

# *Sonification - Sound of Science*

## *VU, WS 2013*

### *Lecture 3 - Auditory Scene Analysis*

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# Gestalt Psychology

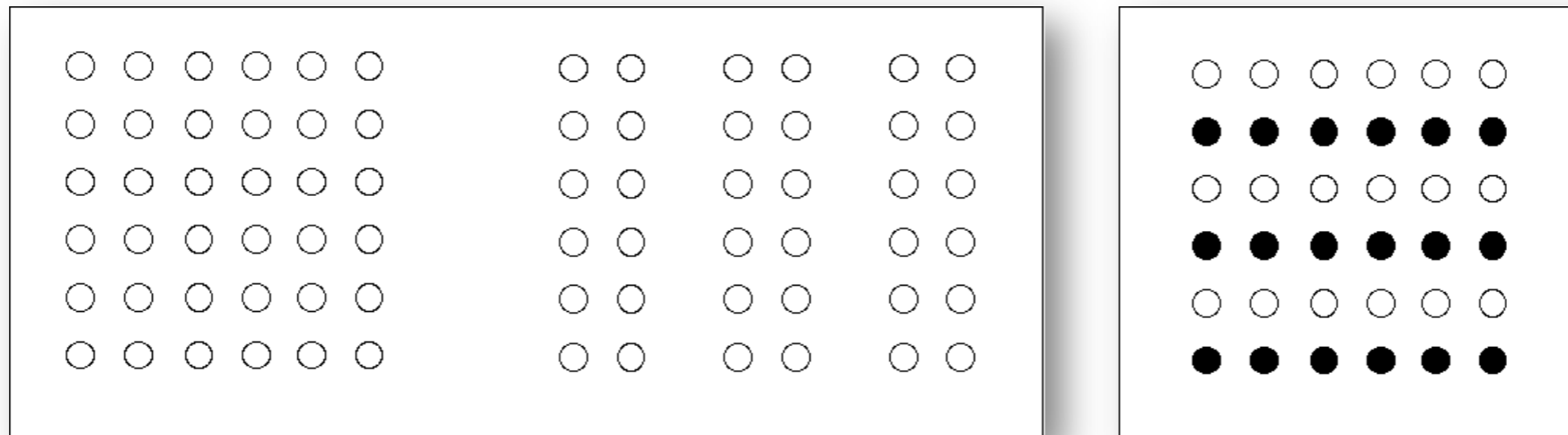
Kurt Koffka: *The whole is other than the sum of the parts.*

- emergence
- proximity and similarity
- reification
- context
- organization
- common fate (continuation and completion)

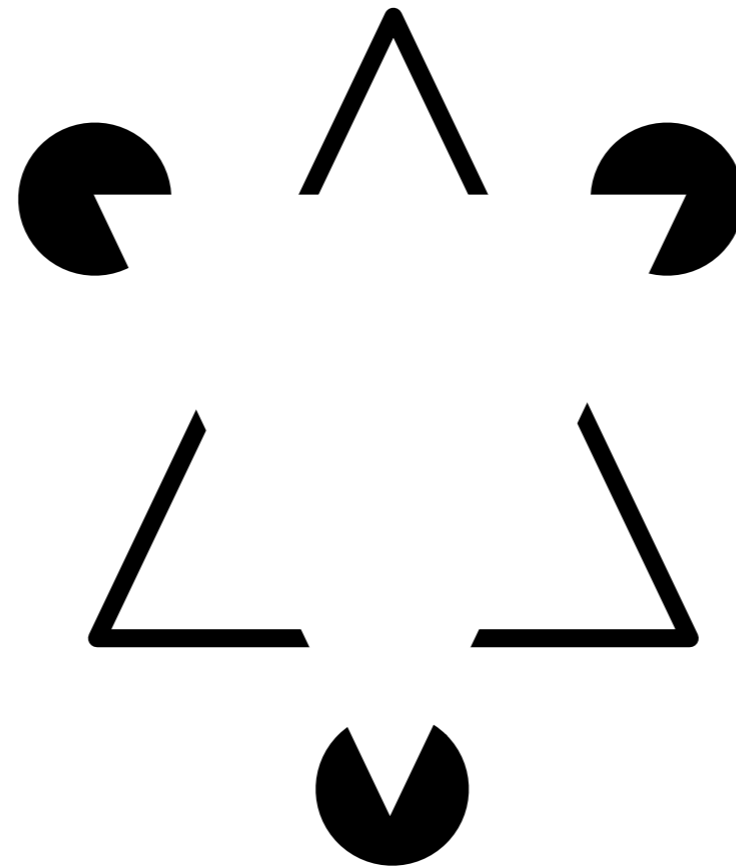
# Gestalt Psychology: Emergence



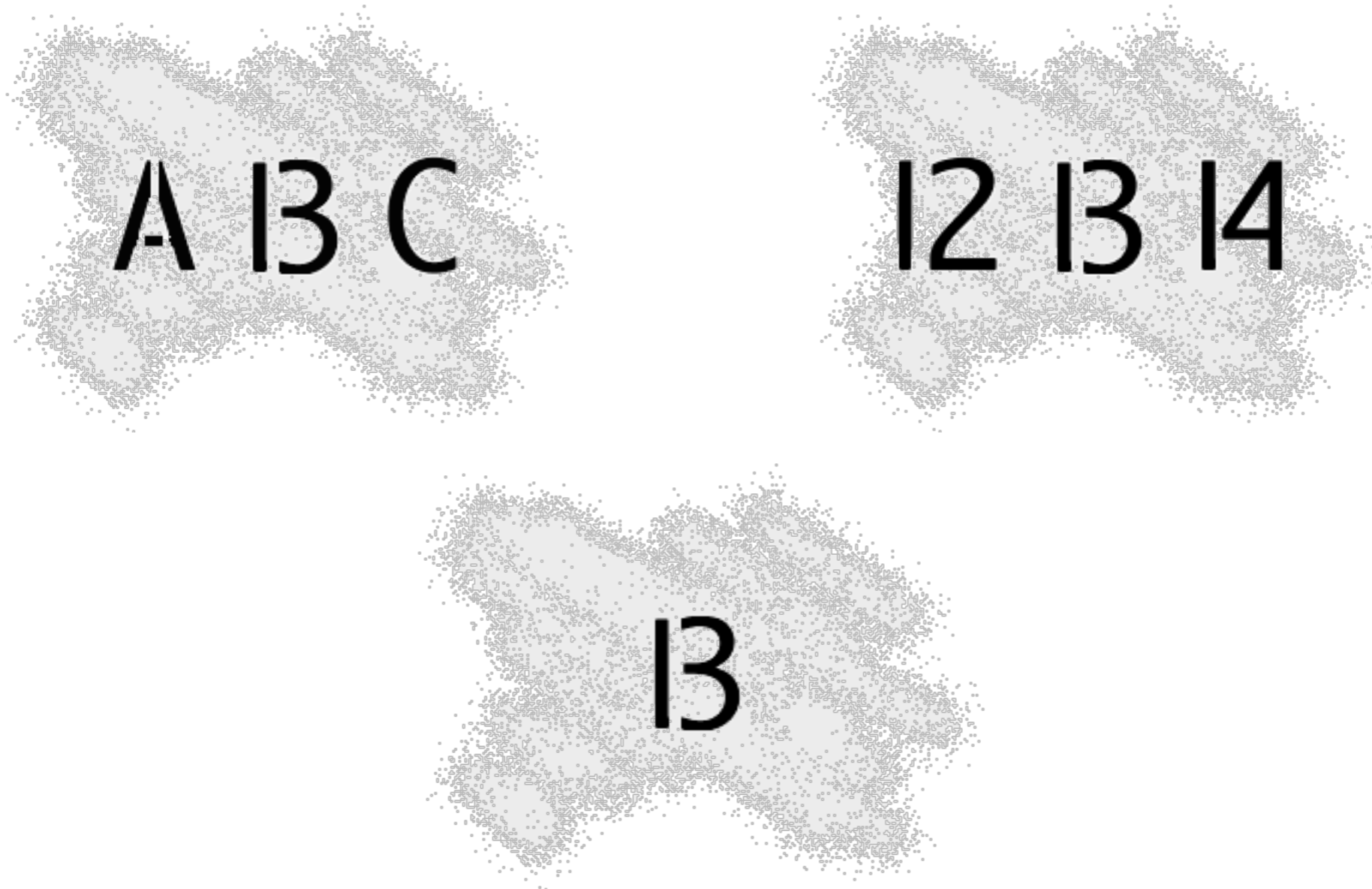
# Gestalt Psychology: Proximity and Similarity



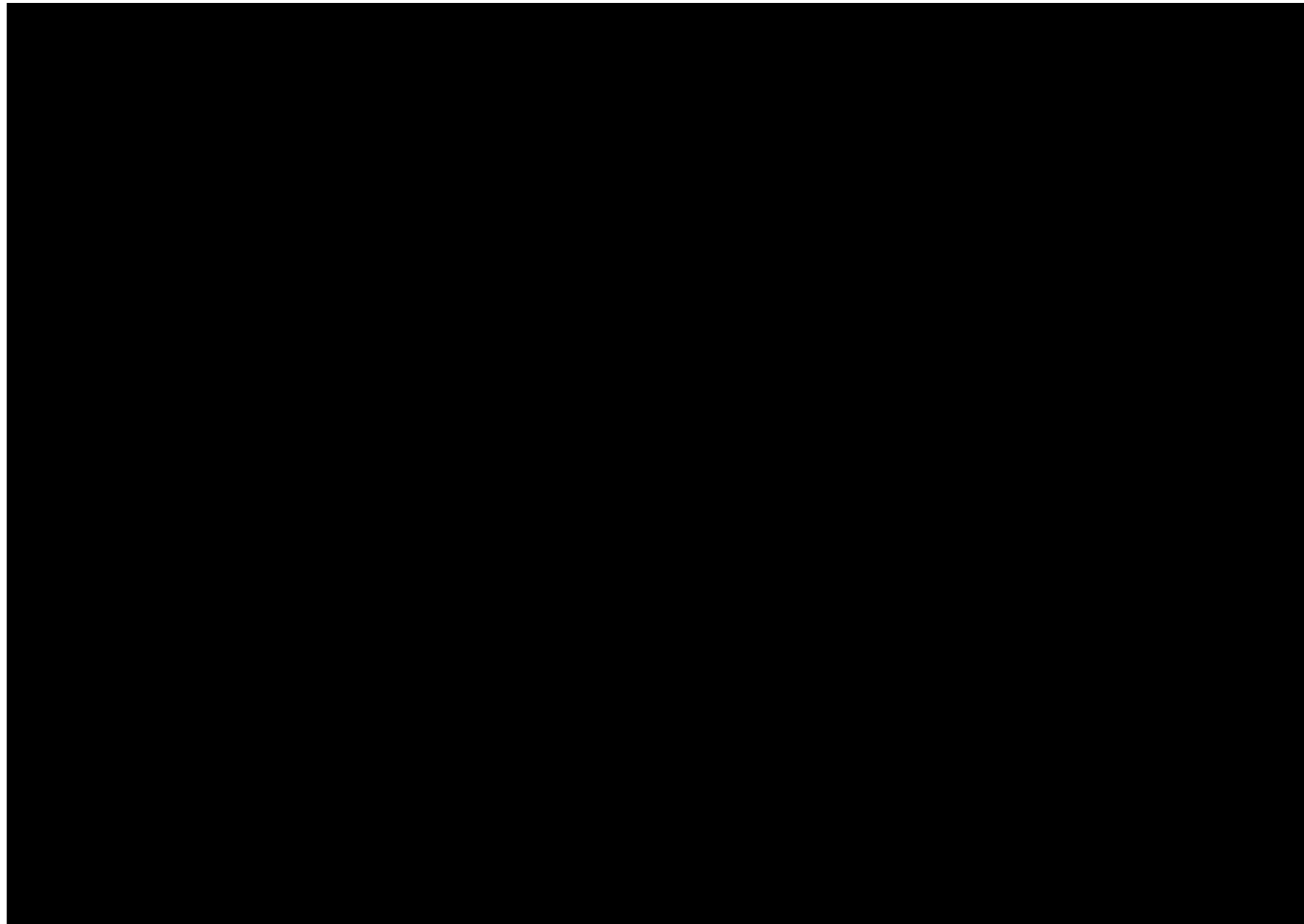
# *Gestalt Psychology: Continuation and Completion*



# Gestalt Psychology: Context

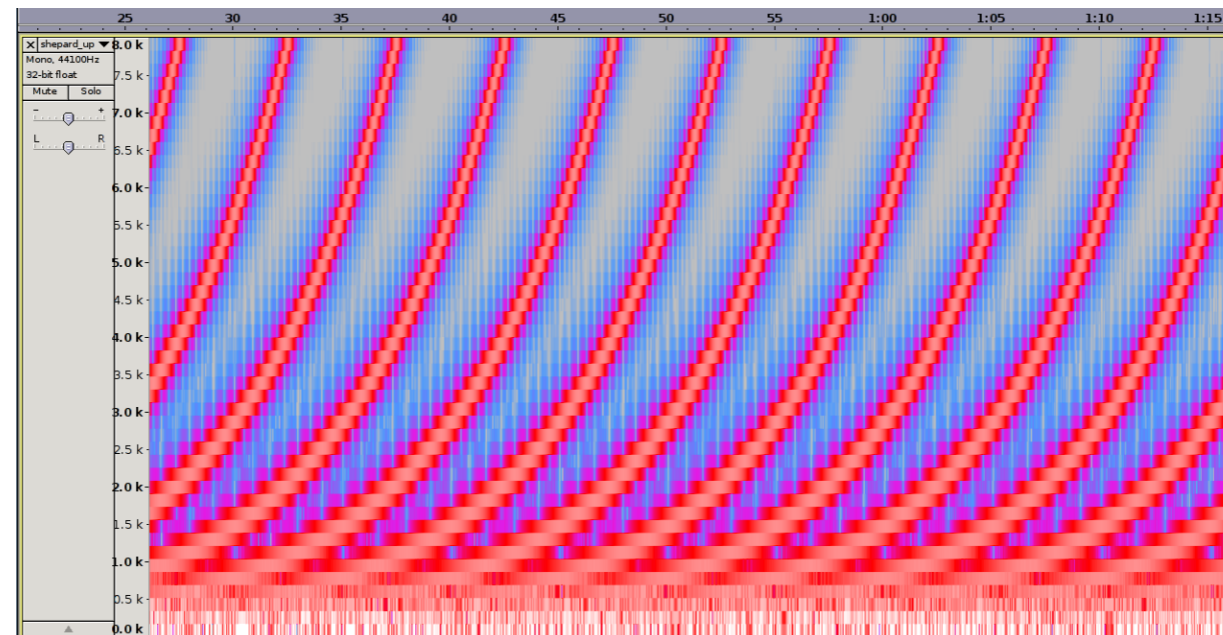


# *Gestalt Psychology: Organization*



# Auditory Illusion

Sheperd Scale: superposition of sine waves separated by octaves.





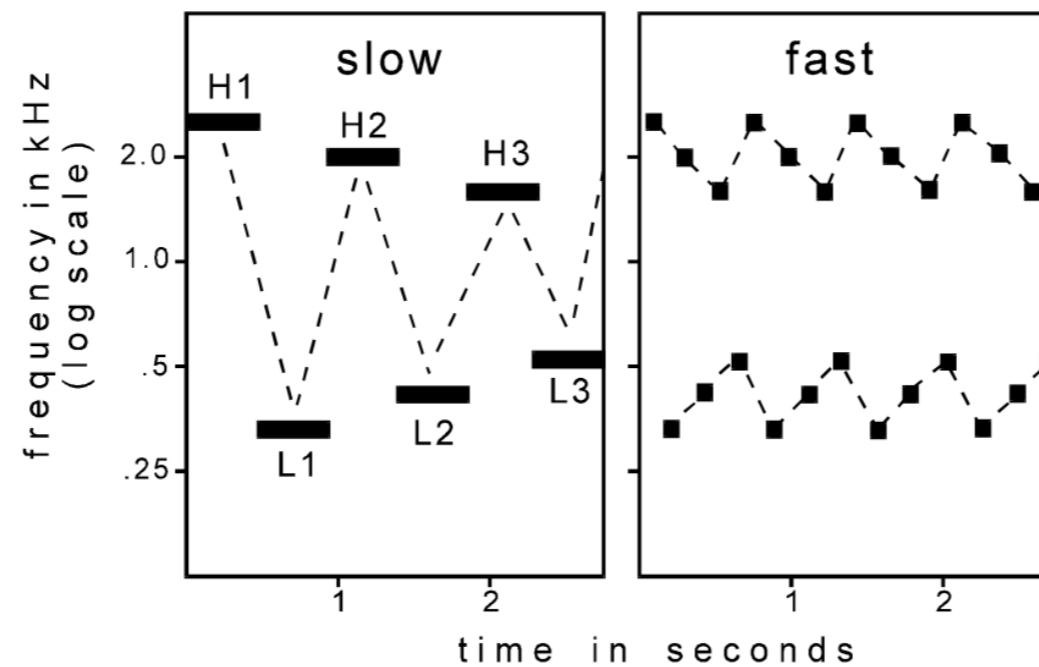
# *Auditory Scene Analysis*

- organizing sound into perceptually meaningful elements. (streams)
- Segregation (sequential grouping, across time, cocktail party effect)
  - Integration ( simultaneous grouping, across frequency)

# Auditory Scene Analysis

## Sequential Integration I

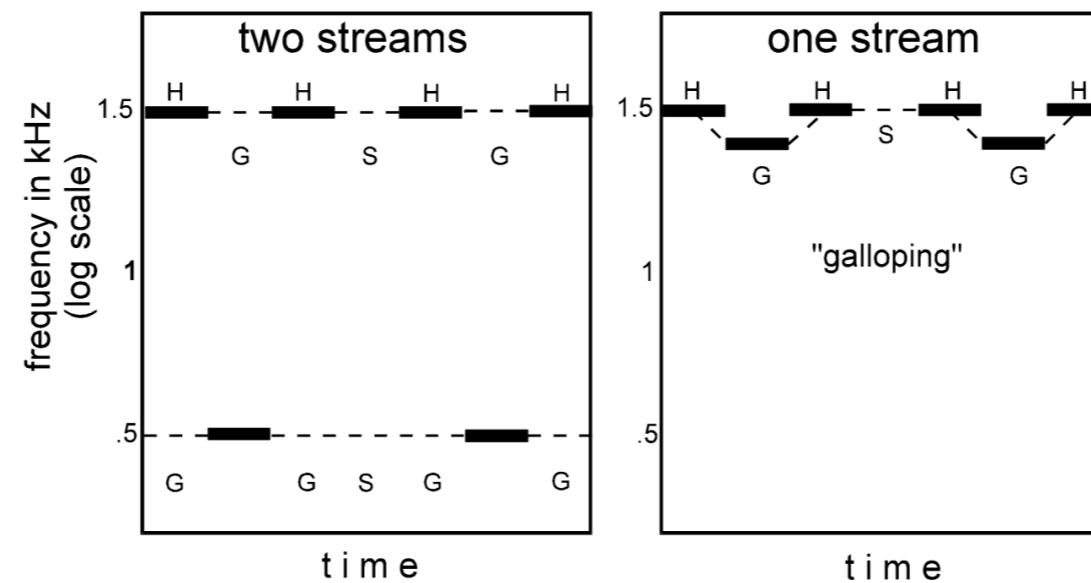
Effects of Tempo and Frequency in sequences



# Auditory Scene Analysis

## Sequential Integration I

The loss of rhythmic information as a result of stream segregation.



# Auditory Scene Analysis Sequential Integration I

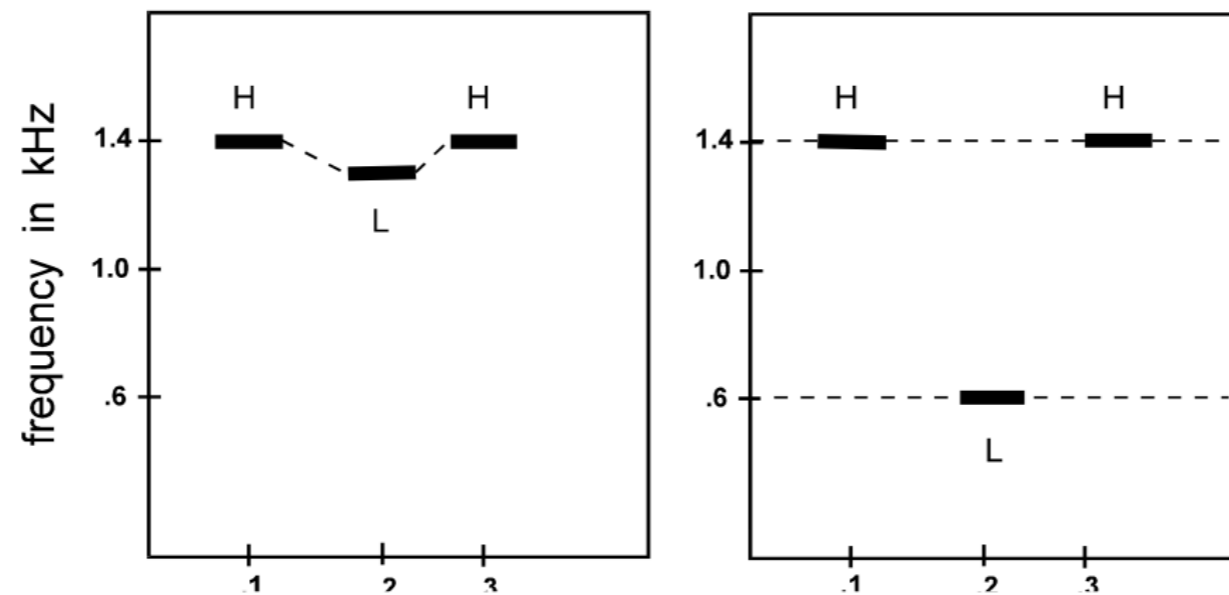
Segregation of high notes from low ones  
in a sonata by Telemann.



# Auditory Scene Analysis

## Sequential Integration II

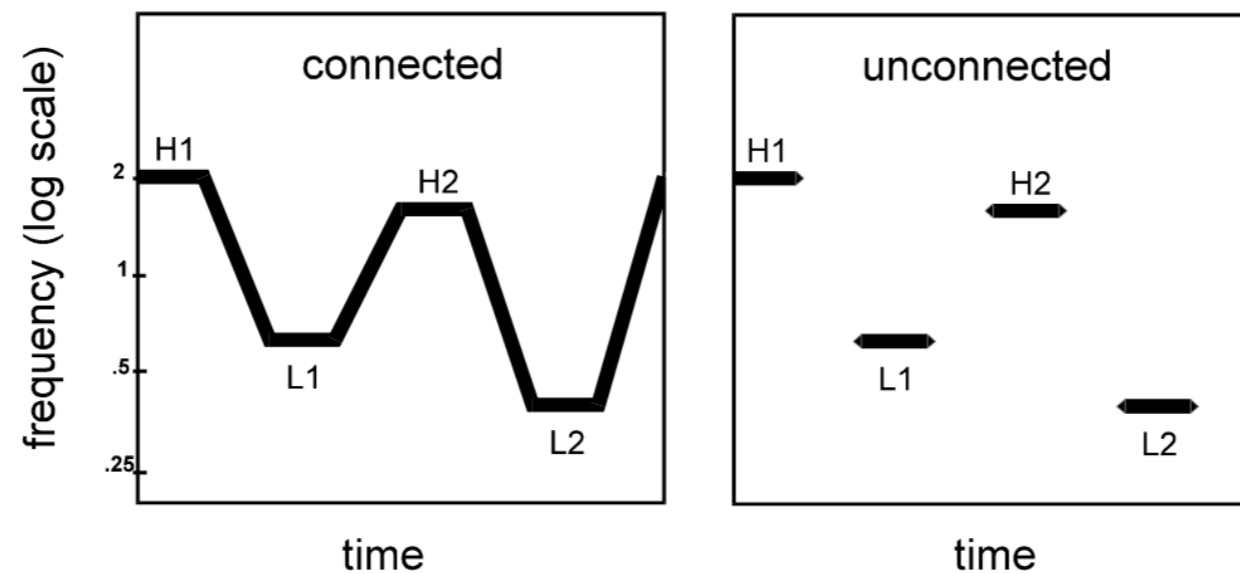
Sequential Integration: The effects of stream segregation on the judgment of timing.



# Auditory Scene Analysis

## Sequential Integration III

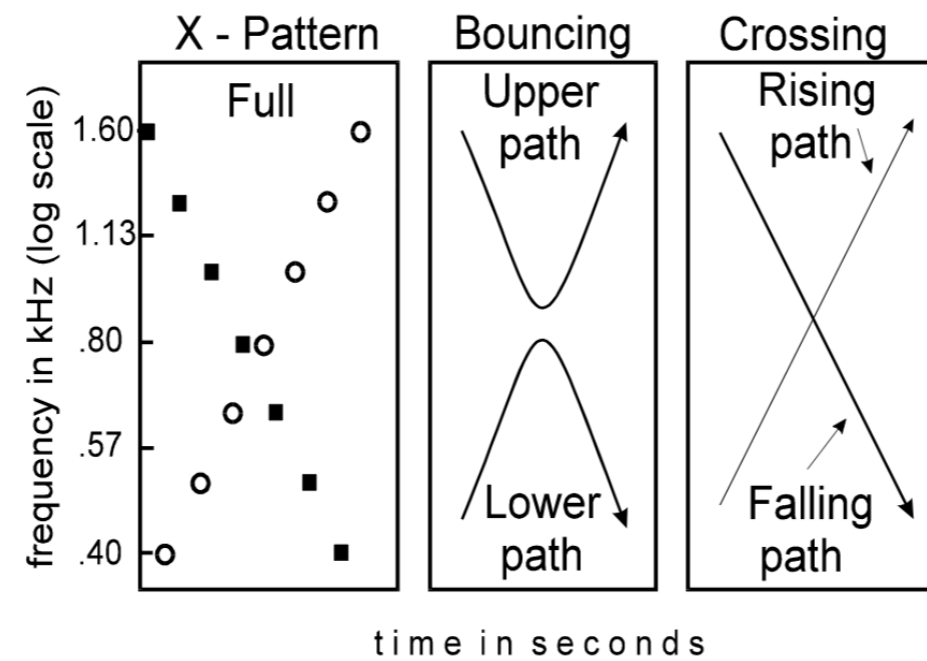
Effects of connectedness (“Glissandi”) and Timbre



# Auditory Scene Analysis

## Sequential Integration III

Failure of crossing trajectories to cross perceptually.

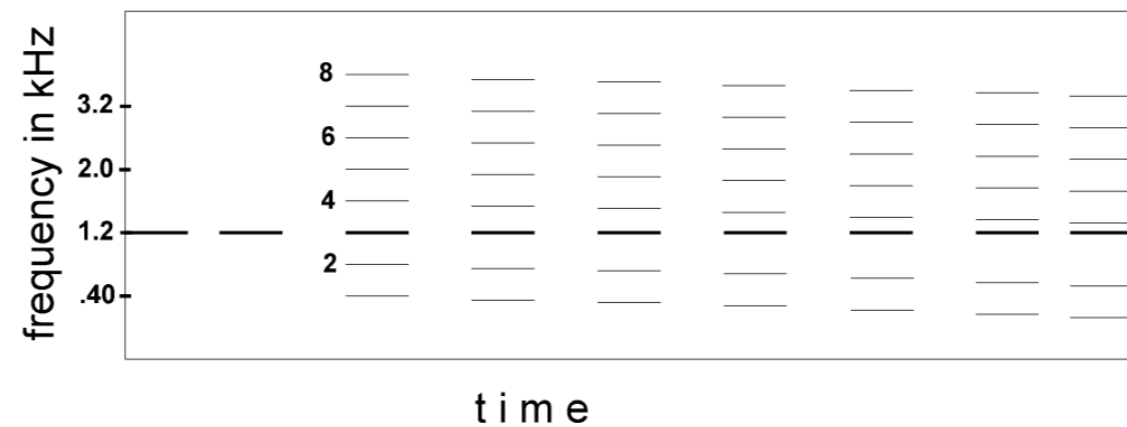


# Auditory Scene Analysis

## Spectral Integration

Connecting partial tones in the whole

Isolation of a frequency component based on mistuning.



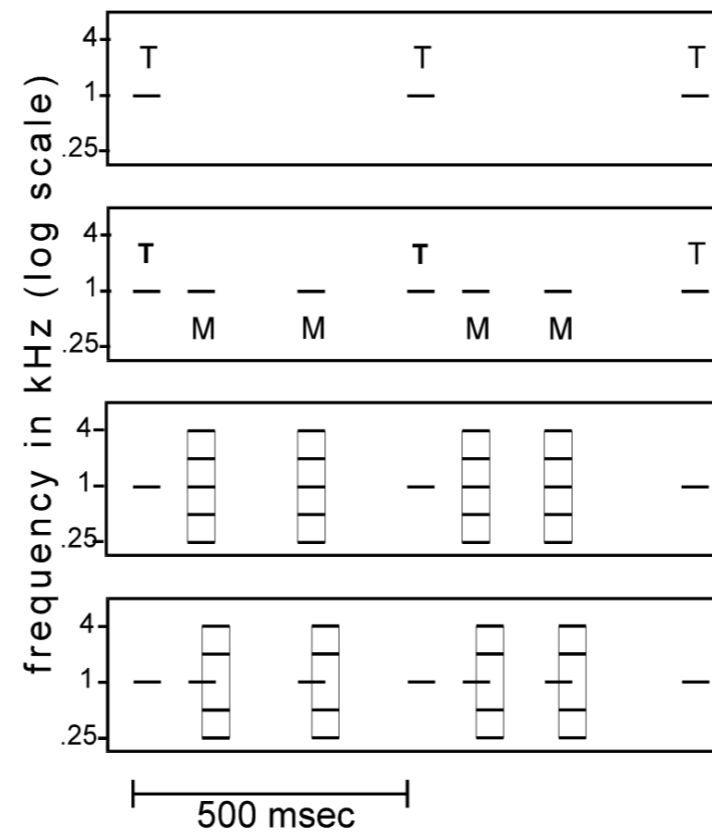


# Auditory Scene Analysis

## Spectral Integration

Connecting partial tones in the whole

Rhythmic masking release.

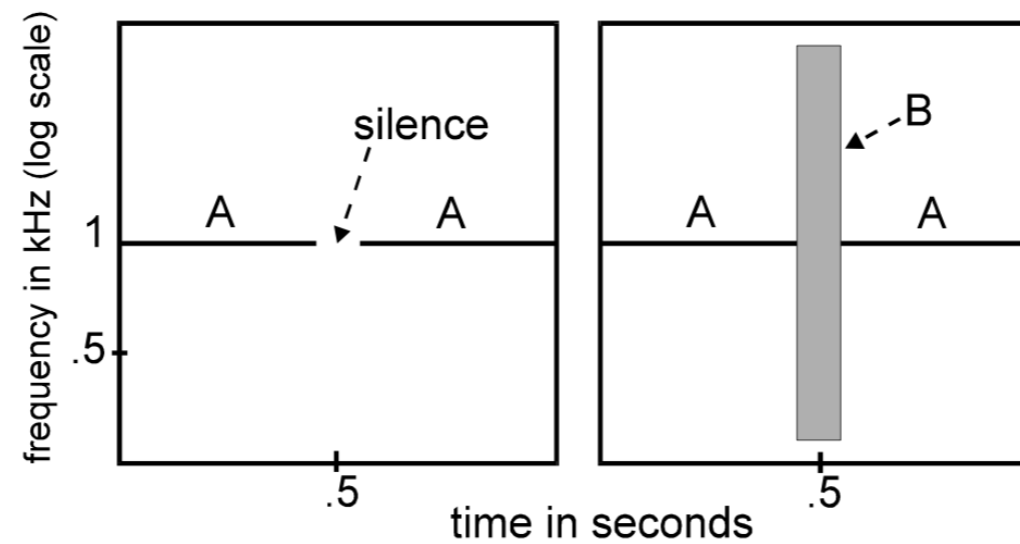


# Auditory Scene Analysis

## Old + new heuristic I

Interpolation of tones and their frequency changes

Apparent continuity

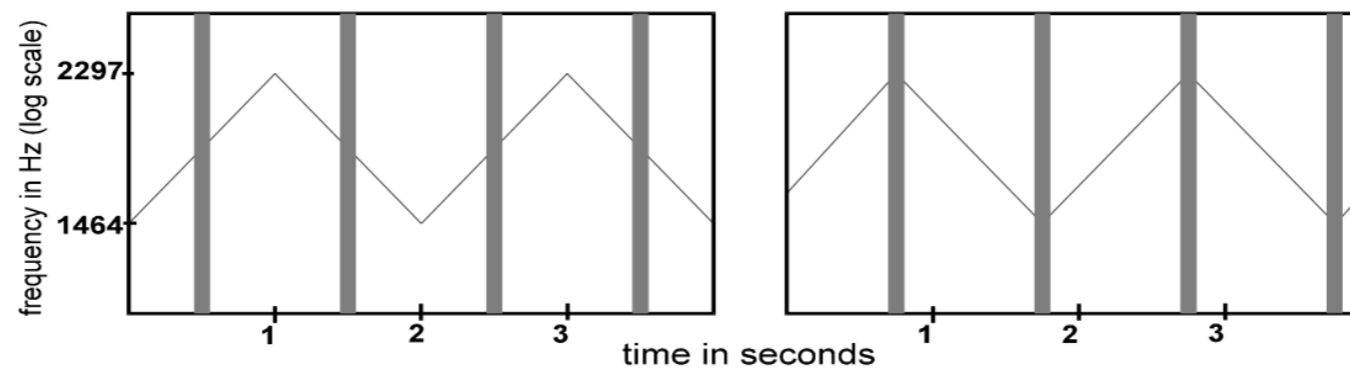


# Auditory Scene Analysis

## Old + new heuristic I

Interpolation of tones and their frequency changes

Perceptual continuation of a gliding tone through a noise burst.



# *Auditory Scene Analysis* *Old + new heuristic II*

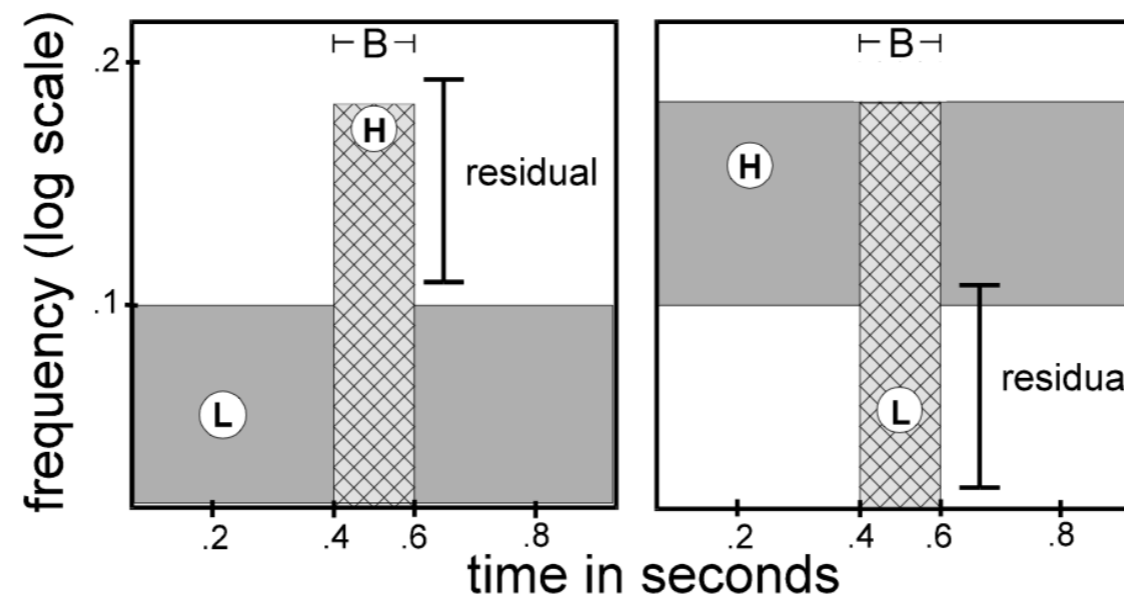
The picket-fence effect with speech



# Auditory Scene Analysis

## Old + new heuristic II

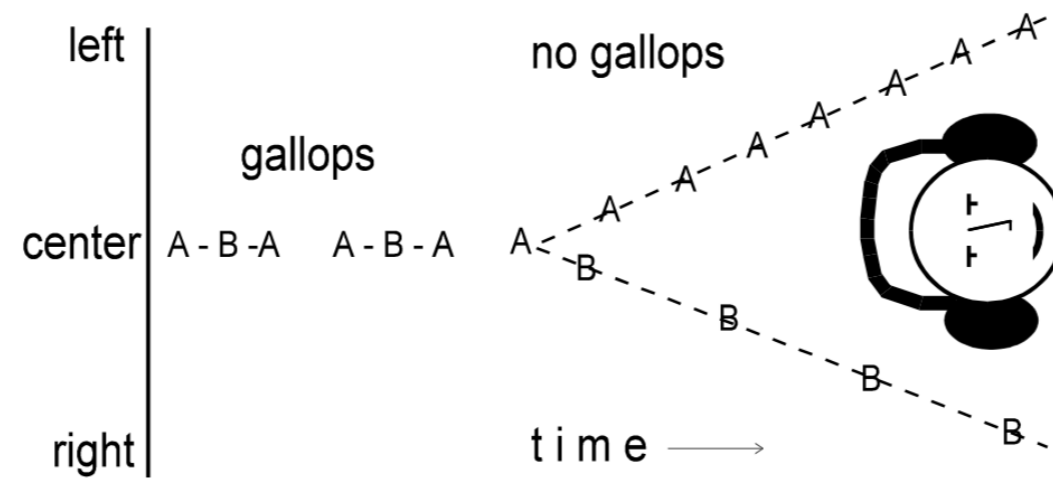
Capturing a band of noise from a wider band.



# Auditory Scene Analysis

## Spatial correspondence

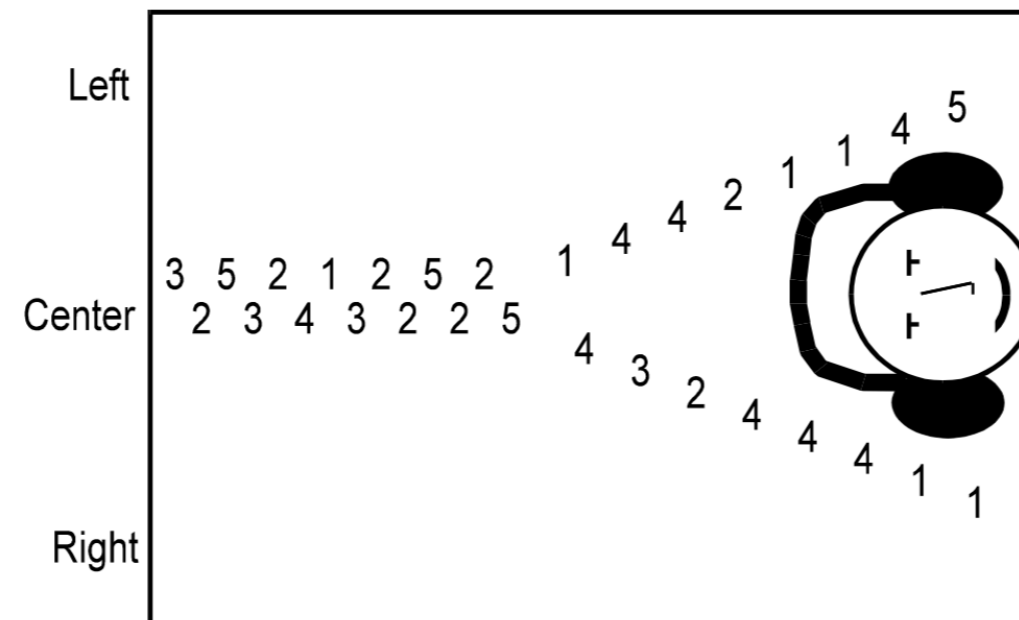
Streaming by spatial location.



# Auditory Scene Analysis

## Spatial correspondence

Effect of a location difference of parts  
in African xylophone music.



## *Literature to read for next week*

- [1] Hawley, M. L., Litovsky, R. Y., & Culling, J. F. (2004). The benefit of binaural hearing in a cocktail party: effect of location and type of interferer. *Journal of the Acoustical Society of America*, 115, 833–843.
- [2] Sussman, E., Winkler, I., & Schröger, E. (2003). Top-down control over involuntary attention switching in the auditory modality. *Psychonomic Bulletin & Review*, 10(3), 630–637.
- [3] Smith, D. R., & Walker, B. N. (2005). Effects of auditory context cues and training on performance of a point estimation sonification task. *Applied Cognitive Psychology*, 19(8), 1065–1087.