

# Communication – bird song



# Ontogeny of communication

Many examples of animal communication are innate



Bird song is a noteworthy exception

# How do birds learn to sing?

Peter Marler

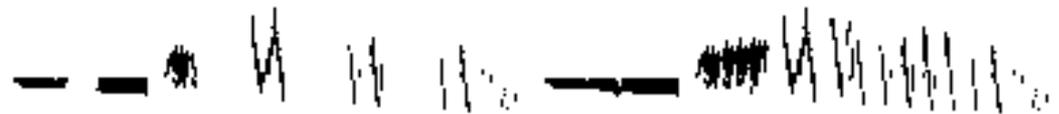
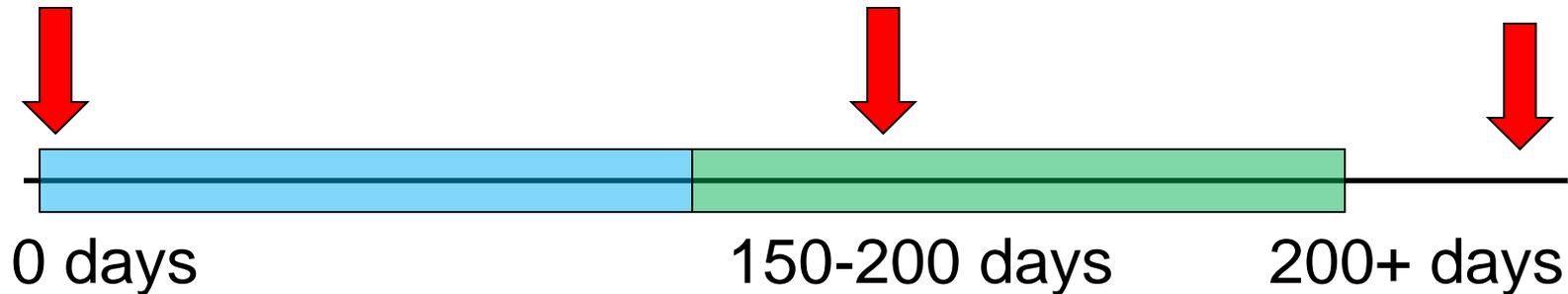


white-crowned sparrow

Begins plastic, eventually crystallized

Exposed to conspecific song

Sings 'subsong'

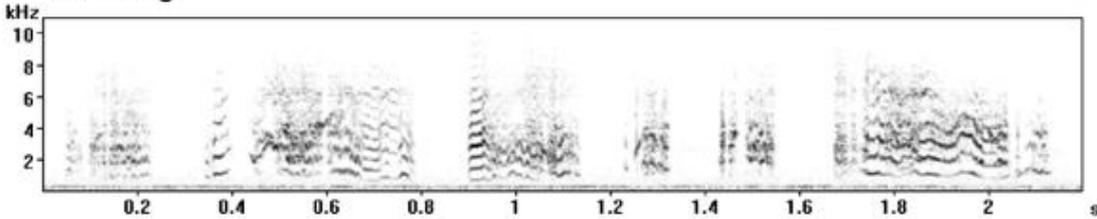


Sensory (memorization) phase

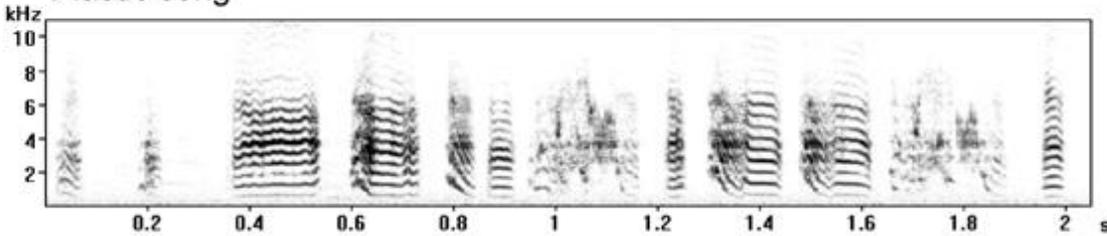
Sensorimotor phase

# How do birds learn to sing?

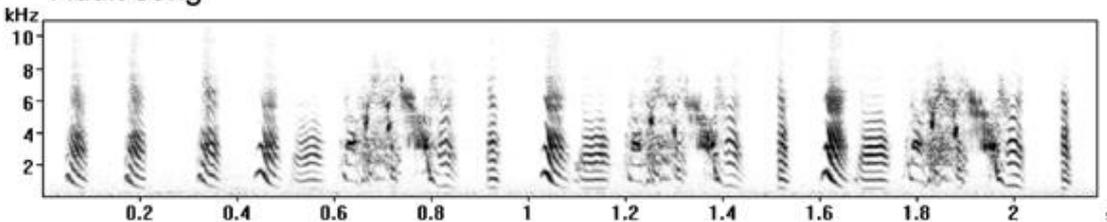
Subsong



Plastic song



Adult song



- Subsong analogous to babbling
- Many song elements practiced but not crystallized



# How do birds learn to sing?



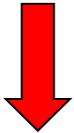
white-crowned  
sparrow

In some rare cases, isolation  
still leads to normal song



gray catbird

If reared  
in isolation

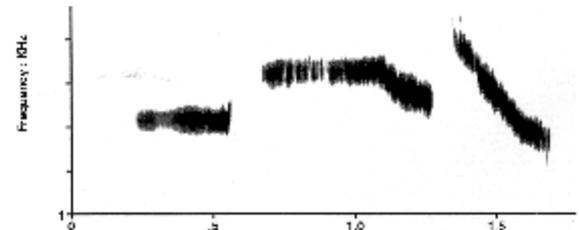


0 days

Progresses through song  
learning, but song abnormal  
compared to conspecifics



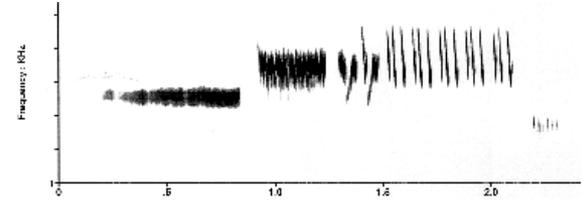
150-200 days



# Role of auditory feedback

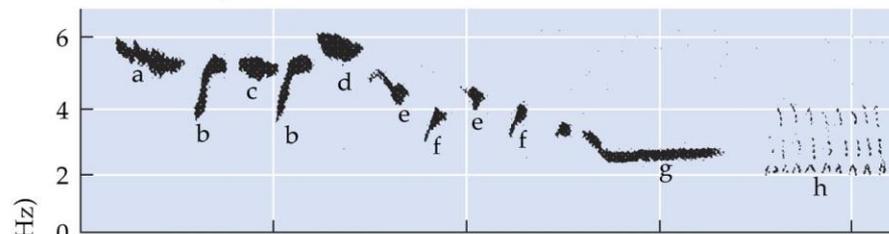


white-crowned  
sparrow

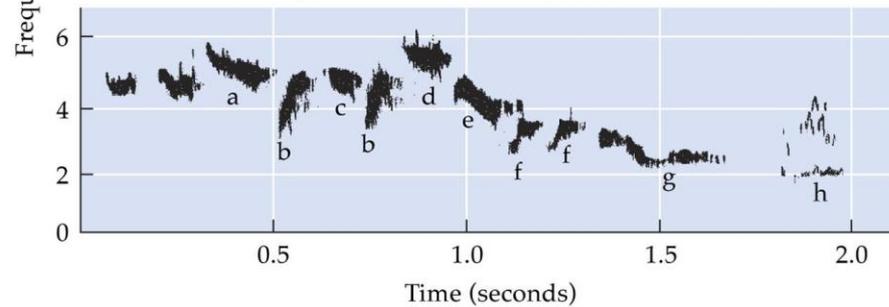


normal white-crowned  
sparrow song

(A) Strawberry finch

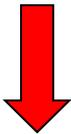


(B) White-crowned sparrow



Hetero-  
specific  
song

Hetero-  
specific  
tutor



0 days

150-200 days

# Role of auditory feedback



white-crowned  
sparrow

Deafened during  
early development



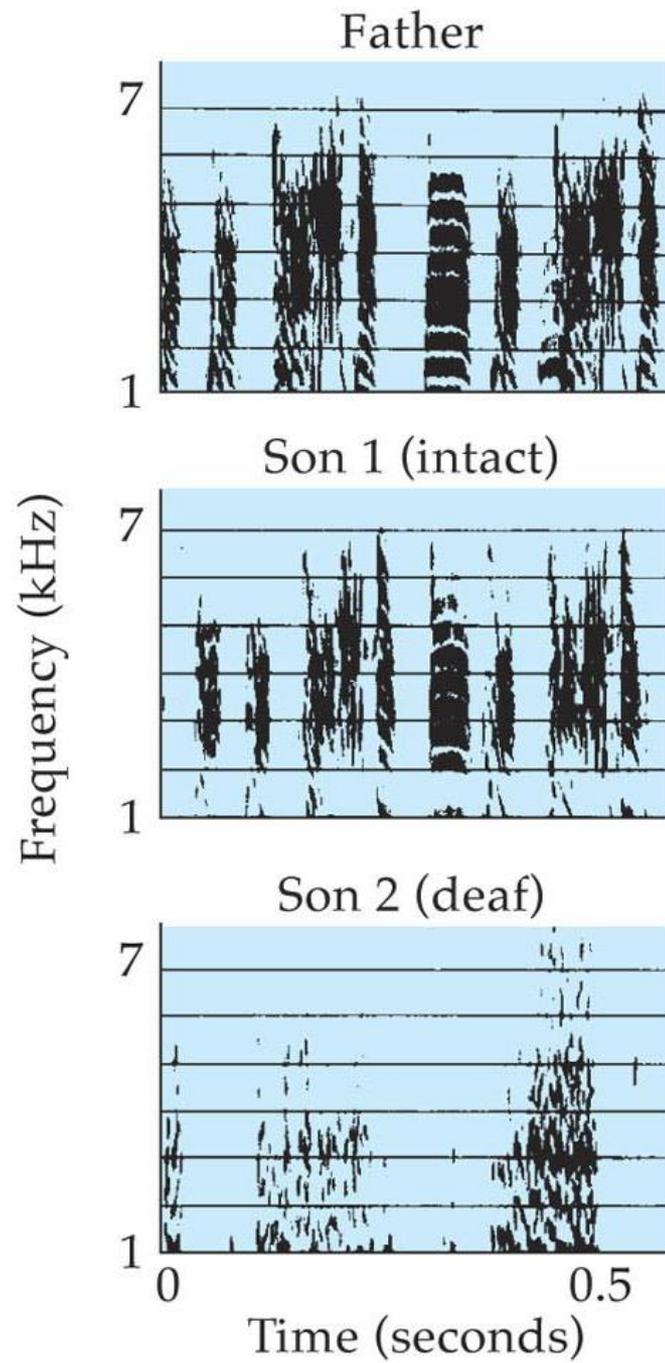
0 days

Never progresses  
beyond early subsong



150-200 days





# Role of auditory feedback



white-crowned  
sparrow

Exposed to  
conspecific song

Never progresses  
beyond early subsong



0 days

150-200 days

150-200 days



Deafened





# Putting it all together



White-crowned sparrows tutored with tapes of songs divided into five segments

E, D, C, B, A



Unable to string  
sequence together

DE, CD, BC, AB



ABCDE

BA, CB, DC, ED



EDCBA

Birds may learn songs by breaking down into phrases

# Putting it all together



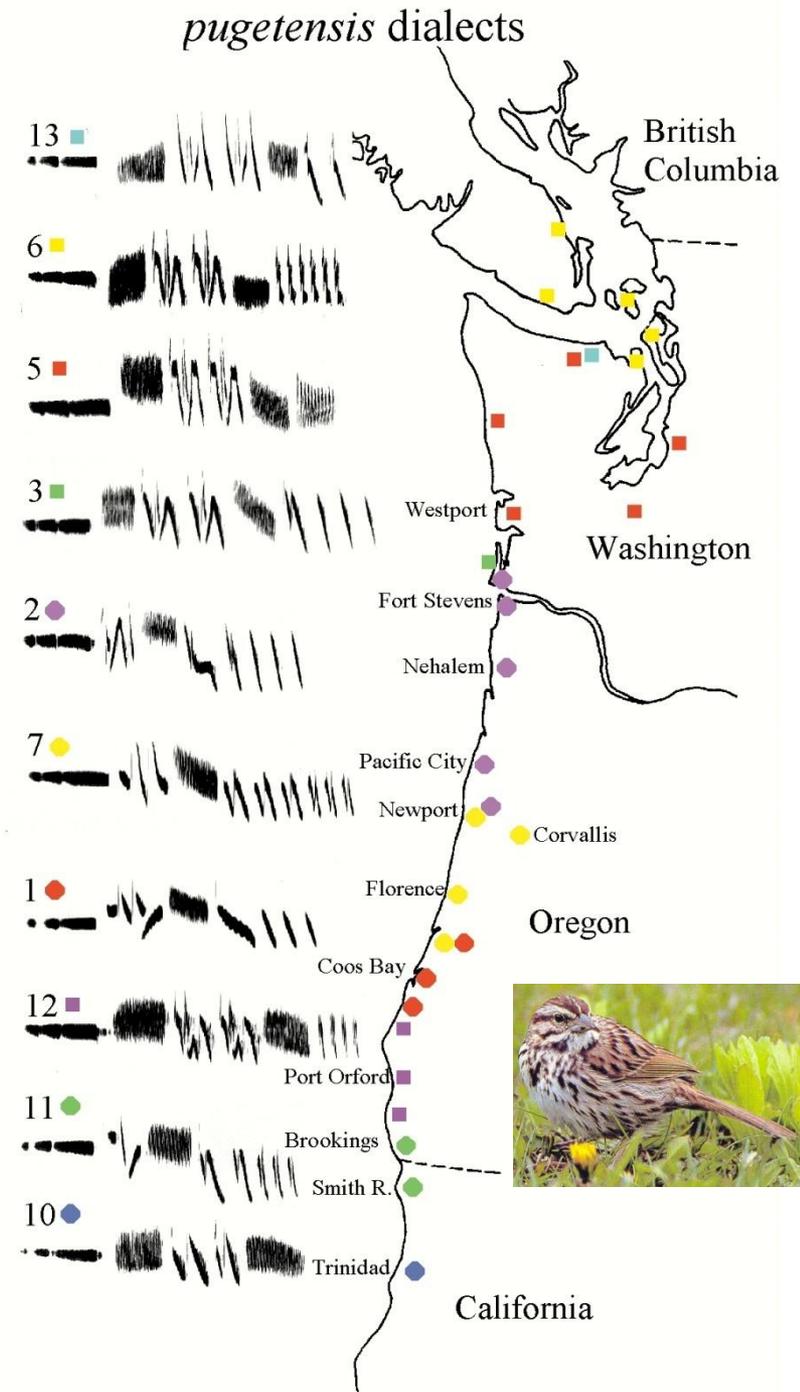
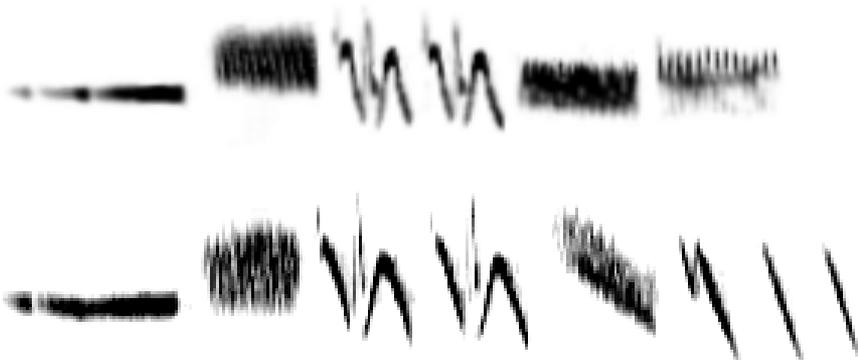
↓  
Regular oscillation in firing of RA neurons

↓  
Regular oscillations + bursts of activity in RA

# Geographic variation

Considerable evidence of vocal dialects

Sonograms of siblings caught 200 km apart

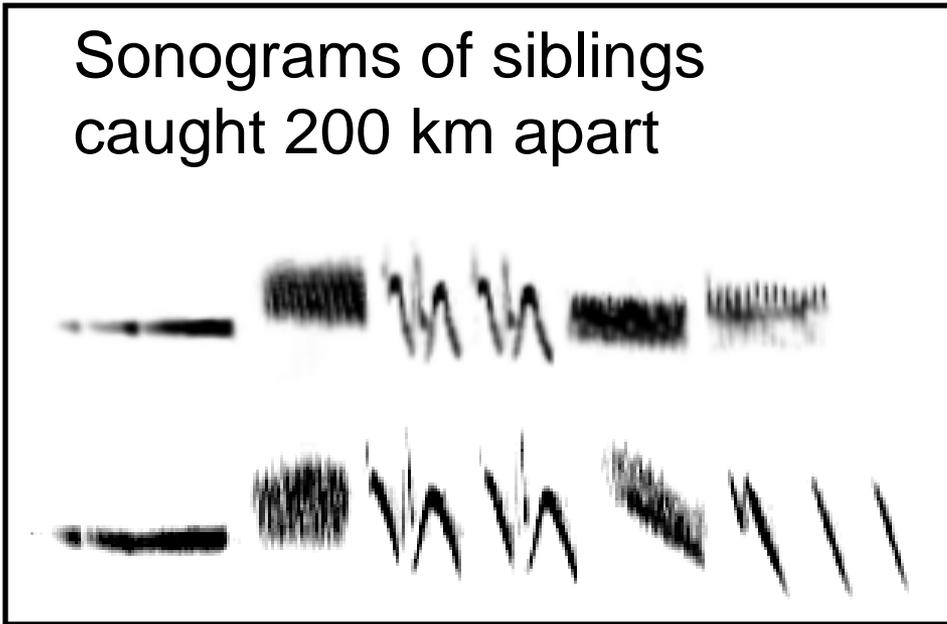


# So when is song learned?

Vocal dialects suggest variation in learning period

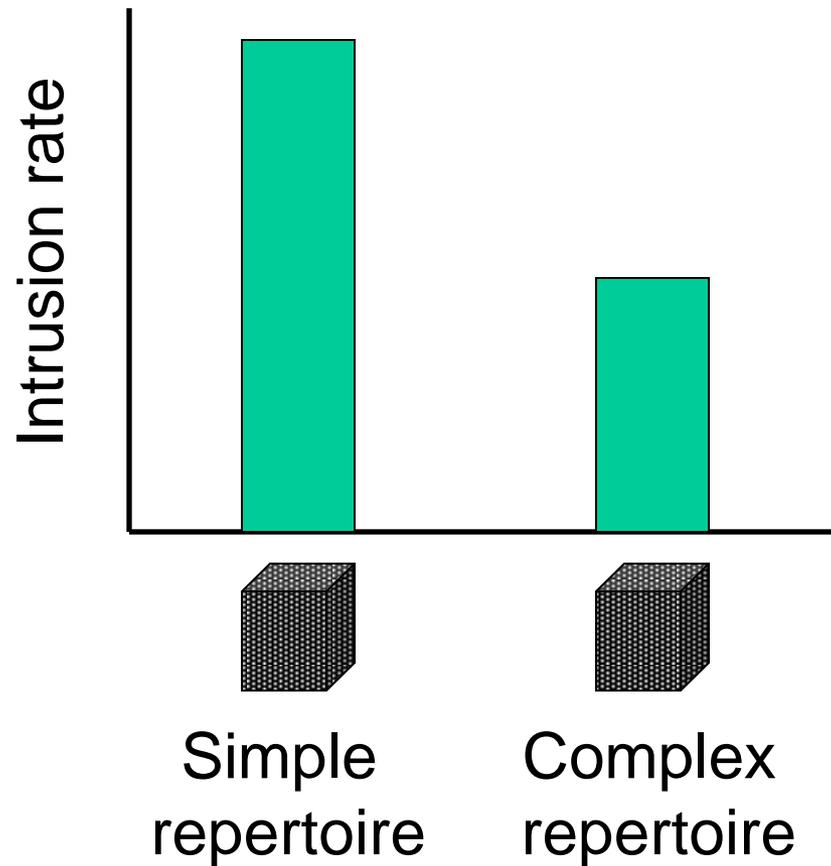
Birds now classified as either  
**open-ended** or **close-ended** learners

Sonograms of siblings  
caught 200 km apart



# Open-ended learning

Social factors: the advantages of a large repertoire



# Conclusions

- Prerequisites for normal adult song
  - Hear conspecific song during sensory period
  - Able to practice during sensorimotor period
- Acquisition of song elements occurs outside song-learning period

