LSci 51/Psych 56L: Acquisition of Language

Lecture 7

Biological bases of language acquisition IV

Announcements

Be working on review questions for biological bases of language acquisition

Be working on HW2 (due: 10/21/20)

Be thinking about questions you want answered to the in-class review on 10/21/20, and post/like them on the Canvas discussion post for the review session

Qualitative differences

Jane Goodall:

http://www.ted.com/talks/
jane_goodall_on_what_separates_us_from_the_apes

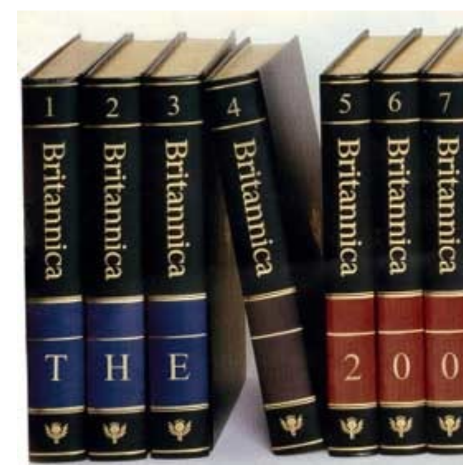
"The one thing we have, which makes us so different from chimpanzees and other living creatures is this sophisticated spoken language — a language with which we can tell children about things that aren't here. We can talk about the distant past, plan for the distant future, discuss ideas with each other, so that the ideas can grow from the accumulated wisdom of a group."

The quantity of communicative displays

"For most relatively social adult fishes, birds and mammals, the range or repertoire size [of communicative displays] for different species varies from 15 to 35 displays."

-Encyclopedia Britannica, "Animal Communication"

Remember: Humans know tens of thousands of words on average.



[Extra]

Mollusks vs. Primates

Primates likely have:

- More complex bodies and brains
- Better learning and problem solving skills
- More complex social structures
- More complex and flexible behavior
- Longer lives

[Extra]

Mollusks vs. Primates

After 450 million years…

Cephelopods:
15-35 distinct displays

Non-human primates:
15-35 distinct displays

Adapted from Liberman

http://www.thecephalopodpage.org/cephschool/WhyCephalopodsChangeColor.pdf

Communication in other species

Communication in other species

Are we special among the animal species?

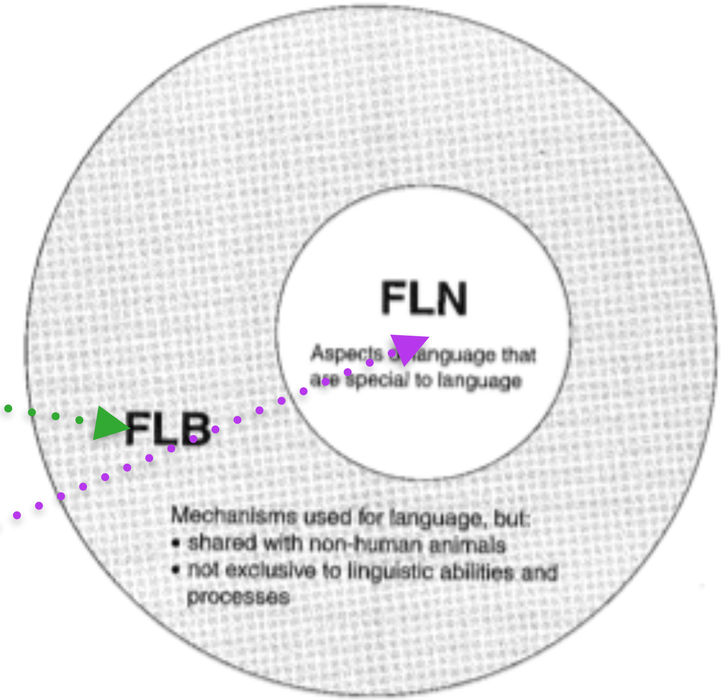
What are other species capable of?

Human language vs. “Animal language”

- Is the difference between an animal communication system and human language just a matter of degree (a quantitative difference)?

or

- Is there a sense in which human language is qualitatively different from the other communication systems?



Communication systems

Human language does enable communication, but it has several features that collectively seem to separate it from other animal communication systems, including these:

intentionality: speakers use language for the purpose of communicating with others

reference: there are symbols which stand for things (even abstract things) in the world

syntax: productive system for combining symbols to express new meanings

Primate communication

Vervet monkeys

Predator alarm calls:

“leopard” = run to the trees

“eagle” = look up, run into the bushes

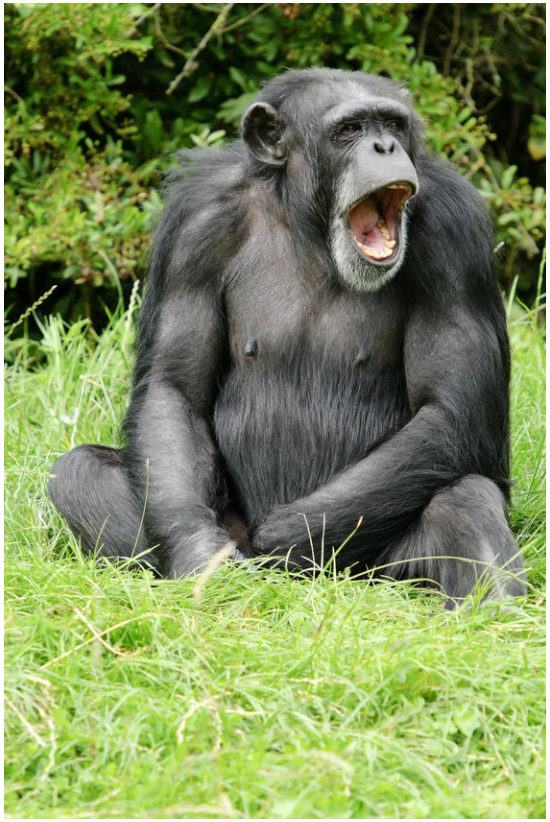
“snake” = stand up on hind legs & look around

Seem to have intentionality – do this to inform other vervet monkeys.

Primate communication

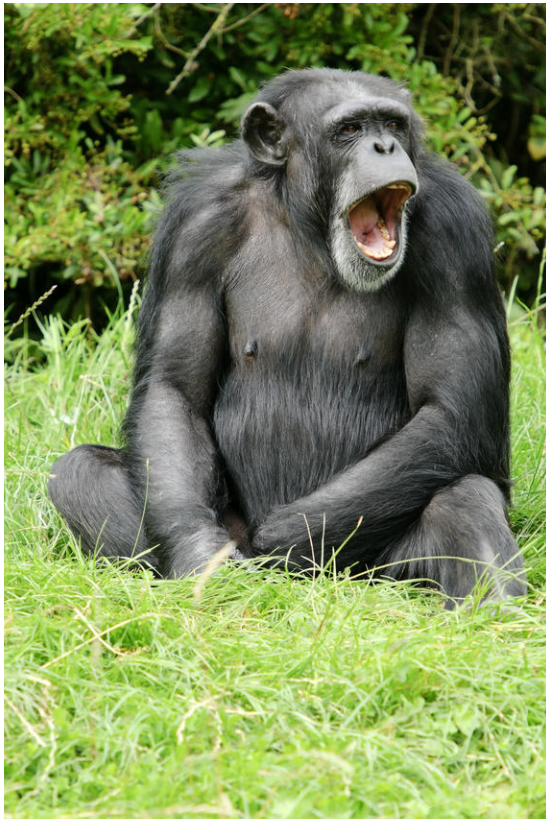
So do chimps — Schel, Townsend, Machanda, Zuberbühler, & Slocombe (2013) have found evidence that chimpanzees produce their alarm calls in a tactical and goal-directed way.

http://www.sciencedaily.com/releases/2013/10/131016212605.htm



Primate communication

Chimpanzees also have three distinct types of contact calls, each given in a different behavioral context: alert, travel, and rest.



https://www.sciencedaily.com/releases/2018/05/180523133327.htm

Primate communication

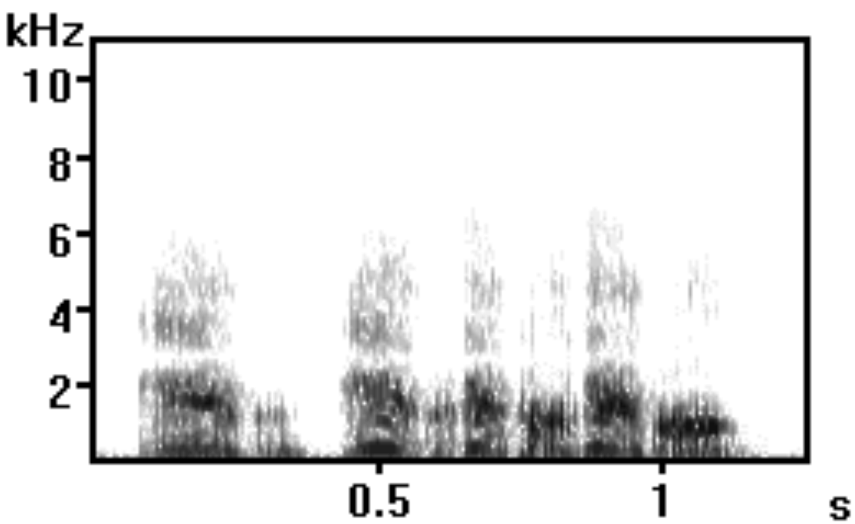
Baboons produce vowel-like sounds and vowel sequences in their vocalizations, which are used in distinct situations.

(Boë, Berthommier, Legou, Captier, Kemp, Sawallis, Becker, Rey, & Fagot 2017)

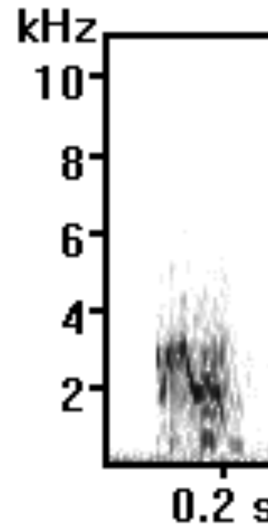
https://www.sciencedaily.com/releases/2017/01/170112143111.htm

Primate communication

Back to vervet monkeys…



Male (KN)
deep, barking call



Female (LO)
high-pitched chirps

Kaplan 2014

Primate communication

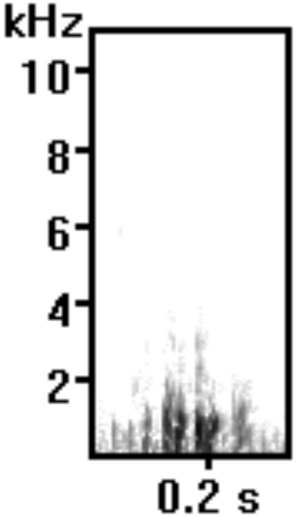
Vervet monkeys

Leopard vervet calls (reacting to pictures of leopards)
http://www.youtube.com/watch?v=hEzT-85gEdA

http://www.youtube.com/watch?v=slGvI2y_W2c

Primate communication

Vervet monkeys



Female (BA)

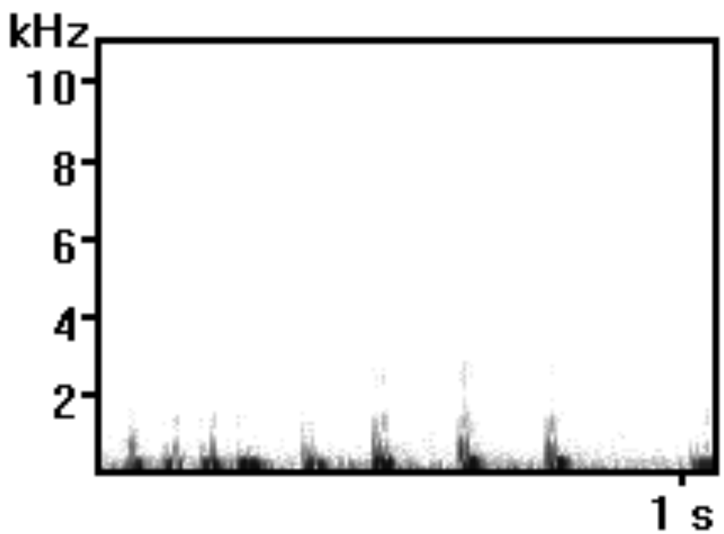
Vervet 'Eagle' Alarm Call

single cough-like call

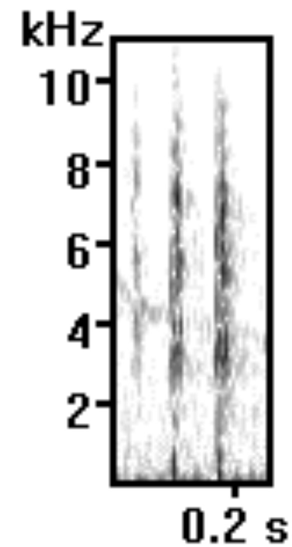
Kaplan 2014

Primate communication

Vervet monkeys



Male (KN)



Female (LB)

Vervet 'Snake' Alarm Call

chutter-like call

Kaplan 2014

Primate communication

Campbell's monkeys, Tiwai Island in Sierra Leone

Have dialects when it comes to their alarm calls.
http://www.scientificamerican.com/article/monkey-see-monkey-speak-video/

Primate communication

Vervet monkeys

However…no evidence for complex combinatorial system in vervet monkey calls.

Unclear if system has reference – are these calls really symbols for "eagle", "snake", and "leopard"? Or are they more like "Ack - go low!" and "Eek - look down!" Or something else?

[Extra]

Primate communication

Marmosets

https://www.sciencedaily.com/releases/2018/02/180222150242.htm

Interestingly, marmoset vocalizations seem to be made up of syllable-like units that are combined together.

> "…What we found was that what had been known as a long 'phee' call actually consists of small units of about the same length as a 'tsik' or 'ekk' -- about 100 milliseconds."

Primate communication

Campbell's monkeys

https://www.sciencedaily.com/releases/2016/07/160706091606.htm

In contrast, Campbell's monkeys seem to have a rudimentary combinatorial system.

"…make a distinction between roots (especially 'hok' and 'krak') and suffixes ('-oo'), and their combination allows the monkeys to describe both the nature of a threat and its degree of danger."

Primate communication

Putty-nose monkeys

https://www.sciencedaily.com/releases/2016/07/160706091606.htm

Putty-nose monkeys also seem to have a rudimentary combinatorial system.

> "…'pyows' are used as general calls ('there is an alert'), while 'hacks' are usually raptor-related (e.g. 'there is an eagle'). But a small number of 'pyows' followed by a small number of 'hacks' have a distinguished status and trigger group movement ('let's move!')..."

Primate communication

Titi monkeys

https://www.sciencedaily.com/releases/2016/07/160706091606.htm

Titi monkeys also seem to have a rudimentary combinatorial system.

"…with just two calls (A and B), they encode information about both predator type and predator location, so that 'raptor in the canopy' (e.g. AAAA...), 'raptor on the ground' (e.g. AAA...BBBB...), 'cat in the canopy,' (e.g. ABBBB...), and 'cat on the ground' (e.g. BBBBB...) give rise to four distinct sequence types...."

Primate communication

Titi monkeys

https://www.sciencedaily.com/releases/2016/07/160706091606.htm

Titi monkeys also seem to be sensitive to how informative the call is — using something that looks like pragmatic reasoning.

Human pragmatic reasoning (implicature):

“**Some of the apples are red**.” vs. “**All of the apples are red**.”

???

Primate communication

Titi monkeys

https://www.sciencedaily.com/releases/2016/07/160706091606.htm

Titi monkeys also seem to be sensitive to how informative the call is — using something that looks like pragmatic reasoning.

Human pragmatic reasoning (implicature):

"All of the apples are red."

Why? "All" is more specific (only applies to situation where all of the apples are red), and therefore more informative.

Primate communication

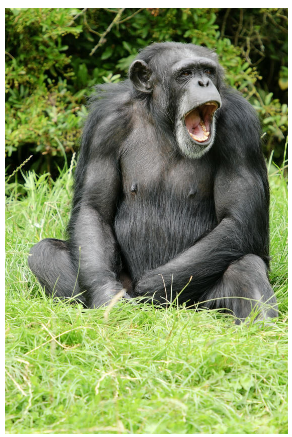
Titi monkeys

https://www.sciencedaily.com/releases/2016/07/160706091606.htm

Titi monkeys also seem to be sensitive to how informative the call is — using something that looks like pragmatic reasoning.

"…in many cases a general call -- for instance the Titi B-call, for 'general alerts' -- competes with a more specific call -- for instance the Titi A-call, for 'serious danger up.' If a threat licenses the specific call (for instance the A-call because a raptor appeared), monkeys don't normally start sequences with the general call (e.g. B), and thus they seem to prefer the more informative alternative ..."

Primate communication



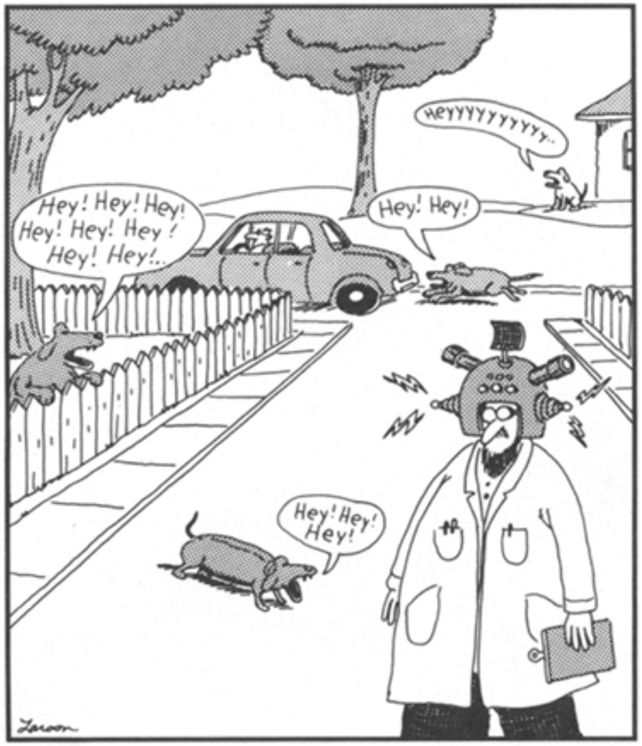
What they probably can't say:

"What a large eagle up in the sky over there! We'd better take cover. C'mon!"

"I doubt there are any leopards around here. The field looks pretty clear."

"Did you see that whopping big snake yesterday? It was super scary!"

Non-primates



Donning his new canine decoder, Professor Schwartzman becomes the first human being on Earth to hear what barking dogs are actually saying.

Bat communication

Bats

https://www.sciencedaily.com/releases/2016/12/161227110231.htm

Prat, Taub, & Yovel 2016

Intention

"…vocalizations contained information about the identity of the bat emitting the call and even about the identity of the bat being addressed by the call. Moreover, while most of this species' vocalizations were emitted during aggressive encounters, by analyzing the spectral composition of the calls, the authors were also able to distinguish their specific aggressive context (such as squabbling over food, sleeping spots or other resources)."

Bat communication

Bats

https://www.sciencedaily.com/releases/2016/12/161227110231.htm

Prat, Taub, & Yovel 2016

Unknown if they have any combinatorial system that looks like human syntax.

May have something like rudimentary reference, since they can refer to specific individuals.

Bat communication

Bats

What bats probably can't communicate:

"You had that sleeping spot yesterday. It's my turn!"

"Look, I think this food will keep until tomorrow, okay?"

Bee communication

Honey Bees

Dance to communicate the location of food (nectar)

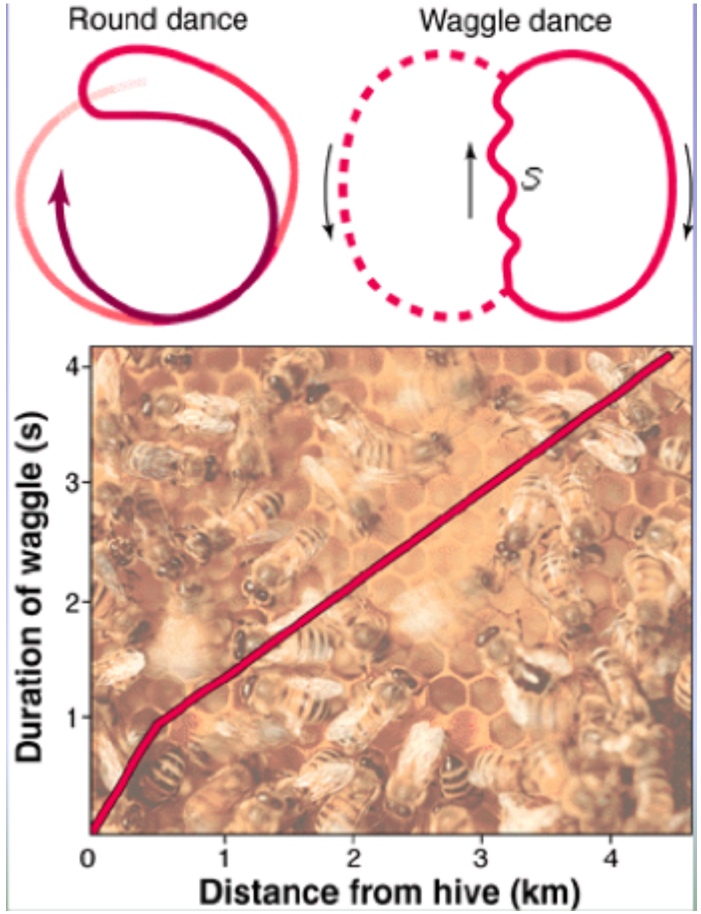
Can indicate: nearby vs. far, direction, richness of the food source (dance harder for the good stuff)

Though bees can create novel messages, they're always about the location of food.

Bee communication

Under 50m away

The angle from the sun indicates direction of food source. The duration of the waggle part of the dance signifies the distance. Approximately 1 second of dance = 1 km distance.



Quantity:

(1) Ratio of waggle part to round part corresponds to quantity of food.
(2) More food = more energetic waggling.

Over 50m away: encodes distance & direction - is encoding of 2D space (a bee's "mental map")

http://www.youtube.com/watch?v=-7ijI-g4jHg

'deciphered' by Karl von Frisch, 1919 & onward

Bee communication

Has intentionality? Definitely – waggling for other bees.

Has reference? Maybe – indicating properties of nectar. (But that's all they ever communicate about with this method – no new symbols are created.)

Has syntax? Not really – but has rudimentary combinatorial properties (what direction, how far, how much) for making novel messages about nectar.

Bee communication

Honey Bees

What bees can’t communicate:

“Have you seen the flowers in the next field over? They totally rock. I’ve never seen such brilliant colors.”

“I thought the hive was really crowded yesterday.”

Bird communication

Songbirds

Males use songs to attract and acquire mates (fairly clear intentionality). In many species, the development of the song requires exposure to adult birds who model the song.

Bird communication

White-crowned sparrows: Stages of learning

0-35 days: no singing (but probably lots of learning)

25-40 days: subsong (like babies babbling)

35-80 days: “plastic” singing -- closer and closer approximations of the full song

> 90 days: crystallization of the song

[Extra]

Bird communication

Songbirds

Note: even though there is a learned part and a genetic part, we still classify birdsong as an instinct.

[Extra]

Bird communication

- Songs are learned
  - Regional dialects

- Learning, however, is innately guided (Marler, 1990)
  - Many species of sparrows prefer to learn the songs of their own species
  - And if they are only exposed to other species' songs, they follow species-specific structure
  - Learning is subjected to a sensitive period (must be learned within a time period)

Bird communication

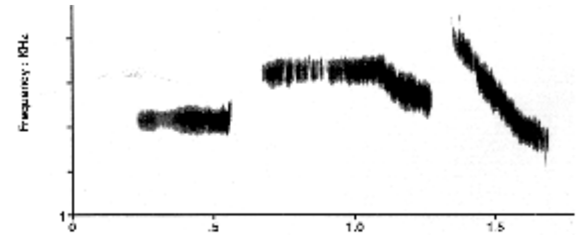
Variation in song

Bird 1

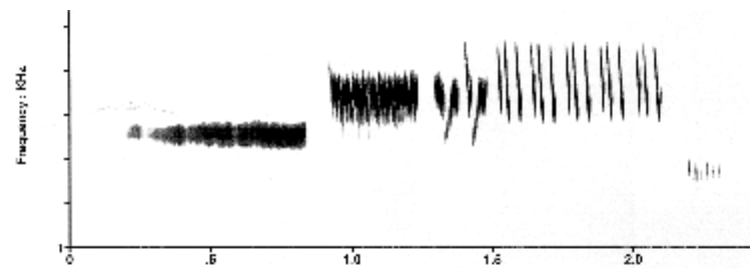
Bird 2

White-crown sparrow song

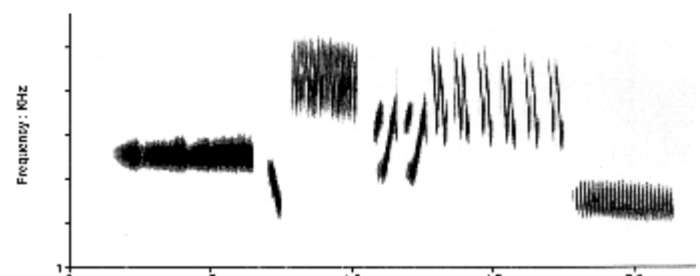
- White-crown sparrow #1 in isolation



- White-crown sparrow #2 w/ tutor



- White-crown sparrow's tutor



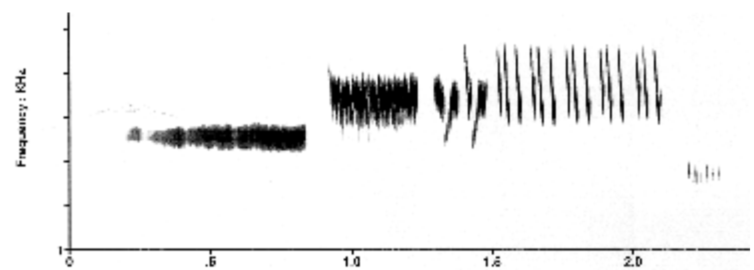
Bird communication

Sparrow song

song

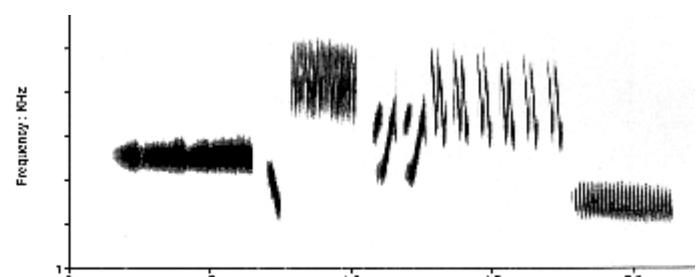
call

student



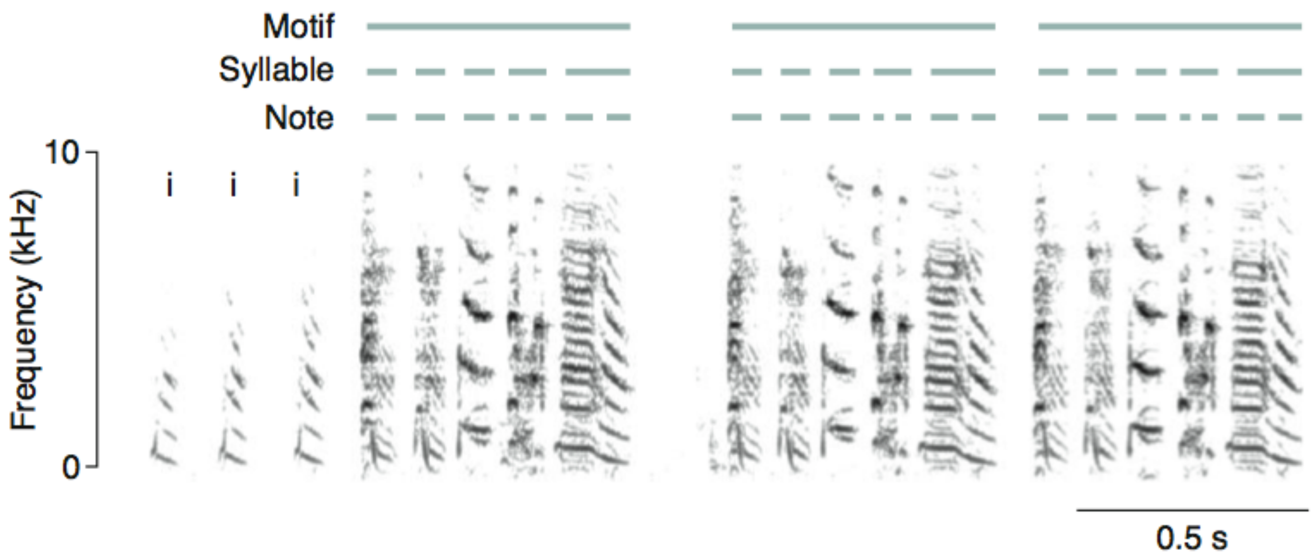
Song is highly structured (combinatorial system) - notes, syllables, phrases

teacher



Bird communication: Hierarchical structure

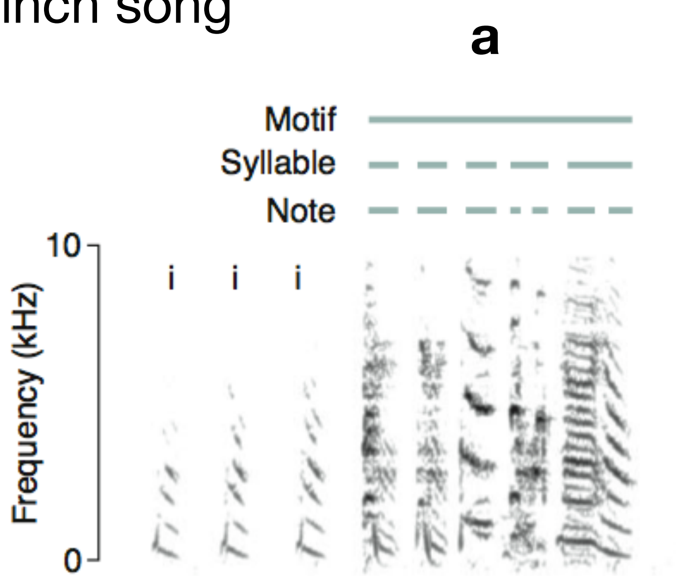
Zebra finch song

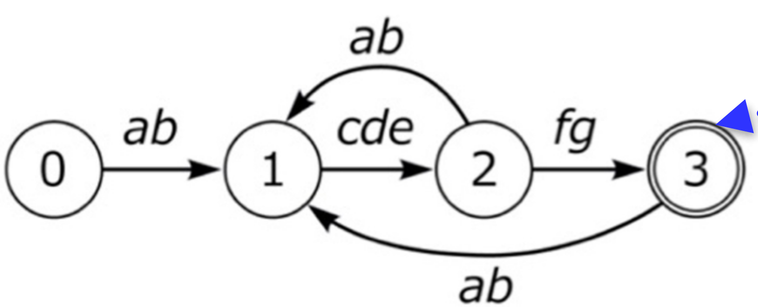


"Sound spectrogram of a typical zebra finch song depicting a hierarchical structure. Songs often start with 'introductory notes' (denoted by 'i') that are followed by one or more 'motifs', which are repeated sequences of syllables. A 'syllable' is an uninterrupted sound, which consists of one or more coherent time-frequency traces, which are called 'notes'. A continuous rendition of several motifs is referred to as a 'song bout'." – Berwick et al. 2012

Bird communication: Variety of communication

Bengalese finch song





A **state diagram** of the sequence of motifs that can make up a Bengalese finch song.

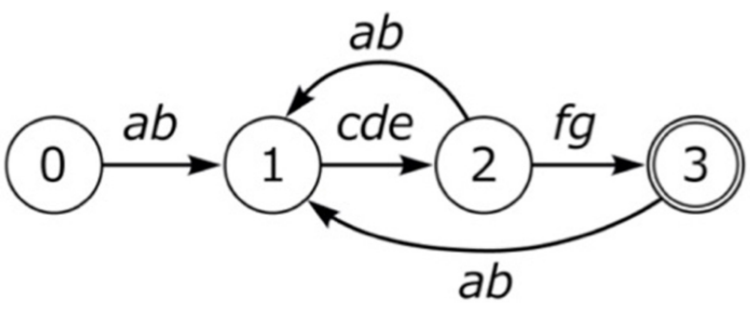
Miyagawa et al. 2014

Bird communication: Variety of communication

Bengalese finch song

A state diagram is a compact way of representing a collection of outputs. It consists of states (0, 1, 2, 3…) and transitions (the arrows between the states).

state diagram



Here, the starting state is 0, and the ending state (indicated by a double circle) is 3.

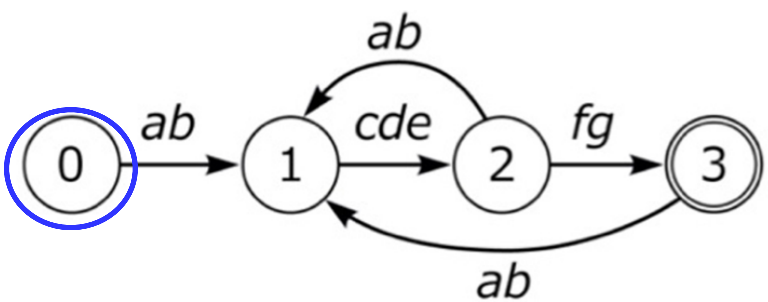
Miyagawa et al. 2014

Bird communication: Variety of communication

Bengalese finch song

To generate an output from a state diagram, begin in the starting state.

state diagram



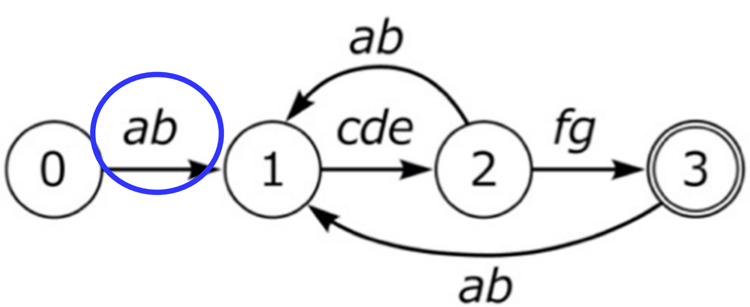
Miyagawa et al. 2014

Bird communication: Variety of communication

Bengalese finch song

Then follow one arrow to the next state, outputting the symbols along the arrow.

state diagram



When going from state 0 to state 1, "ab" is output.

ab

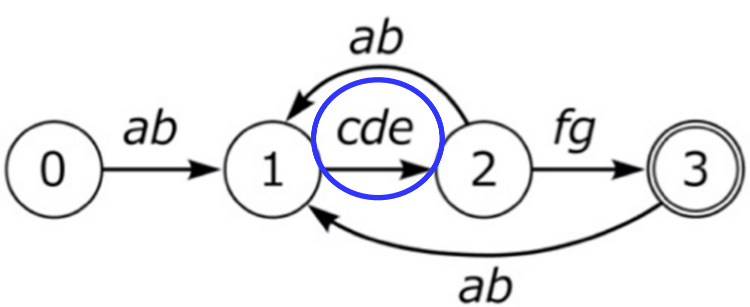
Miyagawa et al. 2014

Bird communication: Variety of communication

Bengalese finch song

Then follow one arrow to the next state, outputting the symbols along the arrow.

state diagram



Miyagawa et al. 2014

When going from state 1 to state 2, “cde” is output.

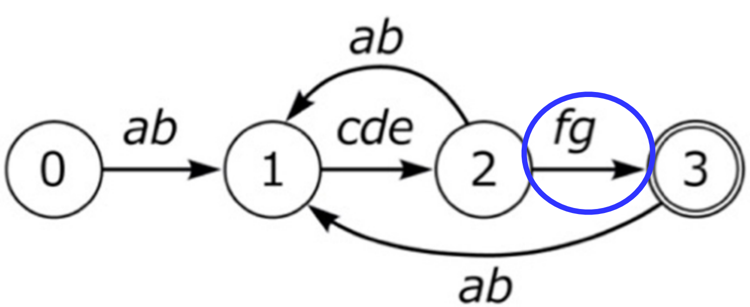
abcde

Bird communication: Variety of communication

Bengalese finch song

If a state has more than one arrow leading out of it, choose any arrow and follow it.

state diagram



If we follow this arrow out of state 2, we go to state 3 and output “fg”.

abcdefg

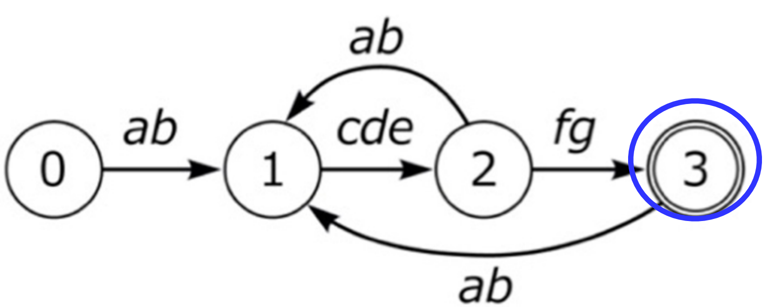
Miyagawa et al. 2014

Bird communication: Variety of communication

Bengalese finch song

When you reach the end state, you are allowed to stop following arrows. The output you have at this point is a valid output captured by the state diagram.

state diagram



Miyagawa et al. 2014

If we end here, our output looks like this:

abcdefg

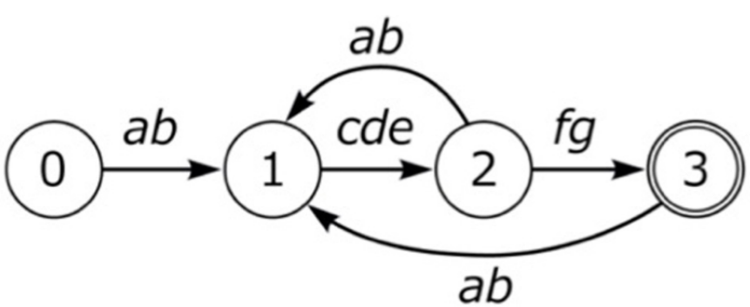
Bird communication: Variety of communication

Bengalese finch song

What are some other output sequences (representing valid Bengalese finch motifs sequences) that this state diagram can generate?

Allowed: abcdefg

state diagram



Miyagawa et al. 2014

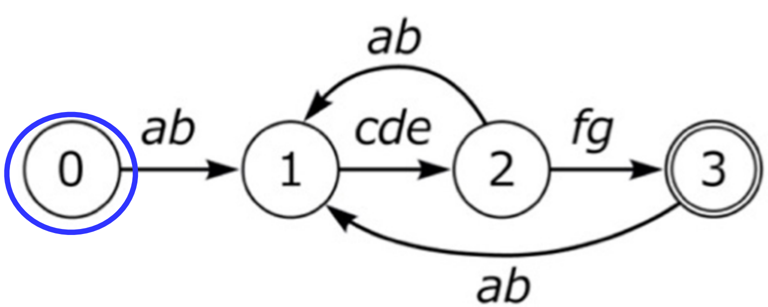
Bird communication: Variety of communication

Bengalese finch song

What are some other output sequences (representing valid Bengalese finch motifs sequences) that this state diagram can generate?

Allowed: abcdefg

state diagram



Miyagawa et al. 2014

Bird communication: Variety of communication

Bengalese finch song

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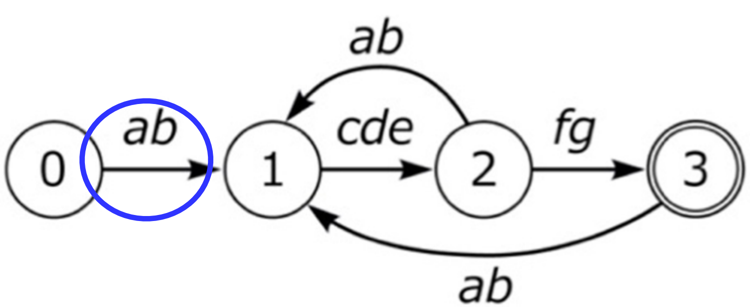
state diagram



Miyagawa et al. 2014

Our current output:

ab

Bird communication: Variety of communication

Bengalese finch song

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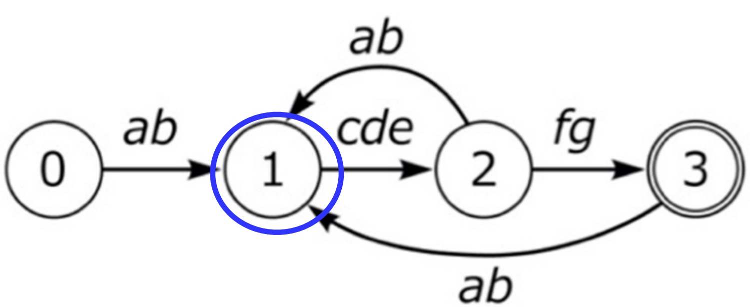
Allowed: abcdefg

state diagram



Miyagawa et al. 2014

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Bird communication: Variety of communication

Bengalese finch song

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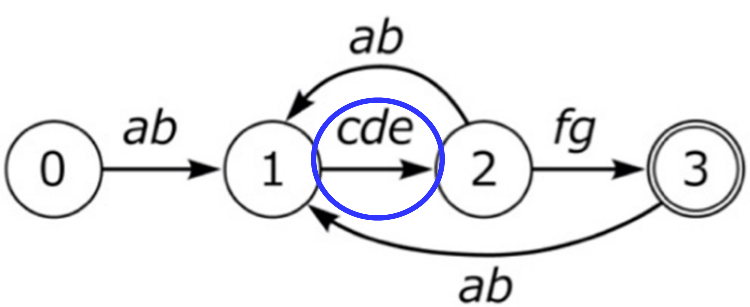

Our current output:

abcde

Miyagawa et al. 2014

Bird communication: Variety of communication

Bengalese finch song

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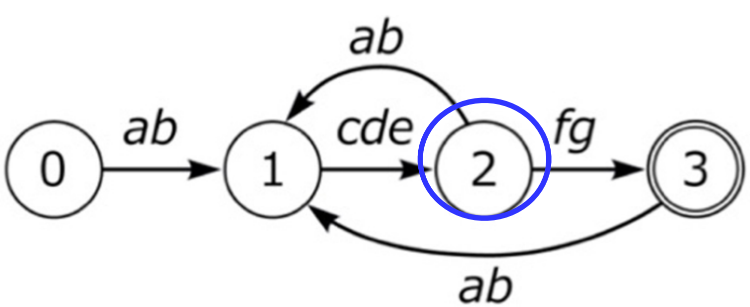
Allowed: abcdefg

state diagram



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Miyagawa et al. 2014

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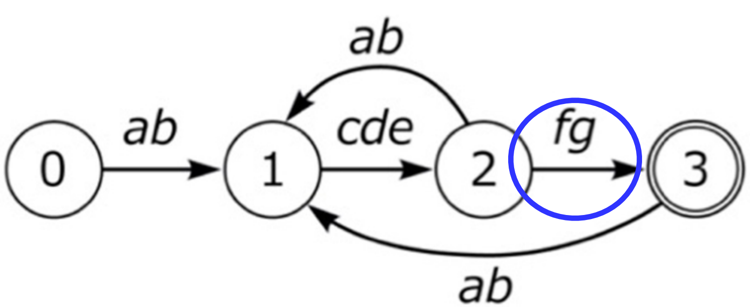
state diagram



Our current output:

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Miyagawa et al. 2014

Bird communication: Variety of communication

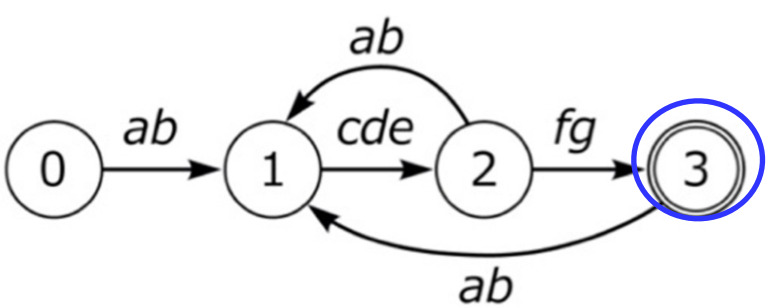
Bengalese finch song

What are some other output sequences (representing valid Bengalese finch motifs sequences) that this state diagram can generate?

Allowed: abcdefg

state diagram

But we don't *have* to stop there…



Our current output:

abcdefg

Miyagawa et al. 2014

Bird communication: Variety of communication

Bengalese finch song

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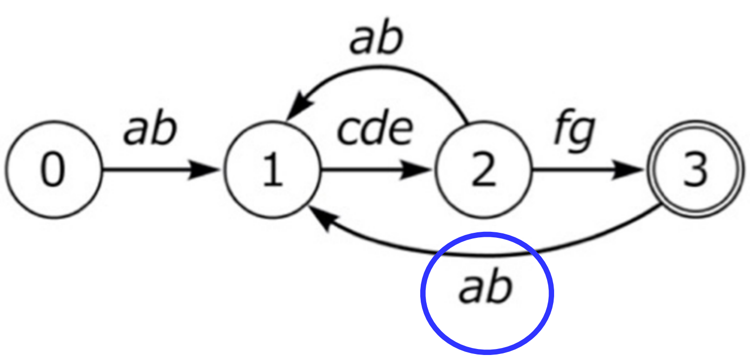
Allowed: abcdefg

state diagram



Miyagawa et al. 2014

Our current output:

abcdefgab

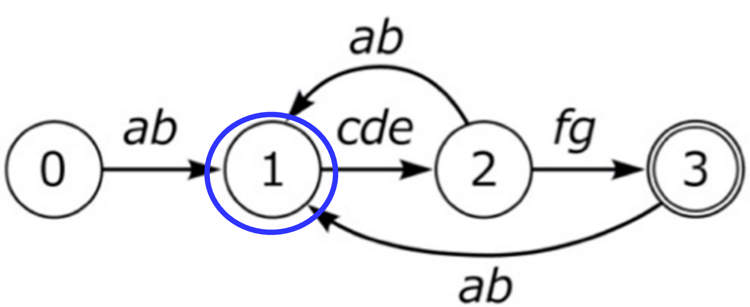
Bird communication: Variety of communication

Bengalese finch song

What are some other output sequences (representing valid Bengalese finch motifs sequences) that this state diagram can generate?

Allowed: abcdefg

state diagram



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Miyagawa et al. 2014

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Bengalese finch song

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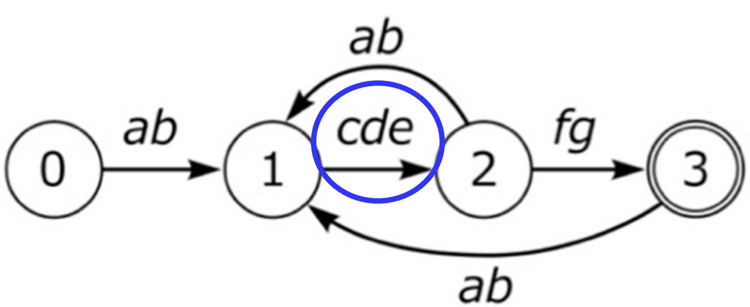


Miyagawa et al. 2014

Our current output:

abcdefgabcde

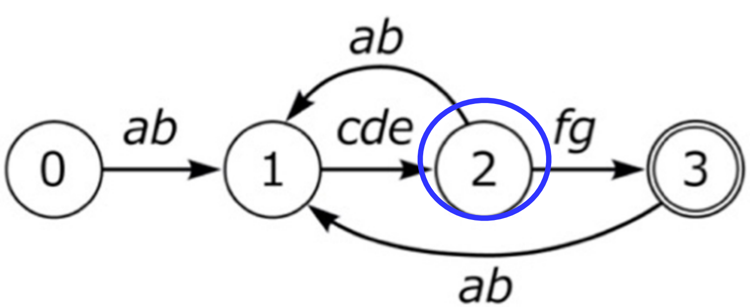
Bird communication: Variety of communication

Bengalese finch song

What are some other output sequences (representing valid Bengalese finch motifs sequences) that this state diagram can generate?

Allowed: abcdefg

state diagram



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Bird communication: Variety of communication

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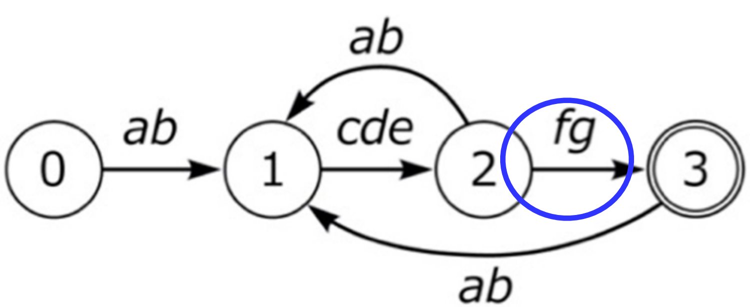
Allowed: abcdefg

state diagram



Miyagawa et al. 2014

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abcdefgabcdefg

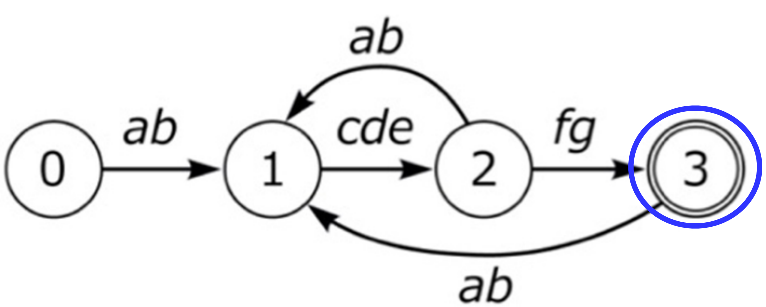
Bird communication: Variety of communication

Bengalese finch song

What are some other output sequences (representing valid Bengalese finch motifs sequences) that this state diagram can generate?

Allowed: abcdefg, abcdefgabcdefg

state diagram



Our current output:

Miyagawa et al. 2014

Bird communication: Variety of communication

Bengalese finch song

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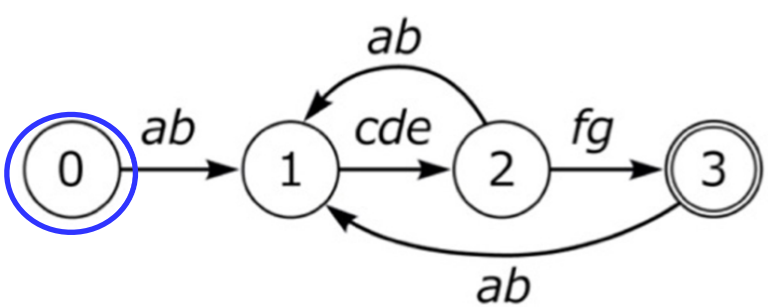
state diagram



Our current output:

Miyagawa et al. 2014

Bird communication: Variety of communication

Bengalese finch song

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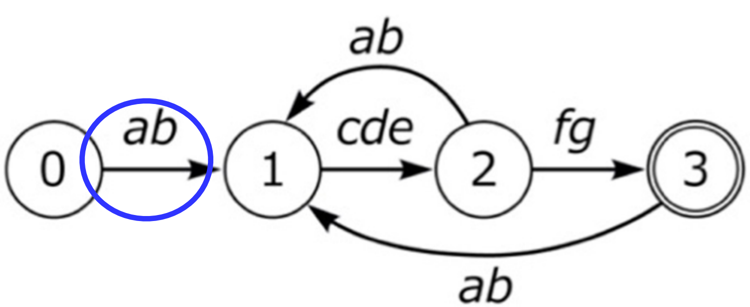


Our current output:

ab

Miyagawa et al. 2014

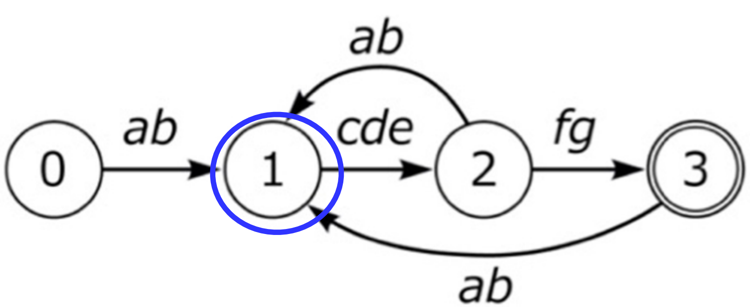
Bird communication: Variety of communication

Bengalese finch song

What are some other output sequences (representing valid Bengalese finch motifs sequences) that this state diagram can generate?

Allowed: abcdefg, abcdefgabcdefg

state diagram



Miyagawa et al. 2014

Our current output:

ab

Bird communication: Variety of communication

Bengalese finch song

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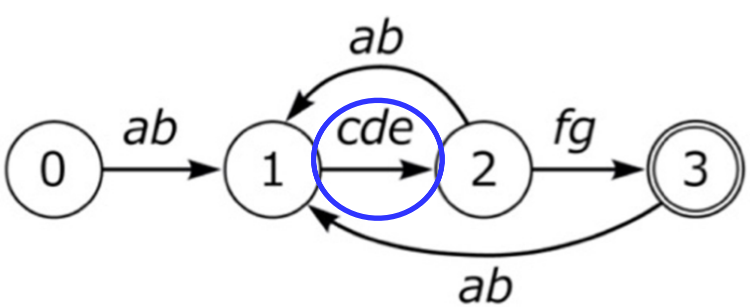
Allowed: abcdefg, abcdefgabcdefg

state diagram



Miyagawa et al. 2014

Our current output:

abcde

Bird communication: Variety of communication

Bengalese finch song

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Allowed: abcdefg, abcdefgabcdefg

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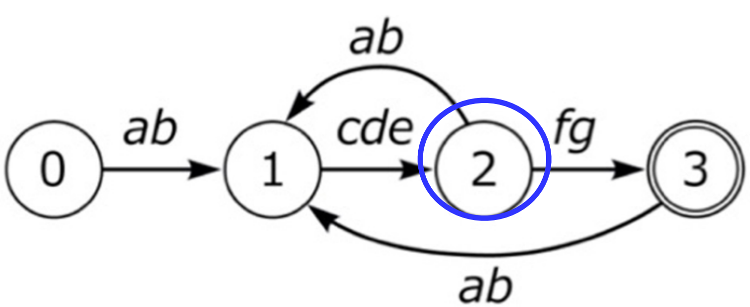

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Bengalese finch song

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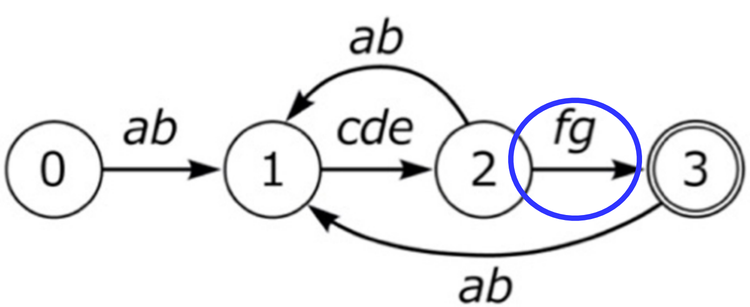


Our current output:

abcdefg

Miyagawa et al. 2014

Bird communication: Variety of communication

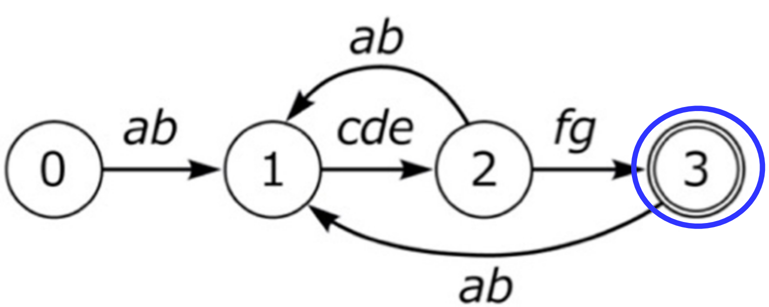
Bengalese finch song

What are some other output sequences (representing valid Bengalese finch motifs sequences) that this state diagram can generate?

Allowed: abcdefg, abcdefgabcdefg

state diagram

But we don't *have* to stop there…



Our current output:

abcdefg

Miyagawa et al. 2014

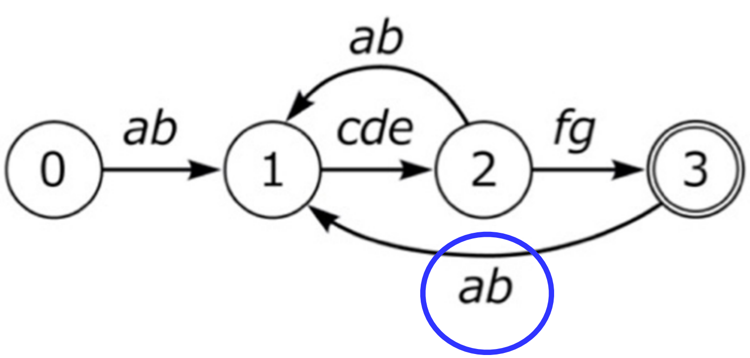
Bird communication: Variety of communication

Bengalese finch song

What are some other output sequences (representing valid Bengalese finch motifs sequences) that this state diagram can generate?

Allowed: abcdefg, abcdefgabcdefg

state diagram



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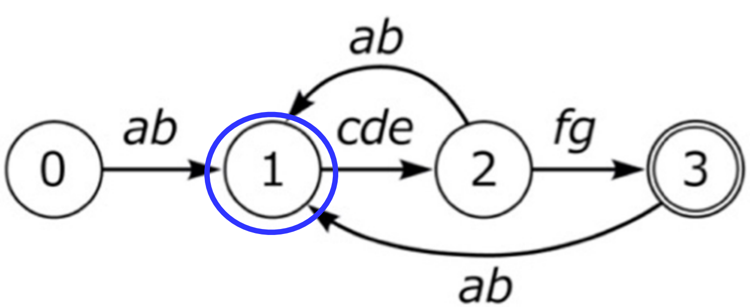

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Miyagawa et al. 2014

Bird communication: Variety of communication

Bengalese finch song

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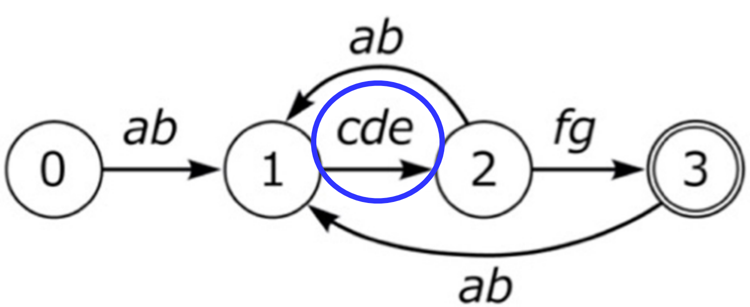

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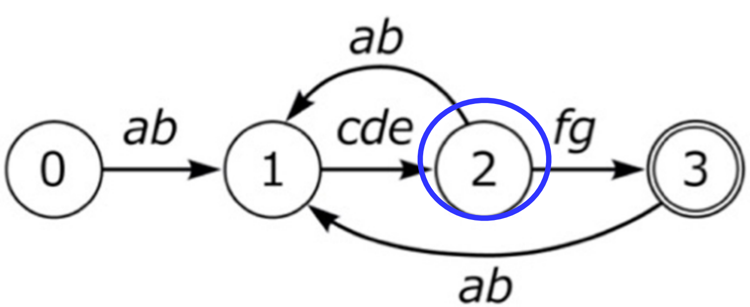

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Bird communication: Variety of communication

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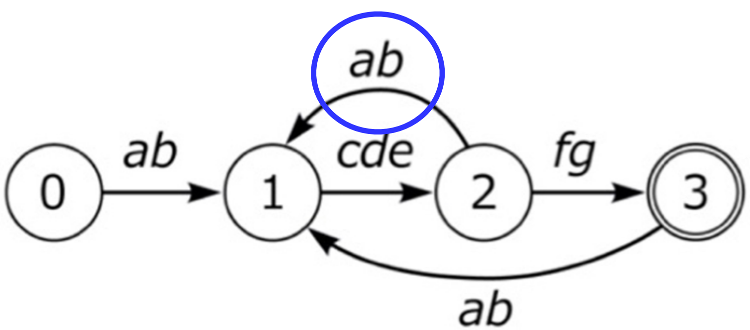

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Miyagawa et al. 2014

Bird communication: Variety of communication

Bengalese finch song

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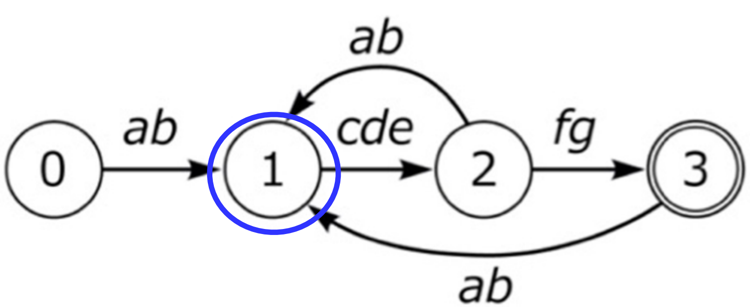
Allowed: abcdefg, abcdefgabcdefg

state diagram



Miyagawa et al. 2014

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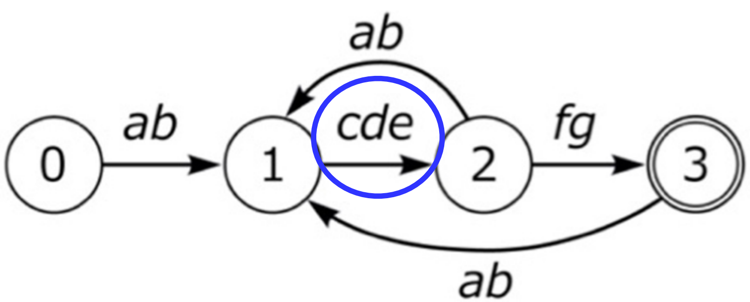

Miyagawa et al. 2014

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Bird communication: Variety of communication

Bengalese finch song

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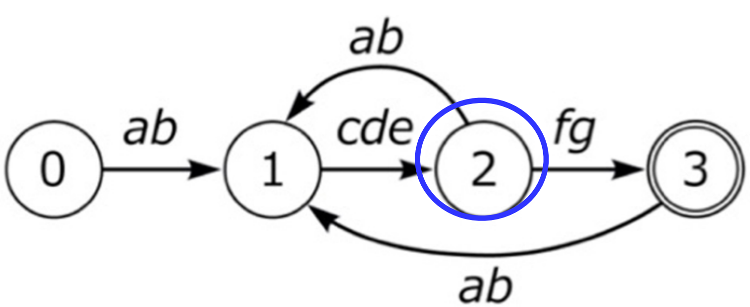
state diagram



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Bird communication: Variety of communication

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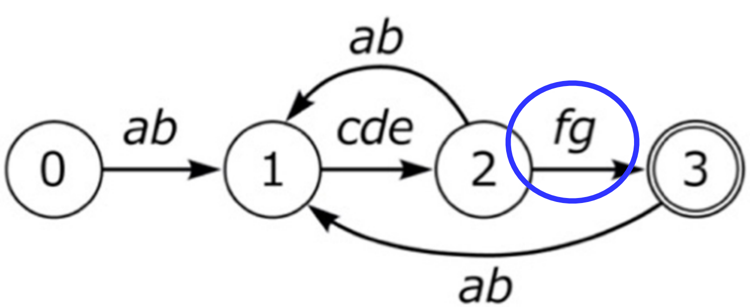

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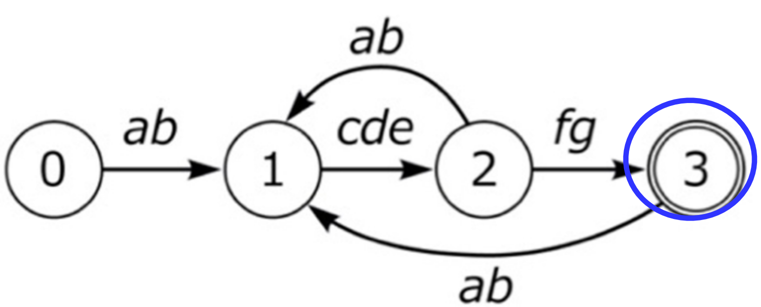
Bird communication: Variety of communication

Bengalese finch song

What are some other output sequences (representing valid Bengalese finch motifs sequences) that this state diagram can generate?

Allowed: abcdefg, abcdefgabcdefg, abcdefgabcdeabcdefg

state diagram



Our current output:

Miyagawa et al. 2014

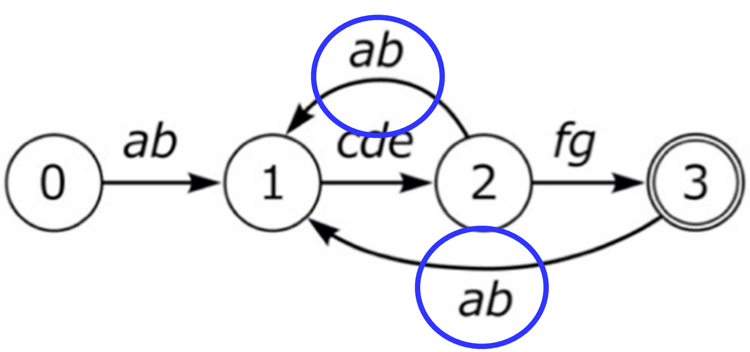
Bird communication: Variety of communication

Bengalese finch song

Important: An infinite number of valid sequences can be generated because we have these backward arrows. This aspect of bird song is similar to human language (which has infinite sentences).

Allowed: abcdefg, abcdefgabcdefg, abcdefgabcdeabcdefg, …

state diagram



Miyagawa et al. 2014

Bird communication vs. Human language

There are several similarities between language in humans and birdsong.

(1) Alarm calls in birdsong and words in human language are referential and stable signals. These signals can incorporate spontaneous gestures like pointing (by either finger or beak) [Kaplan 2014]

(2) Birdsong and human language both have a way to combine units (birdsong: notes make syllables which make motifs; human language: phonemes make syllables which make words) [Kaplan 2014]

Bird communication vs. Human language

There are several similarities between language in humans and birdsong.

(3) How the units that make up syllables (human language: phonemes, birdsong: notes) are perceived depends on the surrounding context (Lachlan & Nowicki 2015)

http://www.sciencedaily.com/releases/2015/01/150105170024.htm

Bird communication vs. Human language

There are several similarities between language acquisition in humans and song acquisition in songbirds (Okanoya 2013). Both human language and birdsong:

(1) have early stages prior to the appearance of the adult form (babbling vs. subsong)

(2) require the babies to be able to hear their own productions

Bird communication vs. Human language

There are several similarities between language acquisition in humans and song acquisition in songbirds (Okanoya 2013). Both human language and birdsong:

(3) have sensitive periods (between 7 and 60 days old for birds) and can reconstitute itself from impoverished input (human language: pidgin to creole; birdsong (zebra finches): from song produced by isolates to full song over several generations)

(4) are lateralized in the left hemisphere

Bird communication vs. Human language

There are several similarities between language acquisition in humans and song acquisition in songbirds (Okanoya 2013). Both human language and birdsong:

(5) rely on similar genes for vocalization (Pfenning et al. 2014, Zhang et al. 2014, http://www.sciencedaily.com/releases/2014/12/141211142429.htm)

(6) are predisposed to certain types of vocalization patterns, with short and high-pitched sounds more likely to appear in the middle of a song/utterance (James & Sakata 2017, https://www.sciencedaily.com/releases/2017/11/171122124032.htm)

Bird communication vs. Human language

There are several similarities between language acquisition in humans and song acquisition in songbirds (Okanoya 2013). Both human language and birdsong:

(7) have smaller and larger units learned simultaneously (human language: sounds and words; birdsong: motifs and song bouts) (Comins & Gentler 2015, http://www.sciencedaily.com/releases/2015/06/150625130900.htm)

Bird communication vs. Human language

There are several similarities between language acquisition in humans and song acquisition in songbirds (Okanoya 2013). Both human language and birdsong:

(8) involve adults modifying their input when it's directed at babies (humans: motherese; zebra finches: a slower and more repetitious version of their normal song) (Chen et al. 2016, https://www.sciencedaily.com/releases/2016/05/160531165239.htm)

and adults helping encourage the output of the babies towards the correct form via social interactions (Caruso-Peck & Goldstein 2019) https://www.sciencedaily.com/releases/2019/01/190131125921.htm

Bird communication vs. Human language

There are several similarities between language acquisition in humans and song acquisition in songbirds (Okanoya 2013). Both human language and birdsong:

(9) have special areas of the brain (children: language-related; birds: song-related) activated by a nearby adult vocalizing in a social way (Tanaka, Sun, Li, & Mooney 2018)

https://www.sciencedaily.com/releases/2018/10/181017140933.htm

Bird communication vs. Human language

However, there are also some crucial differences (see Berwick et al. 2012 for a more thorough discussion of this):

(1) Birdsong seems to lack flexible semantics. (Like the bee dance, birdsong is only ever about a few things. Not clear there's an infinite range of novel meanings.)

(2) Birdsong seems to lack individual words. (Is a particular note sequence a symbol for something? What does it refer to? It's unclear.)

Bird communication vs. Human language

However, there are also some crucial differences (see Berwick et al. 2012 for a more thorough discussion of this):

(3) The combinatorial system seems less complex in birdsong. While human language has phonemes that make syllables that make words that make phrases that make sentences, birdsong often seems to stop at the "word" level (~motif).

Bird communication vs. Human language

However, there are also some crucial differences (see Berwick et al. 2012 for a more thorough discussion of this):

(4) Also, while birds can reorder elements within their song, this doesn't seem to change the meaning of the entire song. Thus, their combinatorial system does not connect with meaning in the same way that human syntax does. (For example, "Penguins eat fish" doesn't mean the same thing as "Fish eat penguins", but a song made of motif order A-B-C conveys the same meaning as a song made of motif order C-B-A.)

Bird communication vs. Human language

Or are there?

(4) …*except* chestnut-crowned babblers produce song “AB” when flying and song “BAB” when feeding chicks, and A and B are distinct units (Engesser, Savage, & Townsend 2015, Engesser, Holub, O’Neill, Russell, & Townsend 2019).

Co-author Townsend suggests this is “the first time that the capacity to generate new meaning from rearranging meaningless elements has been shown to exist outside of humans”.

(http://www.sciencedaily.com/releases/2015/06/150629152230.htm)
(https://www.sciencedaily.com/releases/2019/09/190909160109.htm)

Bird communication vs. Human language

Or are there?

(4) …*except* chestnut-crowned babblers produce song “AB” when flying and song “BAB” when feeding chicks, and A and B are distinct units (Engesser, Savage, & Townsend 2015, Engesser, Holub, O’Neill, Russell, & Townsend 2019).

But is it really meaning (if so, what does each unit *mean*)?

Under debate…

Bird communication vs. Human language

Or are there?

(5) Japanese great tits use "ABC" calls to mean "watch out!" (in the presence of sparrow hawks), "D" calls to mean "come over here", and "ABC-D" calls to indicate that they should all flock together and be alarmed. (This is something like "watch out" + "come over here".) Notably, "D-ABC" doesn't cause them to do this — so order matters. (Suzuki, Wheatcroft, & Griesser 2016).

(https://www.sciencedaily.com/releases/2016/03/160308134748.htm)

Recap: Animal communication

While animal communication systems may share some properties of human language, none currently seem to be as complex as human language.

However, birdsong seems to come the closest to human language. It's currently unclear whether the difference is quantitative (and so part of the FLB) or qualitative (and so part of the FLN).

Questions?

Remember: HW2 is due 10/21/20, and you should be able to do all of it now.

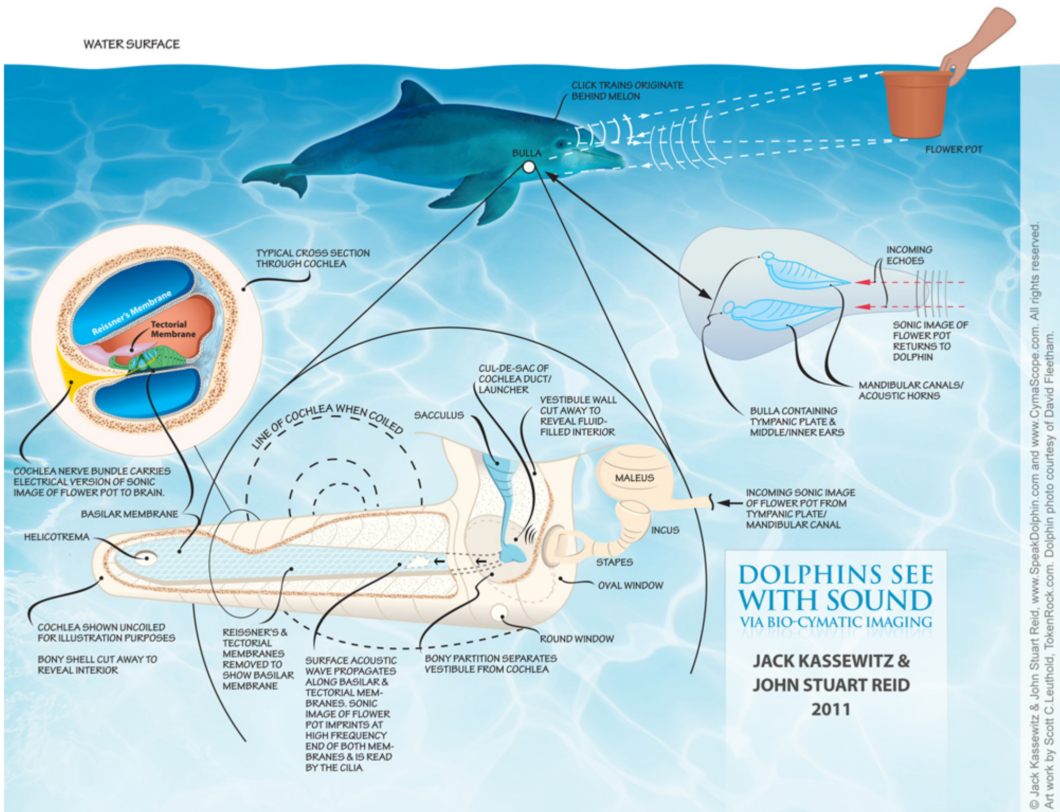
You should also be able to do all of the review questions for biological bases of language acquisition.

Be thinking about questions you'd like us to go over in the review session next time, and post/like them on the discussion post for the review session.

Extra Material

Dolphin communication

Dolphins



Kassewitz & Stuart Reid (2011): Dolphins use "Sono-Pictorial Exo-holographic Language", (SPEL)

Evidence that dolphins can communicate about novel objects in their environment via the patterns that echolocation makes when pinging off the objects.

Certainly intentional, and likely referential.
Unclear if syntax is present.

Dolphin communication

Dolphins Can Call Each Other, Not by Name, But by Whistle
http://news.sciencemag.org/sciencenow/2013/02/dolphins-can-call-each-other--no.html?ref=hp

3 samples of dolphin whistles on webpage

Whistlin' Dolphins

In these recordings, you can hear male dolphin A give his signature whistle. Male dolphin B copies A's call in the second recording; B's own signature whistle sounds very different from A's as you can hear in the third recording.

Male A

00:00 00:02

Male B Copying Male A

00:00 00:03

Male B

00:00 00:03

Credit: S. L. King, 2013

Dolphin communication

Dolphin signals seem to serve the same function as names:

"…males in an alliance retain vocal labels that are quite distinct from one another, suggesting that those calls serve a purpose similar to an individual name."

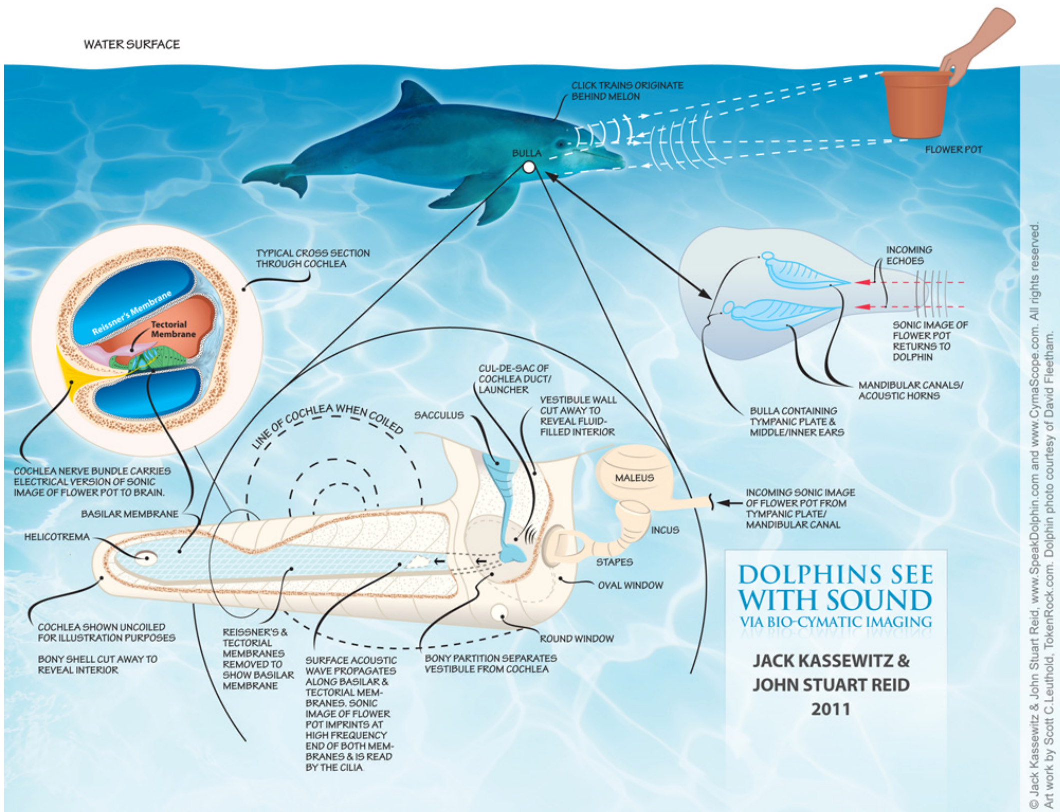
https://www.sciencedaily.com/releases/2018/06/180607112756.htm

Dolphin communication

Herzig (2013), TED Talk: Could we speak the language of the dolphins?
http://www.ted.com/talks/denise_herzing_could_we_speak_the_language_of_dolphins.html
Especially 6:07-6:50 (complexity of dolphin whistles)
8:36-9:26 (two-way communication & symbolic representation)
10:26-10:52 (dolphin requests)

Dolphin communication

Dolphins



Unclear if they have a complex combinatorial system (syntax)

Can a dolphin communicate this?

“I wish there were some better fish around.”

“Those humans are soooo annoying sometimes.”

The evolution of human language: One idea

How Human Language Could Have Evolved from Birdsong: Researchers Propose New Theory On Deep Roots of Human Speech
http://www.sciencedaily.com/releases/2013/02/130221141608.htm

Describing findings in Miyagawa, Berwick, & Okanoya 2013

Human language's deep origins appear to have come directly from birds, primates
http://www.sciencedaily.com/releases/2014/06/140611102209.htm

Describing theory in Miyagawa, Ojima, Berwick, & Okanoya 2014

The evolution of human language: One idea

Human language = combination of two communication forms found elsewhere in the animal kingdom

- elaborate songs of birds

- more utilitarian, information-bearing expressions seen in other animals

"When something new evolves, it is often built out of old parts"
- Robert Berwick

The evolution of human language: One idea

Sample utterance: “Did Sarah trick Hoggle?”

Two layers of human language

Lexical layer

= invariant core elements (Sarah, trick, Hoggle)

[animal equivalents: bee dance components, primate calls, bird calls]

Expression layer

= rearrangement of core pieces to convey different meanings

Sarah tricked Hoggle. Did Sarah trick Hoggle?

How did Sarah trick Hoggle?

[animal equivalent: bird song melodies, which rearrange pieces, but usually don’t change the overall meaning of the song]

Linking nativist ideas and language evolution

Faculty of the Language Broad (FLB: quantitative difference)

Humans and some animals have the lexical layer in their communication systems.

Humans and some animals have something like the expression layer in their communication systems.

Faculty of the Language Narrow (FLN: qualitative difference)
Integration Hypothesis of Miyagawa et al. (2013, 2014)**:**
Only humans have the ability to combine both layers in their communication systems.