Introduction, SEL1007: Language and Science

Joel C. Wallenberg
joel.wallenberg@ncl.ac.uk

October 27, 2014
Outline

1. What are we doing here?

2. What is science?
   - Generalisations
   - Observation and Experiment

3. What is language?

4. Linguistic Experiments
   - Syntax
   - Phonology
   - Semantics

5. Housekeeping
Science of Language

- **Linguistics**: the science of language (i.e. the scientific study of the human language faculty).

- **English Language (programme of study)**: linguistics, with an emphasis on English as a case study.

- Our goal is to learn how to think scientifically about language.

- We test hypotheses about how language works in the brain, how it is learned, how it evolves over time, relates to social organisation, etc.

- In order to do that, we have to know:
  1. what science is.
  2. what language is.
Why?

- Practically speaking, why should you want to think scientifically about language?

- It will help you in any of the following language-related fields:
  - high-tech fields (e.g. Google translate)
  - teaching any language
  - speech/language therapy
  - legal professions, or a law conversion course.
  - media-related professions, e.g. journalism.
  - further (post-graduate) study in linguistics, computer science, or many other fields.

- Thinking scientifically will help you in any profession, and in life in general. For instance, when you see a news article...
And in learning the science of language, you might pick up some skills that apply to all kinds of things:

- An ability to write clearly, in the scientific style.
- An ability to think quantitatively.
- Maybe some basic statistics, some programming, if that’s your bag.

But most of the time, I will assume that you are like me:

- You want to be linguists, and are simply burning with curiosity about how language works, why we have language, how it could possibly exist, etc.
Why science?

- If so, you are curious about some aspect of Nature, and want to find out more about it.
- Science is just a method for finding out more about how something works in Nature, assuming you’re curious about it.
  - Observation, reason, experiment.
  - Science is **not** technology.
  - The pleasure of finding things out!
- In fact, science is the most precise way for finding out the details of natural processes that humans have yet discovered.
  - So if you’re curious about how language works, it’s probably better to use the scientific method than to use literature, music, philosophy, etc.
Sea-shore (adapted from Richard P. Feynman’s Lectures on Physics)
Rules of Nature (adapted from Richard P. Feynman’s Lectures on Physics)
Scientific Method (loosely based on Karl Popper)

(Informal Observation → )
Theory → Specific Hypothesis → Experiment → Data →
... Go back to beginning and start again!

- **Theory**: a general idea of how some part of the world works. (sometimes a guess, or inspiration!)

- **Hypothesis**: a more precise prediction based on the theory, which can be tested by experiment.

- **Experiment**: Construct a controlled environment that is designed to confirm or deny the Hypothesis ("Experiment" can also mean a set of precise observations, e.g. as in astronomy.).
  - Make sure you can observe the outcome (i.e. gather data)!

- **Data**: observe the outcome of the experiment. Decide if it falsifies the Hypothesis, or is consistent with it, and what this means for your Theory.
What is language?

- A complex human social behaviour, centering in the brain, but involving other systems also:

  Meaning/Social-function (brain) ↔ linguistic structure/grammar (brain) ↔ translation to physical symbols (other body, e.g. mouth/nose, hands, ears) ↔ sound (air pressure) or light (particle)

- Most of linguistics studies the human language faculty (brain), and how the brain manages the body’s language-related interaction with the outside world.
  - So, is linguistics a branch of neuroscience? or biology? or sociology? or anthropology? or physics? Well, yes.

- Humans need a division of labour in order to work.

- Nature never cares about our division of labour.
Example of Scientific Method in Syntax

**Observation**: different word orders show up in a single language:

1. Mary ate *her homework*.
2. Mary ate *what*??
3. *What* did Mary eat?

**Theory**: there is a basic word order, but sometimes phrases move around.

**Hypothesis**: any phrase can move anywhere.

**Experiment**: Construct a test sentence.

- See whether speakers recognise such a sentence as grammatical, or not.
- Can we falsify the hypothesis?
Example of Scientific Method in Syntax

- **Data:**
  
  (4) Mary ate **her homework**.
  
  (5) **What** did Mary eat?
  
  (6) * Mary **what** ate ??
  
  (7) * Ate her homework **Mary**?

- We falsified the first hypothesis, so let’s revise and try again.
Example of Scientific Method in Syntax

- **Theory:** there is a basic word order, sometimes phrases move around, but movement is restricted.

- **Hypothesis:** only question-phrases move, and they only move to the front of the clause.

- **Experiment:** Construct test sentences.
  
  (8) Mary gave John a gift.
  (9) Mary gave John what??
  (10) Mary gave who a gift??
  (11) **Who** did Mary give a gift?
  (12) **What** did Mary give John?
  (13) * **Who what** did Mary give?

- **Add to theory:** only one phrase can move at a time.
Example of Scientific Method in Syntax

- **Experiment:** let’s add a second clause into the same sentence, and see what happens:

  (14) **What** did John say [ that Mary ate ]?

  (15) * Did John say [ **what** that Mary ate ]?

- **Add to theory:** phrases only move to the front of the biggest clause.

- **Additional Observations:**
  - (13) is ungrammatical in English, but grammatical in Russian.
  - (15) is ungrammatical in English and Russian, but grammatical in German.

- **Add to theory:** some of the restrictions apply to all languages, but some of them can differ from language to language.
Example of Scientific Method in Phonology

- **Observation**: different languages have different vowels. 
  - Note that different vowels are just different air pressure patterns, with different frequencies.

- **Theory**: when speakers learn their language, they carve up the possible vowel sounds into categories (e.g. /a/, /ei/), and their brains use those categories when they speak or hear language.

- **Hypothesis**: the vowel distinctions that people use to produce their language are the same vowel distinctions they use when they hear their language.
Example of Scientific Method in Phonology

- Can we falsify the hypothesis?

**Experiment:** (Labov, 1984)

1. Record people producing different vowels in a word list.
2. Play it back to them.
3. See if they can tell which word is which.

- For example, the test was done for speakers in Philadelphia for the following words (and more):
  
  ferry – furry
  Kerry – curry
  merry – Murray

- **Data:** for some speakers, they produced the two classes of words with distinct vowels, but could not categorise them correctly when they were played back.
  
  - In fact, one speaker said, “ferry, furry, yeah, they sound the same”.

Example of Scientific Method in Meaning (Semantics)

- **Observation:**
  - Active, transitive sentence:
    
    (16) The policeman arrested John.
  
  - **BE-passive:**
    
    (17) John was arrested (by the policeman).
  
  - **GET-passive:**
    
    (18) John got arrested (by the policeman).

- **Is there a meaning difference?**

- **Hypothesis:** the GET-passive implies that the subject (e.g. John) intended for the event to happen, but the BE-passive is neutral.

- People don’t have precise intuitions about this, so we need a new experiment.
Rapid Anonymous Survey/Experiment (Labov, 1975)

Q: Excuse me, can I ask you a one-question traffic survey?
Q: Ok, there was this case in Wisconsin about jaywalking. The city passed a new law and decided to start arresting jaywalkers. So, a man walked up to a corner where there was a cop standing right there. The guy saw the cop, saw that the light was red, and he crossed the street anyway. Of course the cop saw him, and

[insert one of the four continuations here]

i. he was arrested.
   (or)
ii. he got arrested.
   (or)
iii. he was arrested to test the law.
   (or)
iv. he got arrested to test the law.

Do you think that was the right thing to do?
Rapid Anonymous Survey/Experiment (Labov, 1975)

i. he was arrested.
   (or)
ii. he got arrested.
   (or)
iii. he was arrested to test the law.
   (or)
iv. he got arrested to test the law.

Do you think that was the right thing to do?

- **Data:** Does the test subject interpret “the right thing to do” above to refer to what the policemen did, what the man crossing the street did, or do they not know?
- If the hypothesis is correct, then the question refers to the jaywalker more often with (ii) and (iv) than it will with (i) and (iii).
- **A question for you:** what would falsify the hypothesis?
A Very General Theory

- In the 1950s, Zelig Harris and Noam Chomsky noticed: the human language faculty manipulates sequences of symbols (e.g. words, sounds, phrases).
- This is a lot like a computer (and computers were new in the 50s).
A Very General Theory

- So, is it possible that our brains are like a computer?
  Maybe the language faculty is like a specialised computer.
Every week you should attend 1 lecture and 1 seminar.

Please see this website for schedule, lecture notes, seminar questions, etc:
http://www.staff.ncl.ac.uk/joel.wallenberg/NatureOfLanguage/

I will normally post lecture slides/notes on the day of the lecture.

If there are already lecture notes up, or multiple versions of lecture notes, then these are old. But I am leaving them up as supplementary reading for you.
Seminar 1

- Check the lecture/seminar schedule for Seminar 1.
- Find the reading:
- Find the seminar questions.
- Please do the reading and think about the questions before going to seminar!
Assessment

- **Short (very) hypothesis-testing pieces (100-200 words):** Due in Lecture 3, Lecture 5
  - Give them to me.

- **Mid-Module Essay (900-1000 words):** Due in your seminar, Week 8
  - Give them to your seminar leader.

- **Final Essay (1500-3000 words):** Due Thursday, 8 January (between 10am-4pm)
  - Give them to the School Office (SELLL).
1st Assessment: Hypothesis-testing pieces (Weeks 3, 5)

- 2 very short hypothesis-testing pieces (100-200 words long)
- Each has 3 parts:
  1. A specific, language-related research question that you would like to answer, based on some lecture material, suggested reading, or outside reading (1 sentence).
  2. A specific, language-related hypothesis to test: a possible (partial) answer to the research question (1-2 sentences).
  3. A description of how one might go about testing the hypothesis. e.g., sketch an experiment or precise set of observations that you think would settle the question.

Example

Marking:
- All parts are there, and it makes sense: 65
- All parts are there, and it’s outstanding: 70-75
- All parts are there, and it is brilliantly creative: 76-85
- One part is missing, and/or doesn’t make much sense: 1-60
- You don’t turn it in at all: 0
Some notes on doing well at uni (while not going crazy)

- You are now treated like adults, in relation to: your instructors, each other, the course material.
- We do not teach to the assessment, but we will do everything we can to help you learn the material.
  - Listen to “feedback”: anytime we give you observations about your own work or learning process.
  - Use our office hours.
- Please come to lectures and seminars (but it’s up to you).
  - What you miss is your responsibility.
- Keep an open mind, and try to have fun learning (or find things that are fun to learn)!
References I
