

Why is Language Complicated? & what can evolutionary theory say about it?

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April 11, 2013

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Introduction

- Famous complications
- Traditional evolutionary explanation
- Quandaries

- Subjacency:

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- ▶ *What do you wonder whether John said?

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- Asymmetry:

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Feature yields survival advantage

Feature yields survival advantage



Feature yields reproductive advantage

Feature yields reproductive advantage



Feature yields mating advantage

Feature yields mating advantage



Photograph by Tim Laman

Like all bowers, a great bowerbird's twiggy avenue is used only for courtship and not as a nest. The outer pile of stones is the stage for his theatrics once an admirer is lured within.
Chlamydera nuchalis

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- **Quandaries**

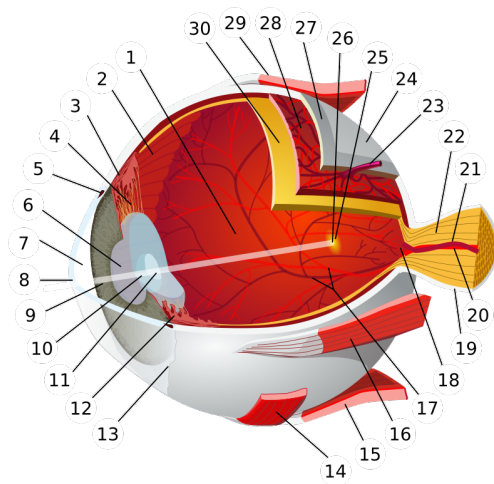
Quandary of colonies & packs

Quandary of colonies & packs



Quandary of anatomical absurdities

Quandary of anatomical absurdities



Linguists aren't alone

Language isn't the only strange & complicated biological phenomenon that doesn't fit easily into evolutionary theory.

2 Evolution & Language

- Theorizing & speculating
- Population dynamics & communication games
- Highly distinct UGs
- Similar UGs

Theorizing & speculating

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Theorizing & speculating

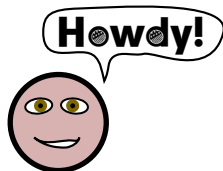
If the main benefit of language is communication, why so complicated?

- Learnability constraint?
- Health indicator?
- Shibboleth? (fluency as an insider / outsider indicator)
- Consequence of dynamics?

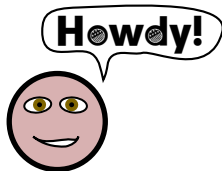
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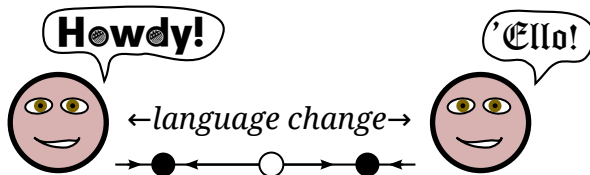
Game dynamics + learning + mutation



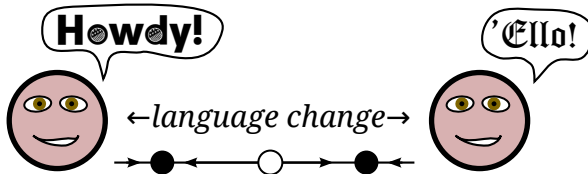
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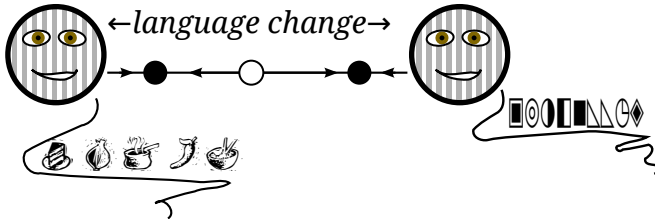
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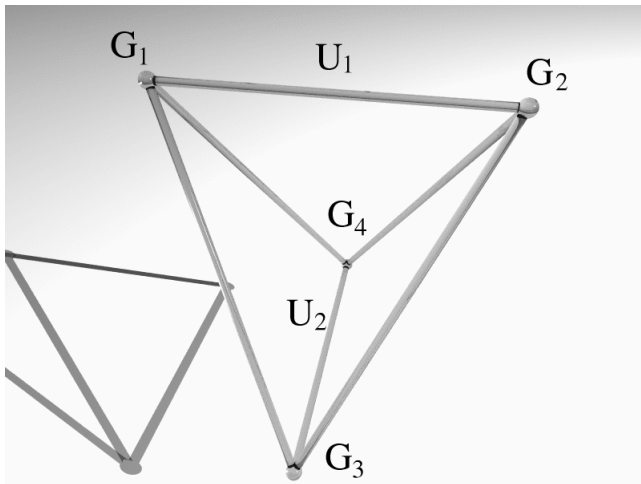
Game dynamics + learning + mutation



↕ *genetic change*



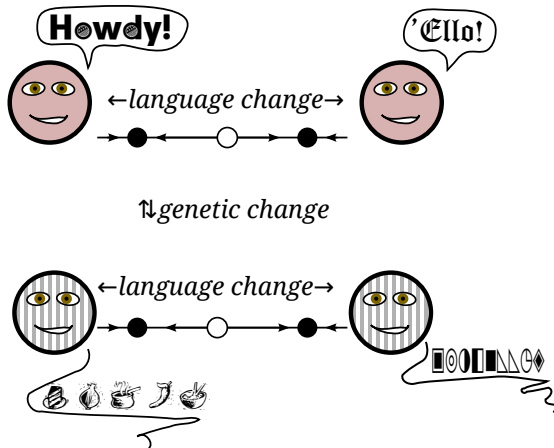
Phase space



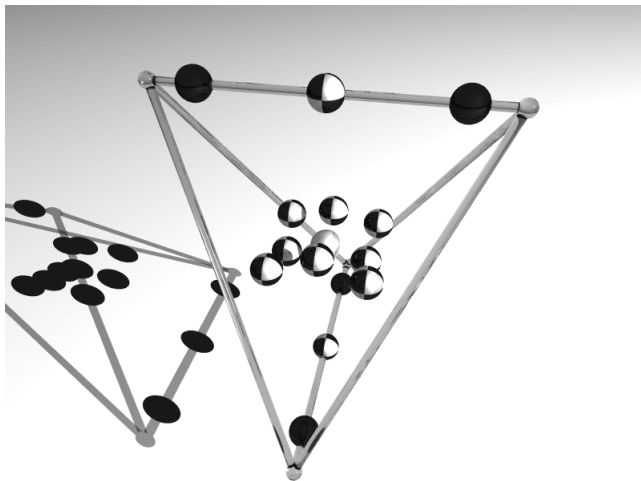
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Highly distinct UGs



Highly distinct UGs

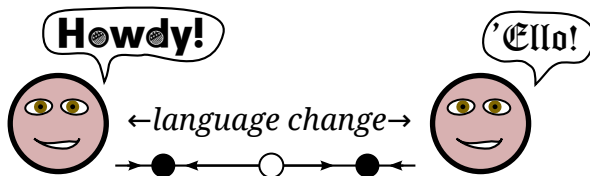


 Sink
 Saddle
 Source

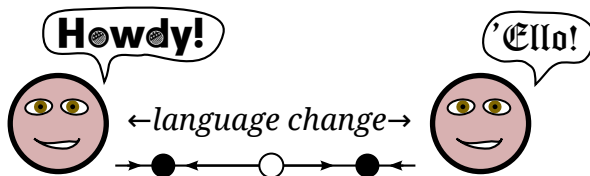
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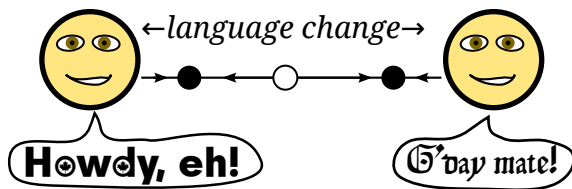
Similar UGs



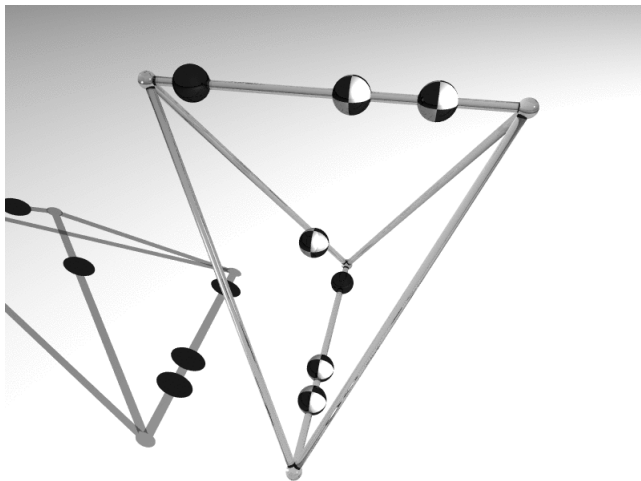
Similar UGs



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Accidental stability



 Sink
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Stability and invasions

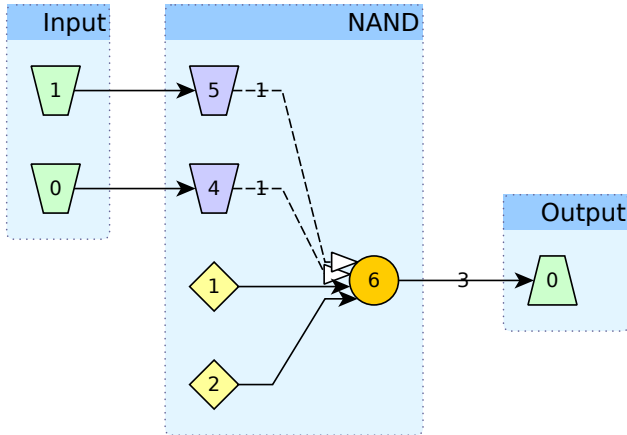
- Compatibility / market share effects can lock in first UG that happens to get discovered.
- A mutation may die out or thrive based on historical accident.

3

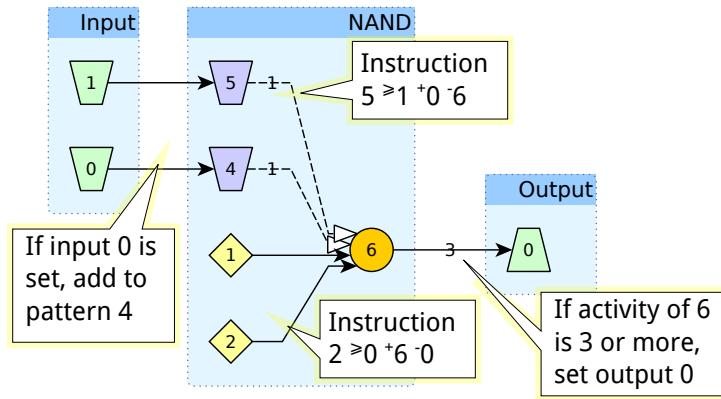
Simulation

- The Utrecht machine
- Bit transmission problem
- Strange solutions

Utrecht machine

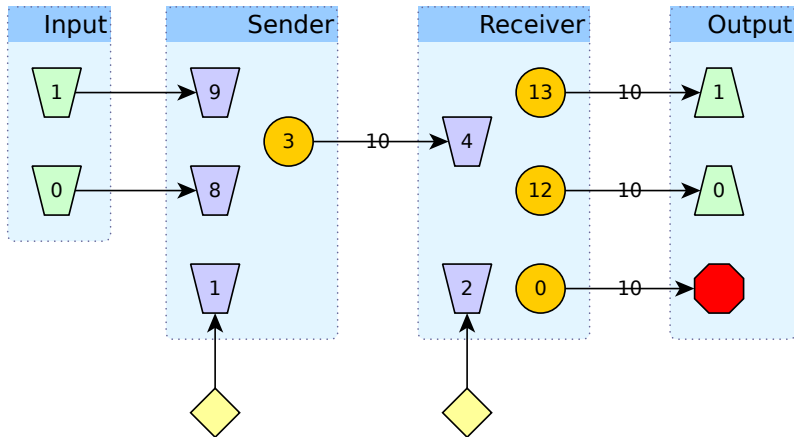


Utrecht machine

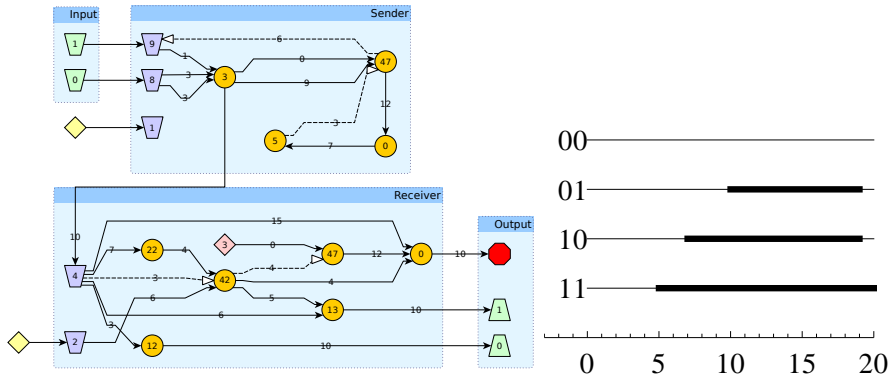


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- The Utrecht machine
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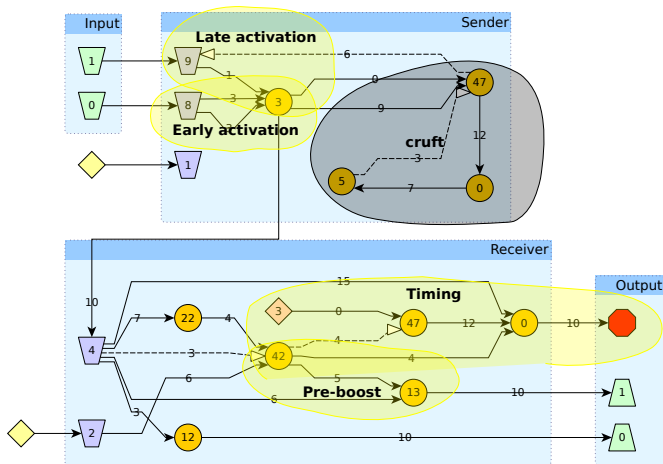
Bit transmission Problem



Typical solution

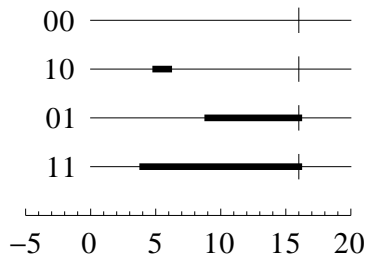
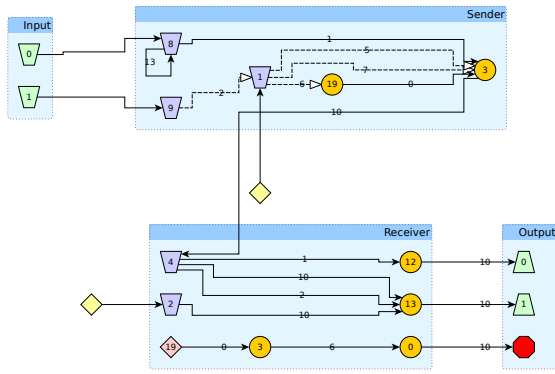


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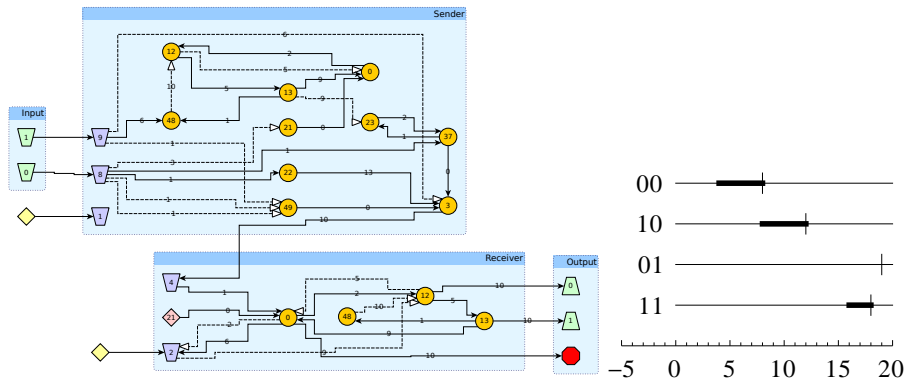


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 - **Strange solutions**

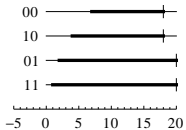
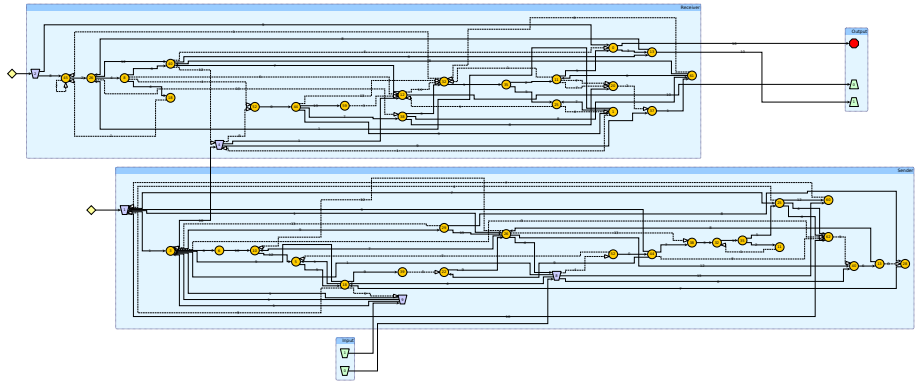
Quirky solution



Quirky solution



Absurd solution



Computational network formation

- Chicken-and-egg problems can be solved incrementally.
- Existing mechanisms are modified, broken, re-purposed, entangled. . .
- First partial solution found can lock the population into strange mechanisms.

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 - ▶ Network built step-by-step

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- Evolution can lock in on sub-optimal solutions