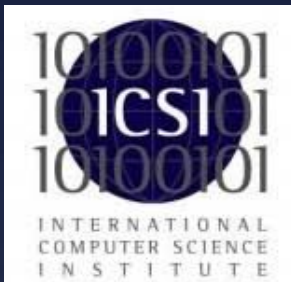


More Meaningful Language

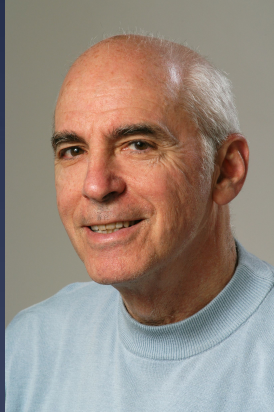
AI, NLP and FrameNet
ICSI / 30th Anniversary

Nancy Chang
October 5, 2018





My path to ICSI



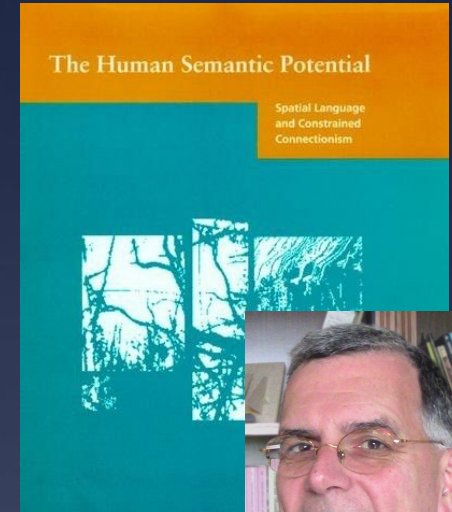
AI REVIEW SPECIAL VOLUME ON INTEGRATION OF VISION
AND LANGUAGE

L_0 —The First Five Years of an Automated Language Acquisition Project

Jerome Feldman
Srin Narayan an

George Lakoff
Terry Regier

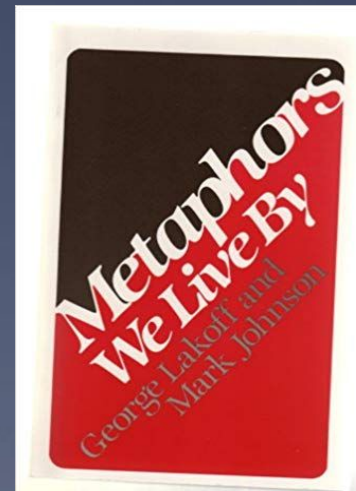
David Bailey
Andreas Stolcke



2

The Case for Case

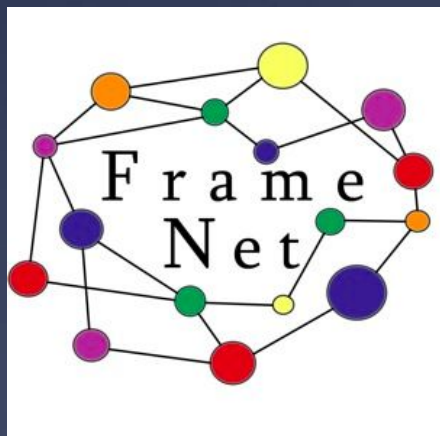
Speculation on language universals has not always and even viewed as a fully respectable pastime for the scientific linguist. I recall a Linguistic Institute lecture of not many summers ago announced that the only really secure generalization on languages is that some members of some communities have been observed to interact by means of vocalizations. If, however, the vocalizations have changed, it is a pleasure to report, and this is partly because we have clearer ideas about what linguistic theories are theories of, and partly because some linguists are willing to risk the danger of being dead wrong.





Neural Theory of Language

- * How can the human brain **learn, use, and understand language?**
- * How are language and thought related to **perception, motor control, social cognition**, and other neural systems?



A lexical database linking meaning to form, based on **frame semantics**

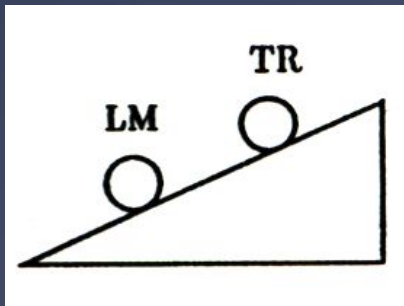
MetaNet Metaphor Wiki

Language Communication
with Autonomous Systems

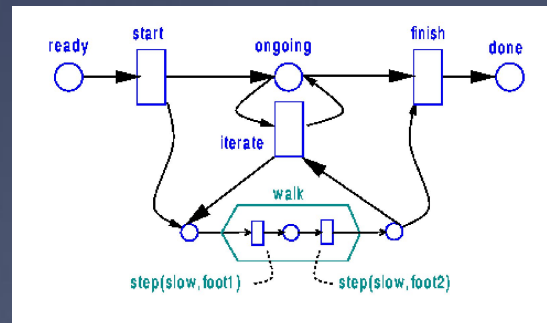
The Embodiment Hypothesis

- * Basic concepts and words derive their meaning from **embodied experience**.
- * Abstract and theoretical concepts derive their meaning from **metaphorical maps** to more basic embodied concepts.

above

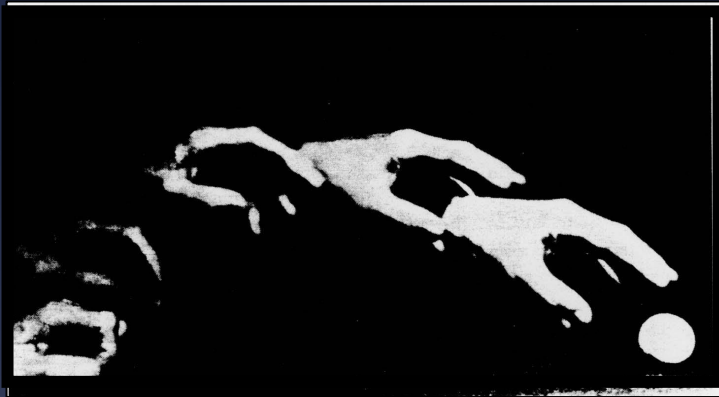


walk



The economy is moving at the pace of a Clinton jog.

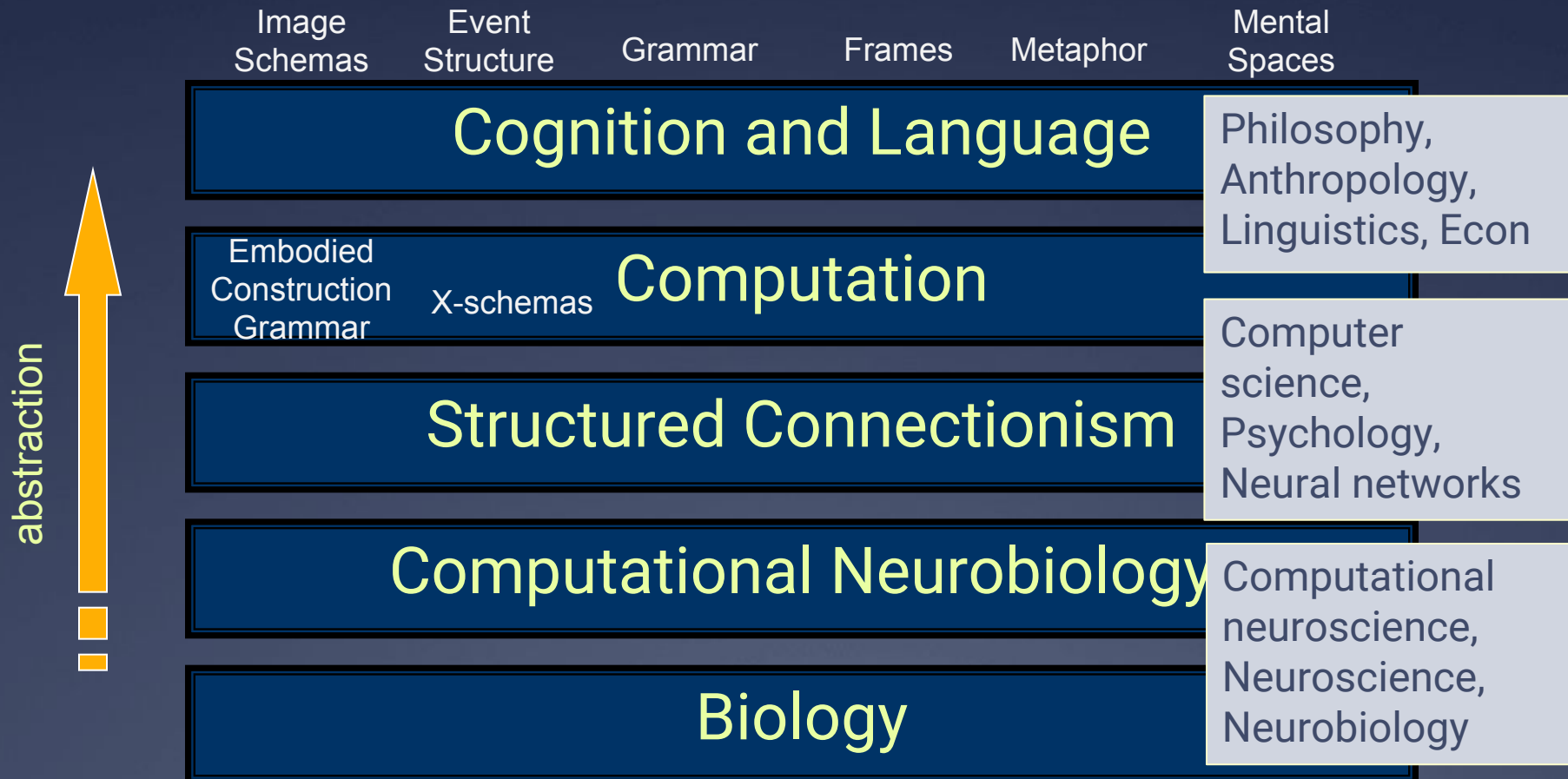
Simulation hypothesis

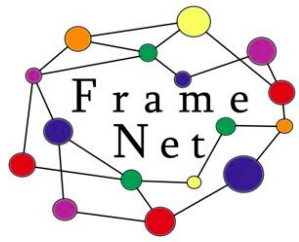


We understand utterances by **mentally simulating their content.**

- Simulation exploits some of the **same neural structures** activated during performance, perception, imagining, memory...
- Linguistic structure **parameterizes** the simulation

5 levels of the Neural Theory of Language





1164 **Frames**

Chuck **bought** a car from Jerry for \$1000.

12K **Lexical units**

Commercial_transaction

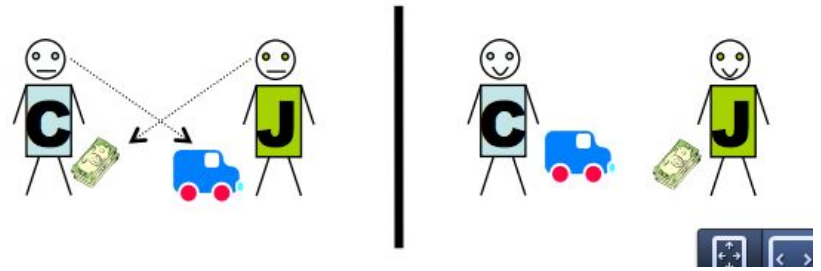
Frame elements
(semantic roles)

Chuck bought a car from Jerry for \$1000.
Buyer **Goods** **Seller** **Money**

Frame-annotated data
 - lexicographic **8180**
 - full-text **4046**

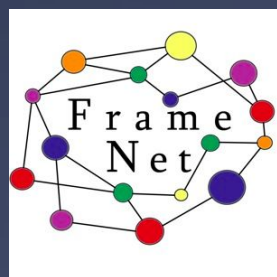
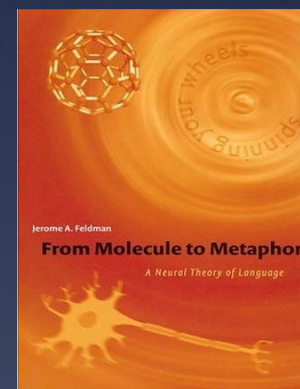
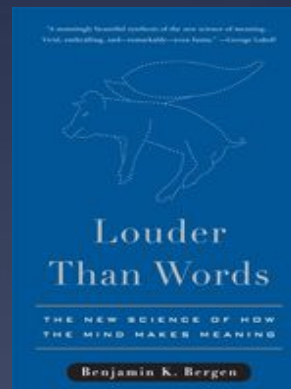
Jerry sold a car to Chuck for \$1000.
 Chuck paid Jerry \$1000 for a car .
 Chuck spent \$1000 on a car.
 The car cost Chuck \$1000.
 The price of the car was \$1000.
 ...

- **Meaning is relativized to scenes**
- Structured networks of frames represent **complex events** and capture **conceptual generalizations**





- * computational models of learning & understanding (Embodied Construction Grammar, metaphor understanding)
- * psycholinguistics & neuroscience empirical results
- * robotics applications



- * semantic role labeling, info extraction
- * PropBank, crowdsourced annotation
- * 10+ multilingual FrameNets
- * Many alumni in academia and industry...

From ICSI...



Come to **Google**

Are you working on language?

No... we're a search company!

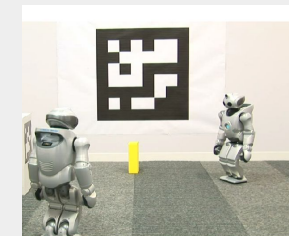
(1998-2008)



'Sem - an - tics'?

(2008)

...via Paris...



Sony CSL



U. Sorbonne Nouvelle

...to "Semantics" @ Google



Conversational search



(2012-2013)



Research & Machine Intelligence

(2014-2016)



The Assistant

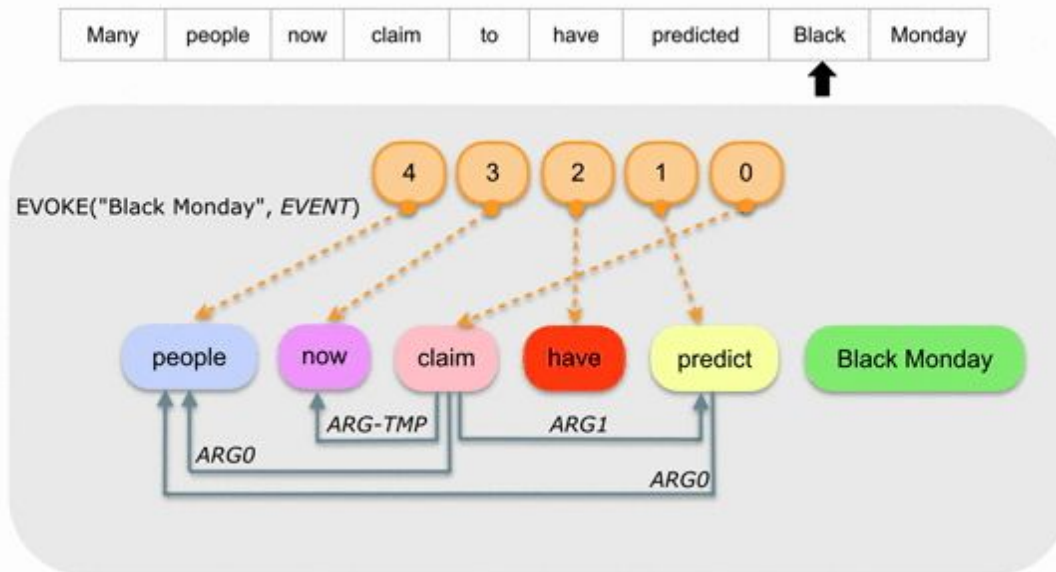
(2016 - present)

Scaling frame annotation via crowdsourcing

(Chang, Paritosh, Huynh & Baker, 2015)
FrameNet-Google collaboration,
based on Google Faculty Research Award

Longer-term NL efforts: grounding & embodiment

More collaboration with academia
Data release planned
Multiple workshops & grants

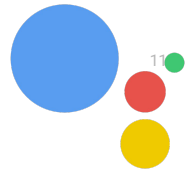


SLING: Frame Semantic Parser

(Ringgaard, Gupta & Pereira. 2017)

graph-based frame
semantic representation

Life of a Conversation



Hey Google, who won the World Cup this year?

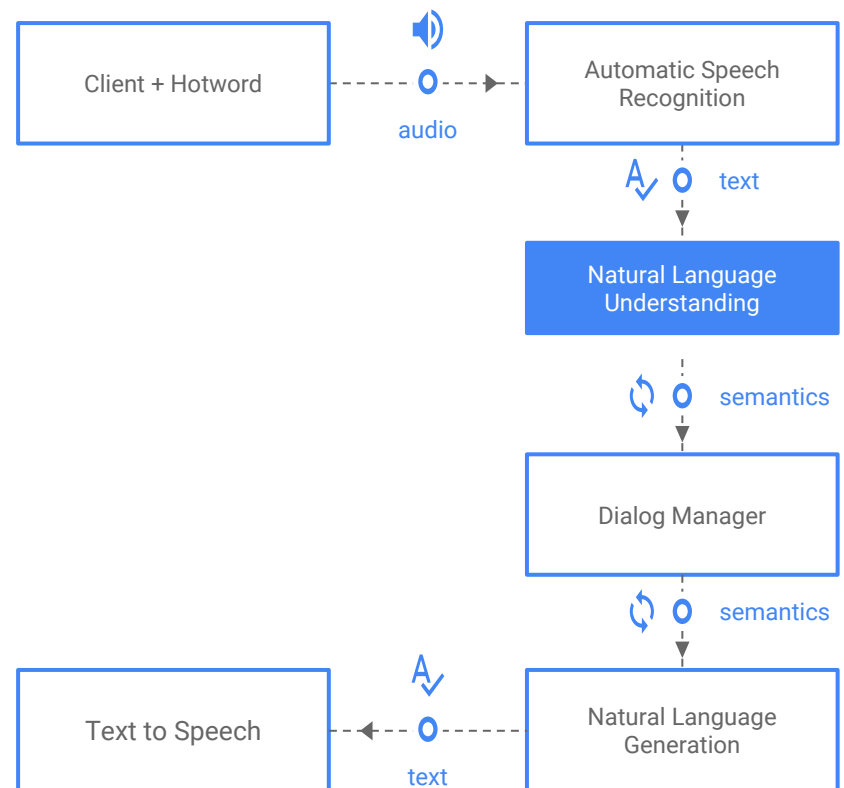
2018 World Cup was won by The France national football team

Who's their best player?

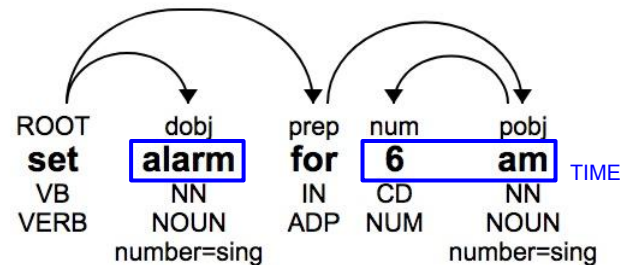
According to Wikipedia: La Liga's top goalscorer is Lionel Messi.

How many goals has he scored?

On the website fcbarcelona.com, they say: The Argentine has scored 365 goals and has provided 144 assists.



Natural Language Understanding



set alarm for 6 am

Semantic
Parsing

Intent
SetAlarm:
Time
August 29th, 6 am

wake me up at 6

6 am alarm

I need to wake up at 6

alarm at 6 in the morning

wake me up one hour
before my first meeting

I want to meditate
for 10 mins

Give me 10 minutes of calm time please

Can you play a guided meditation?

Start meditation

Help me get rid of
stress with yoga

I want to start
meditation

Please help me
meditate

Meditate for
health

How to start yoga at
home for the beginners?

I am overweight. How do
I start yoga?

Start calming activities

Start stretching
practice after work

Calm me
down

I want to start breathing exercises to
chill out about my interview

Start meditation procedure

Destress from life while stretching



Actions & intents featured at Google I/O 2018
(developer conference)

“Language is hard. I work with a team of expert linguists to define intents that capture all of these natural variations...”

Ok Google,
start calming activities

Ok Google,
I want to start breathing exercises
to chill out about my interview

Ok Google,
I want to meditate for 10 minutes

Ok Google,
help me get rid of stress with yoga

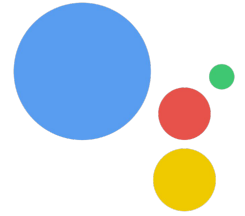
Built-intent:
start_calming_activity

calming activity:
type of activity

duration:
time period for activity

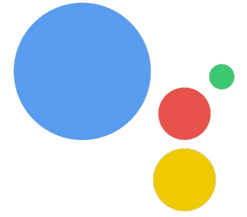
stressor:
reason for stress





Ideas (and people) incubated at ICSI are increasingly influential on industry NL efforts.

- Emphasis on thinking **long-term**
- Truly **interdisciplinary** environment for rich collaborations & conversations



Thank you!

Question(s)?

