)$ (and other factors) that lead to a c-command pattern and those that do not.

- Testing the correlational prediction based on the above.
- Testing the contrapositive based on the above.

Each of those assignments will be based on initial submissions of your answers, subsequent exchanges with me based on your initial submissions; i.e., your submission will be graded based on the “final” submission for each task.

Each of the above tasks is for yourself and for others in class. Information about others in class will be provided, based on individual students’ initial answers and their subsequent exchanges with me, to be discussed in class..

(6x5=30 points)

1.4.2. On-line experiment participation

(5 points)

1.4.3. Reading-related assignments (4 points each)

These assignments are meant to help your understanding of course materials. Currently, they will cover the following parts of the chapters in question, subject to change. Their due dates will be announced later.

Ch. 9: 9.1 and 9.2 and Ch. 4: 4.1

Ch. 4: 4.2 and 4.3

Ch. 4: 4.4 (perhaps excluding the Ueyama models)

Ch. 4: 4.5

Ch. 4: 4.6.1

Ch. 5: 5.1

Ch. 5: 5.2-5.4

Ch. 6: 6.1, 6.2
Ch. 6: 6.3 (up to 6.3.1.3)
Ch. 6: 6.3.1.5
(4x10=40 points)

1.4.4. Four Review Assignments (5 points each)

The review assignments are also to help your understanding of the materials discussed in class, not limited what is covered in the reading-related assignments. Their due dates are subject to change, depending upon how things go.
(5x4=20 points)

1.4.5. Logic Assignment

This is to make sure that you have a good understanding of the logic discussion (including Truth tables, the De Morgan's Law and the contrapositive, the latter two are crucial for understanding how our correlational predictions are deduced from hypotheses.
(5points)

1.4.6. Total

(30+5+40+20+5=100)

1.5. Course Grading Scale

Course grades will be determined based on the following scale.

- A 94 or higher
- A- 90 or higher and lower than 94
- B+ 87 or higher and lower than 90
- B 84 or higher and lower than 87
- B- 80 or higher and lower than 84
- C+ 77 or higher and lower than 80
- C 74 or higher and lower than 77
- C- 70 or higher and lower than 74
- D+ 67 or higher and lower than 70
- D 64 or higher and lower than 67
- D- 60 or higher and lower than 64
- F 59 and below
- C- or higher counts as Pass for Pass/Non Pass.

1.6. Assignment Submission Policy

The due dates for, and where/how to submit, each assignment will be announced later. Late submission of assignments and reports will not be accepted without a very good reason (e.g. demonstrable illness or a life-changing event).

1.7. Grading Timeline

Students can expect grading and feedback from the instructor within a week from the (final) submission of the assignment, often much faster than that.

2. Weekly Schedule (LFS=Language Faculty Science)

Weeks	In-class activities	Lecture topics
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	<p>Going over the syllabus Participating in on-line experiments (just in BVA-Mains)</p>	<p>General introduction to LFS Ambiguity, phrase structures Vision and language</p>
1-2	<p>General and initial discussion Ambiguity: <i>unlockable</i>, referential vs. bound uses of pronouns, (sloppy-identity readings) Pronoun vs. Names Effects of word orders on judgments An initial look at initial “experimental” results Reliability of speaker judgments Participating in BVA-Subs. Different choices of X and Y, and other factors that affect speaker judgments on BVA(X, Exp-related assignment for finding choices of X and Y that lead to a c-command pattern with BVA(X, Y). Review assignment 1 on the content of Weeks1-4 to check students’ understanding.</p>	<p>Object of inquiry and the method of inquiry Basic Scientific Method The basic logic of LFS, up to the postulation of Merge, and how we can seek disconfirmability of Merge hypothesis by the basic scientific method Initial hypothesis, related hypotheses and predictions Disconfirmability BVA(X, Y): Bound Variable Anaphora: BVA(every boy, his/him), for example, is a particular M(eaning) R(elation) pertaining to <i>every boy</i> and <i>his/him</i> appearing in a sentence of various patterns. Sounds-meaning pairing, Merge, c-command, and M(eaning) R(elation)s Generalized hypothesis about MR(X, Y), with MR including BVA, DR and Coref.</p>
3-4	<p>Participating in on-line experiments on DR-Mains Participating in on-line experiments on DR-Subs The DR version of the generalized hypothesis about MR(X, Y) Exp-related assignment for finding choices of X and Y that lead to a c-command pattern with DR(X, Y). Correlations between judgments on BVA and those on DR. Judgments on DR(X, Y). Review assignment 2 on the content of Weeks5-6 to check students’ understanding.</p>	<p>Different MRs (BVA, DR, and Coref) as tools for investigating properties of the Computational System (CS) of the language faculty by a correlational method. DR(X, Y): Distributive Reading: DR(every boy, three robots), for example, is a particular MR pertaining to <i>every boy</i> and <i>three robots</i> appearing in a sentence of various patterns. A bit more conceptual discussion about universal and I-language-particular hypotheses</p>
5-6	<p>Participating in on-line experiments on Coref. The Coref version of the generalized hypothesis about MR(X, Y). Correlations between judgments on Coref and those on BVA X and Y (and other factors) on the availability of Coref(X, Y). Review assignment 3 on the content of Weeks7-8 to check students’ understanding.</p>	<p>Coreference: Coref(John, his/him), for example, is a particular MR pertaining to <i>John</i> and <i>his/him</i> appearing in a sentence of various patterns, the one of referring to the same individual. Correlational method</p>
7-8		
9	<p>Extra sessions reserved in case we fall behind the “schedule”.</p>	
10-11	<p>Correlational predictions Contrapositive Propositional Logic and Truth Tables “Chart”-based exercises for having a firmer understanding of BVA(X, Y) Logic Assignment, including “chart”-based considerations</p>	<p>Testability in LFS and correlational methodology Correlational prediction and its contrapositive</p>

12	Checking judgments with additional sentence patterns	Hypotheses about conditions on BrQrk and BeQrk Generalized hypothesis more fully stated The anti-locality condition on FD(X, Y)
13	Venn Diagrams Review assignment 4	Replication in LFS Within-speaker replication Across-speaker replication Across-“language” replication
14-15	The LFS research in wider (historical) contexts	Addressing various readings listed under “Readings” that we have not discussed.

3. Readings and what purpose they are meant to serve

Weeks	Readings	Remarks
1-2	Feynman 1965/1994 Ch. 9: Sections 9.1 and 9.2 Lasnik 1990	The Ch. 9 readings are for an initial exposure to the object and the method of inquiry in LFS, the Feynman reading is about the basic scientific method adopted in LFS. They are the basis for the basic logic of LFS. The Lasnik reading is an important background reading.
3-4	Ch. 4	The Ch. 4 readings are for understanding basics of what is behind the class activities.
5-9	Ch. 5	The Ch. 5 readings illustrate how a LFSist working on Japanese (their native language) checked their introspective judgments in a way analogous to what students will have checked their introspective judgments.
10-11	Plesniak 2022a	The Plesniak 2022a reading is for a review of the correlational methodology.
12	TBA	The handout/reading to be provided will be a more fully articulated statement of the generalized hypotheses, including hypothesized conditions on BrQrk(X, Y) and BeQrk(X, Y).
13	Ch. 6	The Ch. 6 readings illustrate how replication is pursued in demonstration attempts in Japanese.
14-15	Various readings mentioned below under “Readings”, not mentioned above, including: Einstein 1953/1967, Feynman 1985, Meehl 1967, Chomsky 2017.	Those readings are meant to help students to understand the LFS research in wider (historical) contexts.

4. Readings

- Chomsky, Noam. 1959. “A Review of B. F. Skinner’s *Verbal Behavior*”, in *Language*, 35, No. 1, 26-58.
- Chomsky, Noam. 2017. “[The Galilean Challenge](#),” *Inference: International Review of Science*, Vol. 3, Issue 1.
- Einstein, Albert. 1936. [Physics and Reality](#). The Journal of the Franklin Institute; Reprinted in: *Ideas and Opinions*. 1955. Crown Publishers, New York. (The assigned reading is pp. 293-295.)
- Einstein, Albert. 1953/1967. “Foreword to the English translation of *Galileo's Dialogue Concerning the Two Chief World Systems*, University of California Press. (The assigned reading is pp. xvii-xix)
- Feynman, Richard. 1965/1994. *The character of physical law*. New York: The Modern Library. (The Feynman lectures based on which this book was prepared can be viewed on-line. If you Google "Feynman Messenger Lectures," you will find the seven lectures. The assigned reading is pp. 150-153, which is part of his seventh lecture (“Seeking New Laws”) available at:

- http://www.youtube.com/watch?v=MIN_-Flswy0 (last accessed on 1/24/2023). The content of pp. 150-151 starts around 14:40 of that video.)
- Feynman, Richard. 1985. "Cargo Cult Science", in *"Surely You're joking, Mr. Feynman": Adventures of a curious character*, W. W. Norton and Company, New York.
- Hoji, H. 2017. "[Galileo's Other Challenge](#)." *Inference: International Review of Science*, Vol. 3. Issue 2.
- Hoji, H, D. Plesniak, and Y. Takubo. (eds.) 2023 *The Theory and Practice of Language Faculty Science*, De Gruyter Mouton.
- Hoji, H. "The key tenets of language faculty science", in Hoji et al. 2023. (This shall be referred to as "Ch. 4".)
- Hoji, H. "Detection of c-command effects", in Hoji et al. 2023. (This shall be referred to as "Ch. 5".)
- Hoji, H. "Replication: predicted correlations of judgments in Japanese", in Hoji et al. 2023. (This shall be referred to as "Ch. 6".)
- Hoji, H. and D. Plesniak. "Language Faculty Science and Physics", in Hoji et al. 2023. (This shall be referred to as "Ch. 9".)
- Lasnik, Howard. 1990. "Syntax", in D. N. Osherson and H. Lasnik eds., *Language: An Invitation to Cognitive Science Volume 1*, A Bradford Book, The MIT Press, Cambridge, pp. 5-21.
- Meehl, E. Paul. 1967. "Theory testing in psychology and physics: a methodological paradox", *Philosophy of Science* 34: 103-115. (Reprinted in Morrison and Henkel 1970/2007. The page reference is to Morrison and Henkel 1970/2007.)
- Penrose, Roger. 2004. *The Road to Reality: A Complete Guide to the Laws of the Universe*, Jonathan Cape. (The required reading is Chapter 1: Section 1.4, but you will find it useful to read the rest of the chapter.)
- Plesniak, Daniel. 2022a. "[Building the Linguistic Telescope](#)". February 2022. Talk given at the Second Annual Workshop on Language Faculty Science. Online.
- Plesniak, Daniel. 2023a. "Predicted Correlations of Judgments in English", in Hoji et al. 2023. (This shall be referred to as "Ch. 7".)
- Popper, Karl. 1963. "Science: Problems, aims, responsibilities", *Federation Proceedings (Baltimore), Federations of American Societies of Experimental Biology* 22.4: 961-972.
- Schütze, Carson and Jon Sprouse. 2013. "Judgment Data", in Robert J. Podesva and Devyani Sharma, eds., *Research Methods in Linguistics*, Cambridge University Press, Cambridge, 27-50.

5. Additional References

- Chomsky, Noam. 1975. *Reflections on Language*. Pantheon, New York.
- Chomsky, Noam. 2004. *The Generative Enterprise Revisited*, Mouton de Gruyter, Berlin.
- Chomsky, Noam. 2012. *The Science of Language: Interview with James McGilvray*, Cambridge University Press, Cambridge.
- Duhem, Pierre. 1906/1954. *The aim and structure of physical theory*, Princeton University Press, Princeton. (The original publication in French in 1906, its original English translation in 1954, and its renewed edition in 1982.)
- Einstein, Albert., 1936. *Physics and Reality*. The Journal of the Franklin Institute; Reprinted in: *Ideas and Opinions*. 1955. Crown Publishers, New York.
- Feynman, Richard. 1963. *Six Easy Pieces*, Basic Books, New York.
- Feynman, Richard. 1965/1994. *The character of physical law*, The Modern Library, New York.
- Feynman, Richard. 1999. *The Pleasure of Finding Things Out*, Basic Books, New York. (The suggested readings are pp. 22-23 and pp. 108-109. What is in pp. 22-23 can be viewed at: <https://www.youtube.com/watch?v=tWr39Q9vBgo&t=7s> (last accessed on 1/24/2023).)
- Hoji, Hajime. 2015. *Language Faculty Science*. Cambridge University Press.
- Hoji, Hajime, Satoshi Kinsui, Yukinori Takubo and Ayumi Ueyama. 2003. "The demonstratives in modern Japanese", In Yen-Hui Audrey Li and Andrew Simpson (eds.), *Functional structure(s), form and interpretation*, 97-128. New York: Routledge.

- Plesniak, Daniel. 2022b. *Towards a Correlational Law of Language: Three Factors Constraining Judgment Variation*. Los Angeles: University of Southern California PhD dissertation.
- Plesniak, Daniel. 2023b. "Implementing Experiments on the Language Faculty", in Hoji et al. 2023. (This shall be referred to as "Ch. 8".)
- Plesniak, Daniel. 2023c. "C-command and Beyond: The Emerging Universe of Formal and Non-Formal Relations", *The Korean Journal of Linguistics* (언어), 48(2), 315-366.
- Poincaré, Henri. 1952. *Science and hypothesis*. New York: Dover Publications. (The English translation of *La science et l'hypothèse* (1902).)
- Schütze, Carson. 1996. *The empirical base of linguistics: Grammaticality judgments and linguistic methodology*, University of Chicago Press, Chicago.

6. Academic Integrity

The University of Southern California is foremost a learning community committed to fostering successful scholars and researchers dedicated to the pursuit of knowledge and the transmission of ideas. Academic misconduct is in contrast to the university's mission to educate students through a broad array of first-rank academic, professional, and extracurricular programs and includes any act of dishonesty in the submission of academic work (either in draft or final form).

This course will follow the expectations for academic integrity as stated in the [USC Student Handbook](#). All students are expected to submit assignments that are original work and prepared specifically for the course/section in this academic term. You may not submit work written by others or "recycle" work prepared for other courses without obtaining written permission from the instructor(s). Students suspected of engaging in academic misconduct will be reported to the Office of Academic Integrity.

Other violations of academic misconduct include, but are not limited to, cheating, plagiarism, fabrication (e.g., falsifying data), knowingly assisting others in acts of academic dishonesty, and any act that gains or is intended to gain an unfair academic advantage.

The impact of academic dishonesty is far-reaching and is considered a serious offense against the university and could result in outcomes such as failure on the assignment, failure in the course, suspension, or even expulsion from the university.

For more information about academic integrity see the [student handbook](#) or the [Office of Academic Integrity's website](#), and university policies on [Research and Scholarship Misconduct](#).

7. Statement on Academic Conduct and Support Systems

7.1. Academic Integrity:

The University of Southern California is a learning community committed to developing successful scholars and researchers dedicated to the pursuit of knowledge and the dissemination of ideas. Academic misconduct, which includes any act of dishonesty in the production or submission of academic work, comprises the integrity of the person who commits the act and can impugn the perceived integrity of the entire university community. It stands in opposition to the university's mission to research, educate, and contribute productively to our community and the world.

All students are expected to submit assignments that represent their own original work, and that have been prepared specifically for the course or section for which they have been submitted. You may not submit work written by others or “recycle” work prepared for other courses without obtaining written permission from the instructor(s).

Other violations of academic integrity include, but are not limited to, cheating, plagiarism, fabrication (e.g., falsifying data), collusion, knowingly assisting others in acts of academic dishonesty, and any act that gains or is intended to gain an unfair academic advantage.

The impact of academic dishonesty is far-reaching and is considered a serious offense against the university. All incidences of academic misconduct will be reported to the Office of Academic Integrity and could result in outcomes such as failure on the assignment, failure in the course, suspension, or even expulsion from the university.

For more information about academic integrity see [the student handbook](#) or the [Office of Academic Integrity's website](#), and university policies on [Research and Scholarship Misconduct](#).

Please ask your instructor if you are unsure what constitutes unauthorized assistance on an exam or assignment, or what information requires citation and/or attribution.

7.2. Students and Disability Accommodations:

USC welcomes students with disabilities into all of the University’s educational programs. The Office of Student Accessibility Services (OSAS) is responsible for the determination of appropriate accommodations for students who encounter disability-related barriers. Once a student has completed the OSAS process (registration, initial appointment, and submitted documentation) and accommodations are determined to be reasonable and appropriate, a Letter of Accommodation (LOA) will be available to generate for each course. The LOA must be given to each course instructor by the student and followed up with a discussion. This should be done as early in the semester as possible as accommodations are not retroactive. More information can be found at osas.usc.edu. You may contact OSAS at (213) 740-0776 or via email at osasfrontdesk@usc.edu.

7.3. Support Systems:

The Student Resources page is found at: <https://sites.google.com/view/uscphongroup/usc-support>