**Richard Widdess** 

# Cognitive research and South Asian music





Dāphā group, Dattātreya temple, Bhaktapur (2012)



Dāphā group, Dattātreya temple, Bhaktapur (2012)



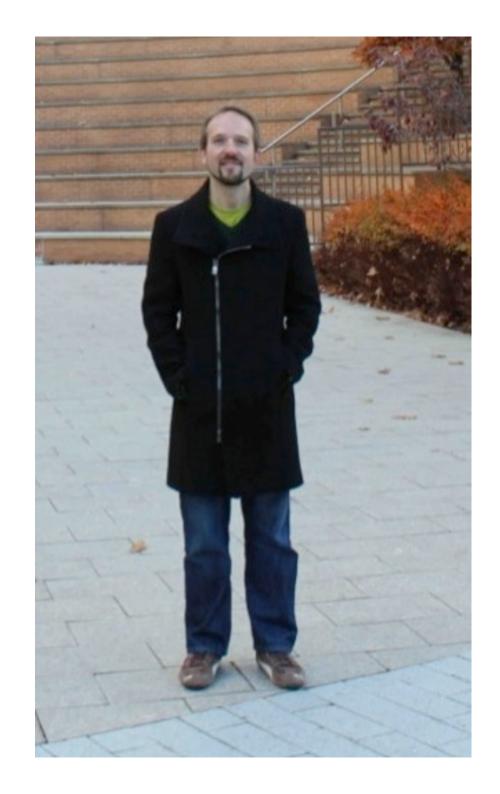




1. Implicit learning

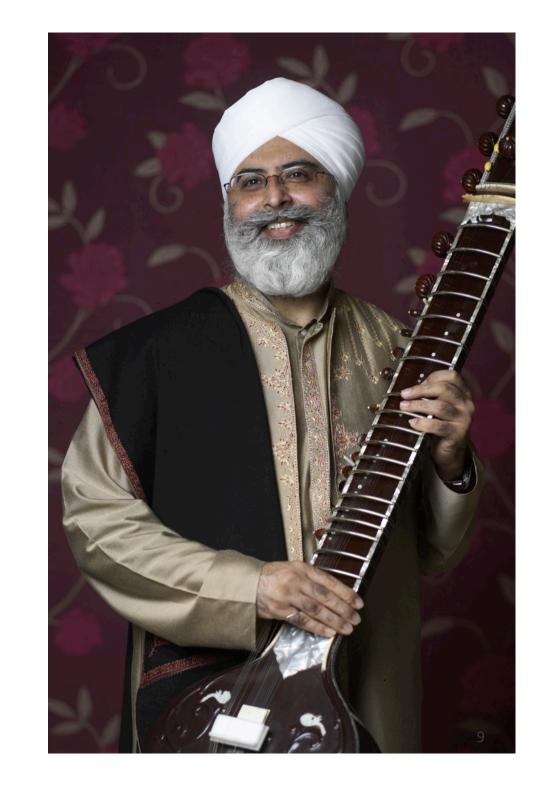
2.Recursion

3. Cognitive models and "flow"



Martin Rohrmeier

Technical University, Dresden



Dharambir Singh MBE

- The whole point of understanding music as music is that we carry in our bodies the cognitive equipment to transcend cultural boundaries and resonate at the common level of humanity."
  - Blacking, J. 1983. "New Babel or New Jerusalem: Cosmic consciousness or cultural apartheid?"
    Studies in Music 17:9–22

# Implicit learning of rāga grammar





## Rāgas Torī and Multānī

- Rāgas Torī and Multānī
- Scale:



# Pitch hierarchy

Torī:

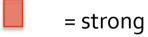
- 1
- b3 #4
- 5
- b6
- 7
- 1'

Multānī:

- 1
- b<sub>2</sub>

b2

- b3 #4
- 5
- b6
- 7
- 1'

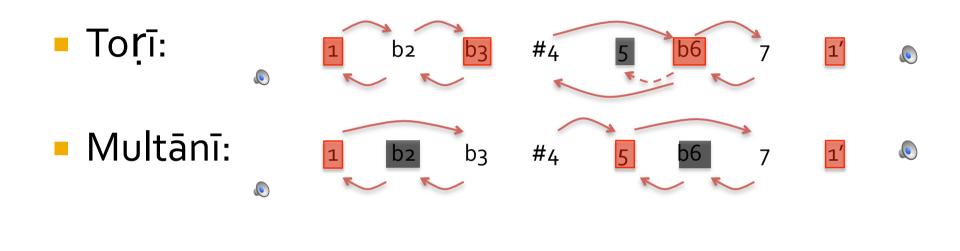




= weak

#### Melodic movement

= strong



= weak

# ālāp and jor

- ālāp
  - no clear pulse

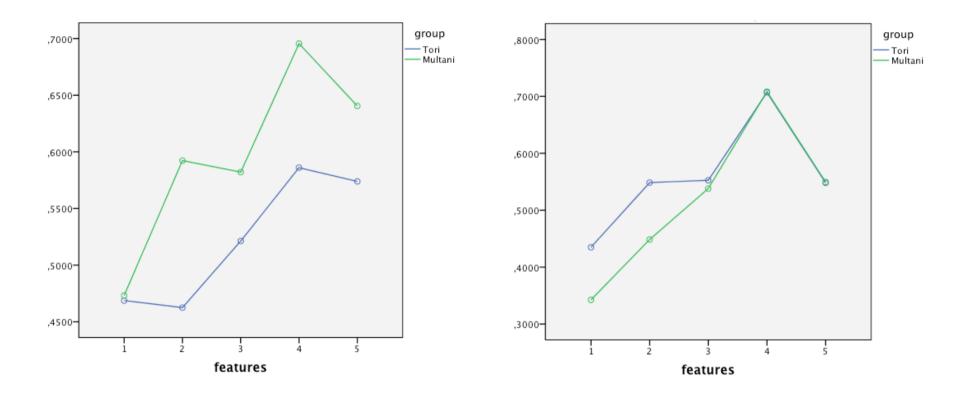


rāga To<u>r</u>ī

- jor
  - clear pulse



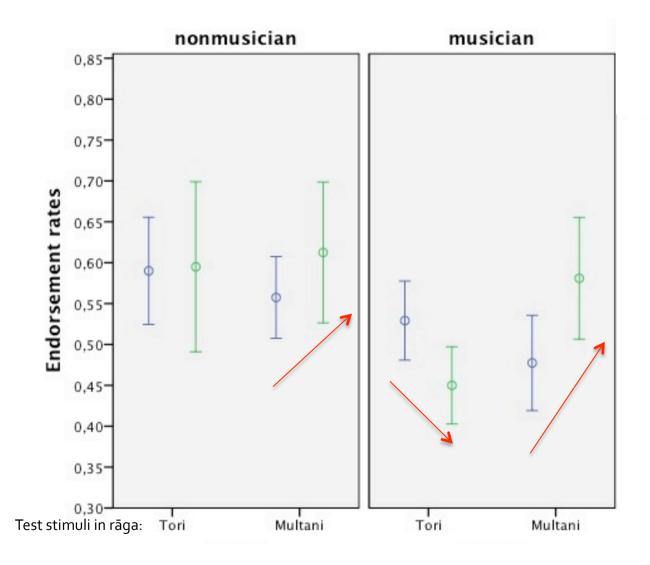
rāga To<u>r</u>ī



Endorsement of Multānī extracts

Endorsement of Torī extracts

Differing responses of Groups A (Toṛī) (blue) and B (Multānī) (green) to extracts in rāga Multānī (left) and Toṛī (right)



Differing responses of musicians and non-musicians in Groups A and B

blue = Group A (Toṛī) green = Group B (Multānī)

o = mean

I = standard deviation

Error bars: +/- 2 SE

#### Conclusions

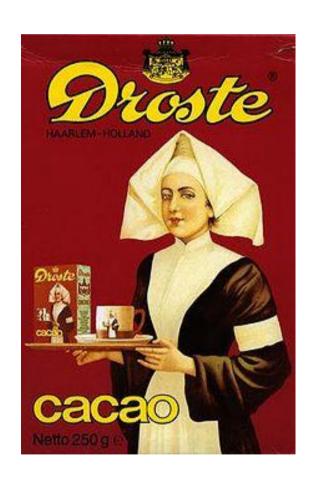
- Musicians and non-musicians both learned features of an unfamiliar melodic grammar.
- They did so implicitly.
- They acquired judgement knowledge.
- They did so rapidly.
- They did so on the basis of ecologically valid material.

## Recursion in Indian music



#### Recursion

- Embedding of one structure inside another, especially within a structure of the same kind
- "a procedure that calls itself, or...a constituent that contains a constituent of the same kind"
  - Pinker and Jackendoff (2005)

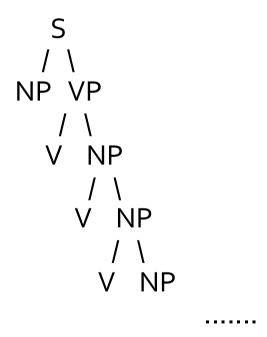


# Recursion in language

The dog bit the cat.

#### Tail recursion

The dog bit the cat that chased the squirrel that climbed the tree...



## Centre embedding

The cat the dog bit chased the squirrel.

### Centre embedding

- The cat the dog bit chased the squirrel.
- The squirrel the cat the dog bit chased climbed the tree.

## The faculty of language

- The faculty mediating human communication appears remarkably different from that of other living creatures; ... the human faculty of language appears to be organized like the genetic code — hierarchical, generative, recursive, and virtually limitless with respect to its scope of expression."
  - Hauser, Chomsky and Fitch, "The Faculty of Language: What Is It, Who Has It, and How Did It Evolve?", Science 298 (2002)

## Recursive thought

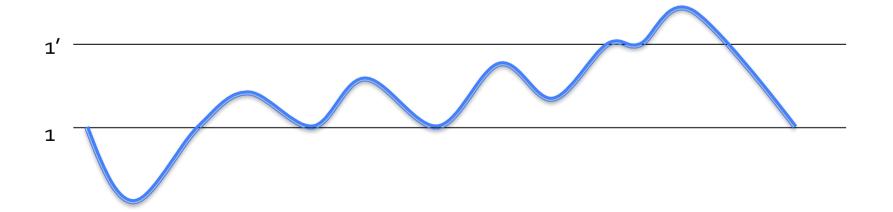
- "[Recursion is] the primary characteristic that distinguishes the human mind from that of other animals. It underlies our ability not only to reflect upon our own minds, but also to simulate the minds of others. It allows us to travel mentally in time, inserting consciousness of the past or future into present consciousness."
  - Michael Corballis: The Recursive Mind 2011

#### Recursion in music

- "grouping structure is recursive: that is, it can be elaborated indefinitely by the same rules."
  - (Lerdahl and Jackendoff, *A Generative Theory of Tonal Music* 1996: 16)

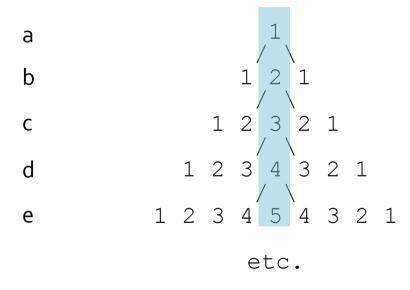
## Recursion in ālāp

ālāp: an unmetered, improvised exposition and development of a melodic mode (rāga), usually preceding a metrical composition in the same mode.



## Recursion in ālāp

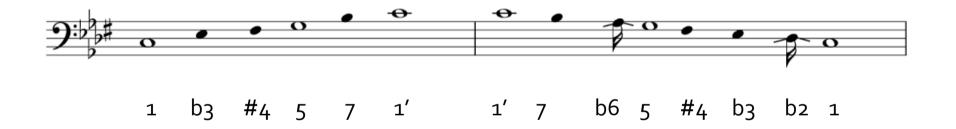
- Internal scalar expansion (Widdess 1981):
  - "A rising and falling phrase is expanded at successive repetitions, by adding higher and higher notes at the apex."



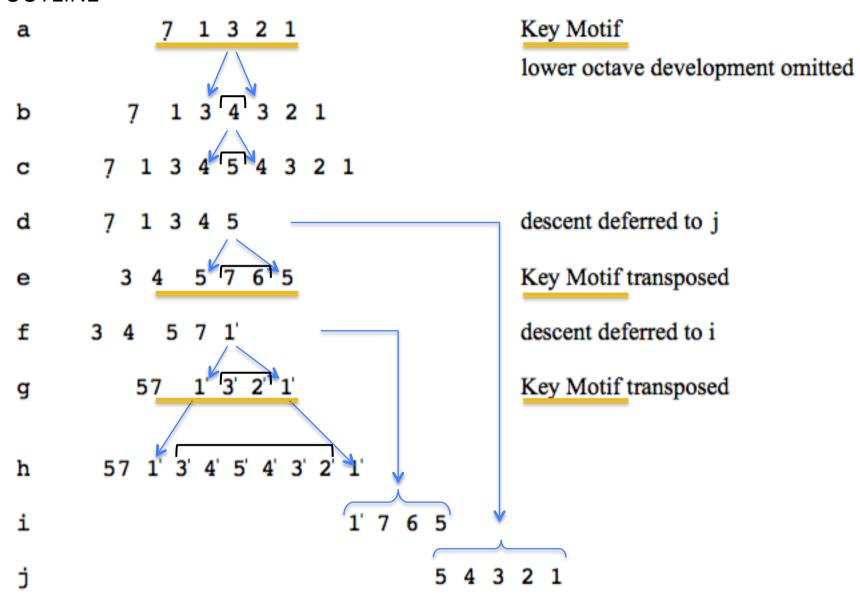
vistār/barhat - "expansion"

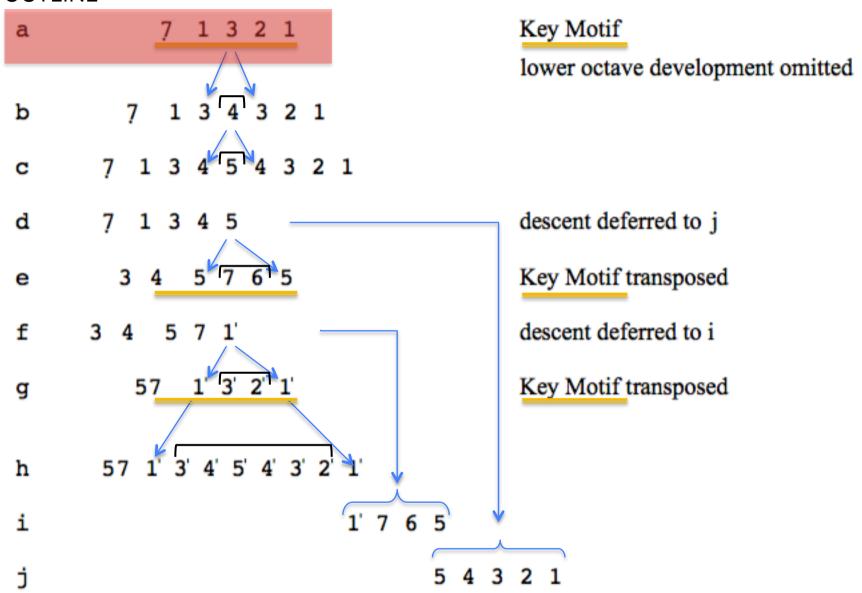
## An ālāp in rāg Multānī

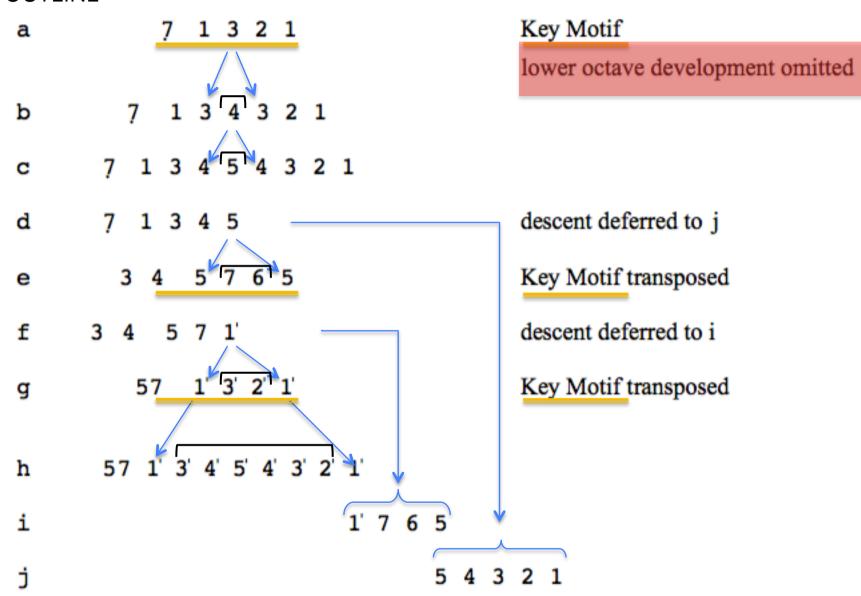
Rāg Multānī: ascent–descent schema (āroh–avāroh)

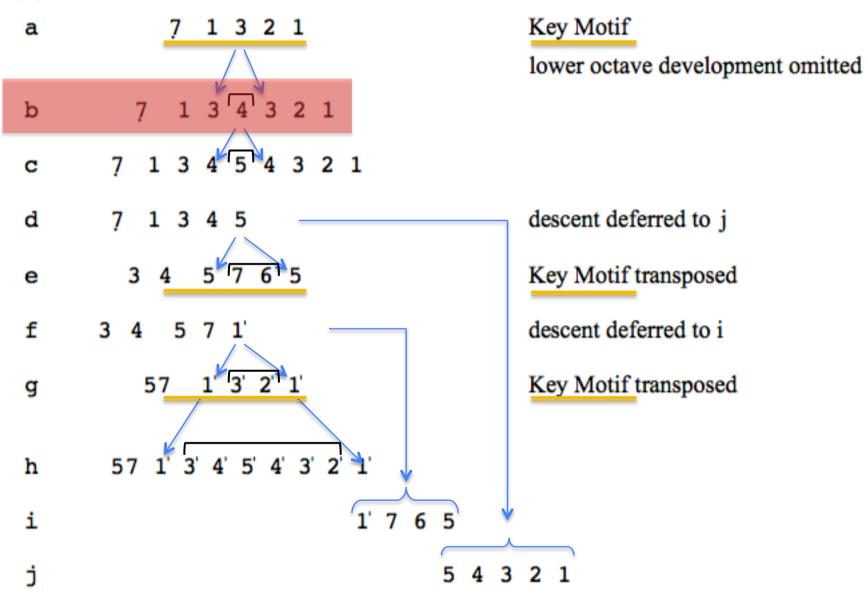


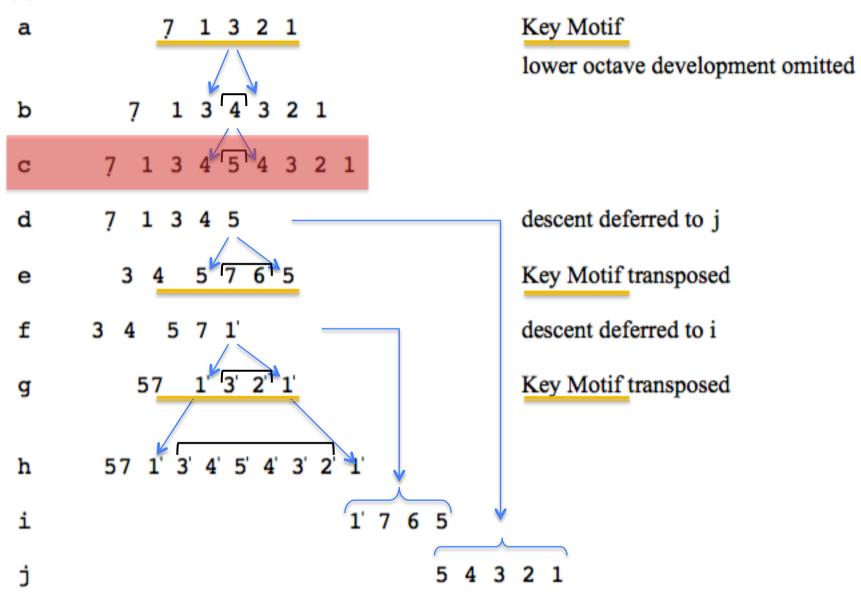
Multānī key phrase (pakaṛ): 7 1 b3 b2 1

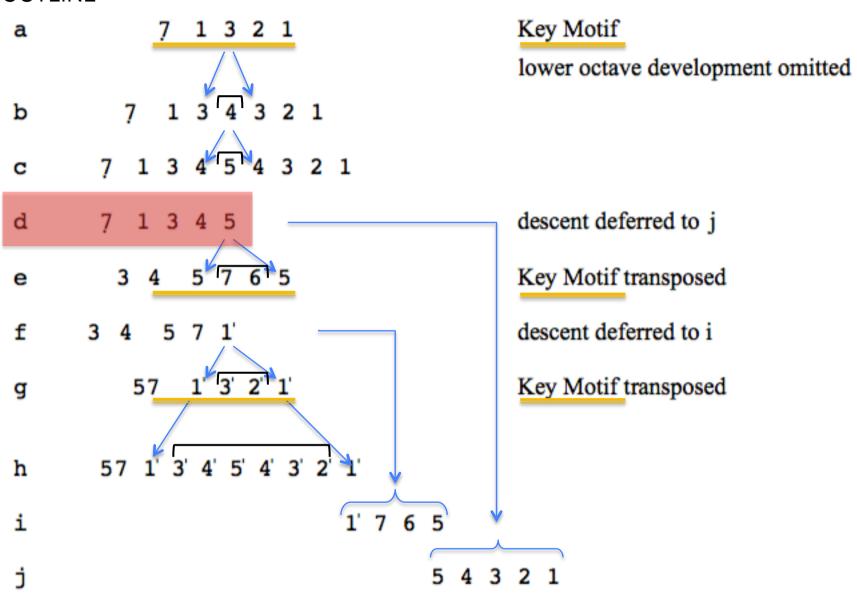


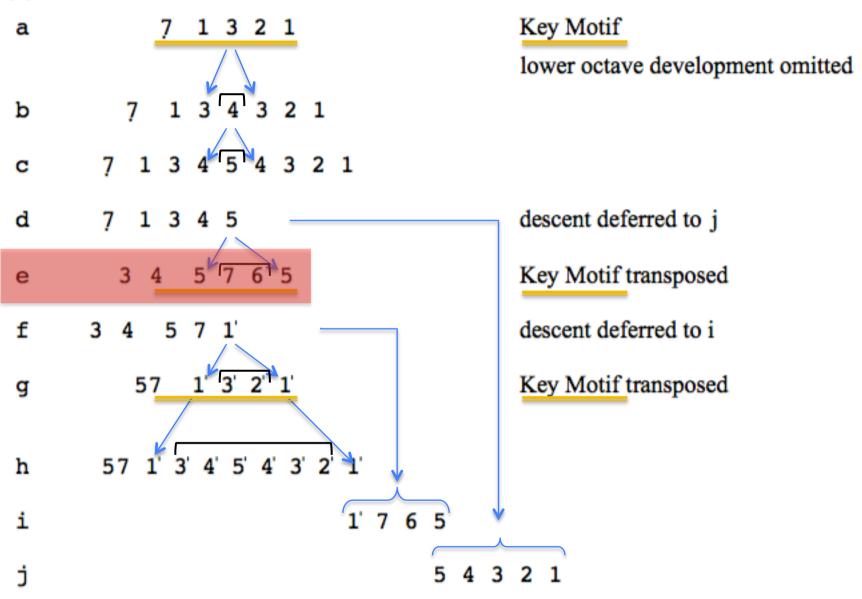


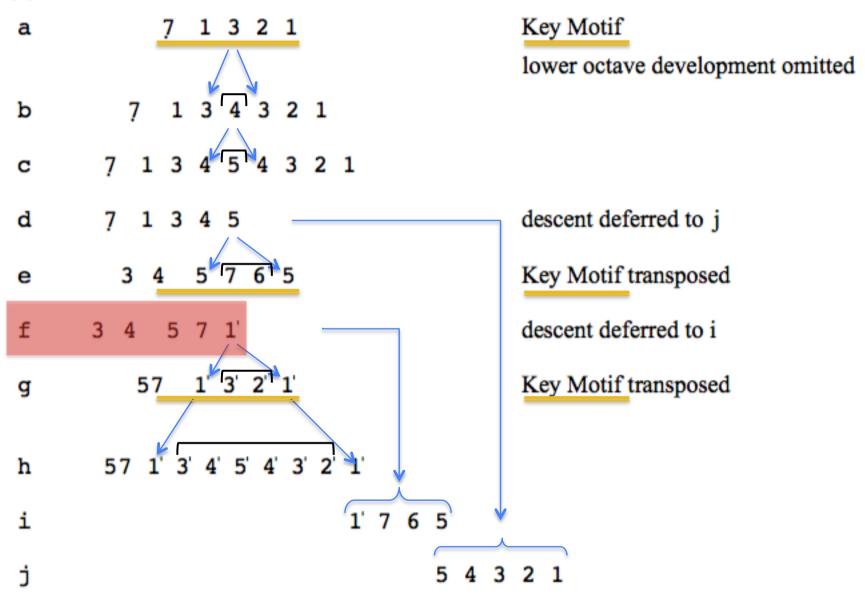


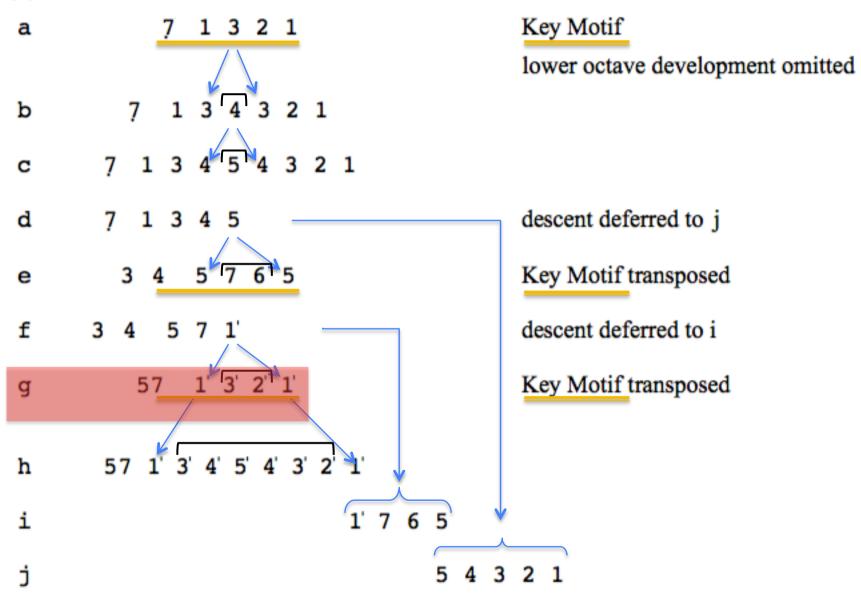


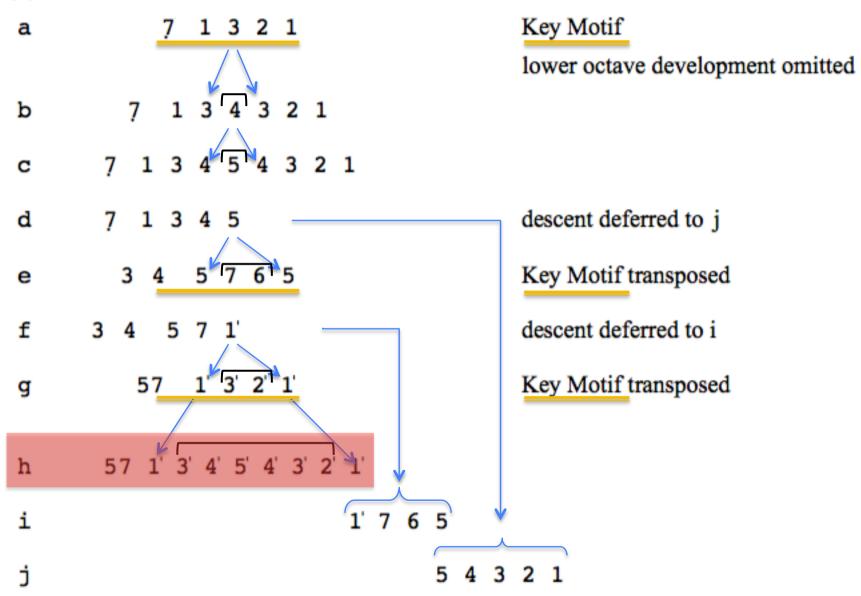


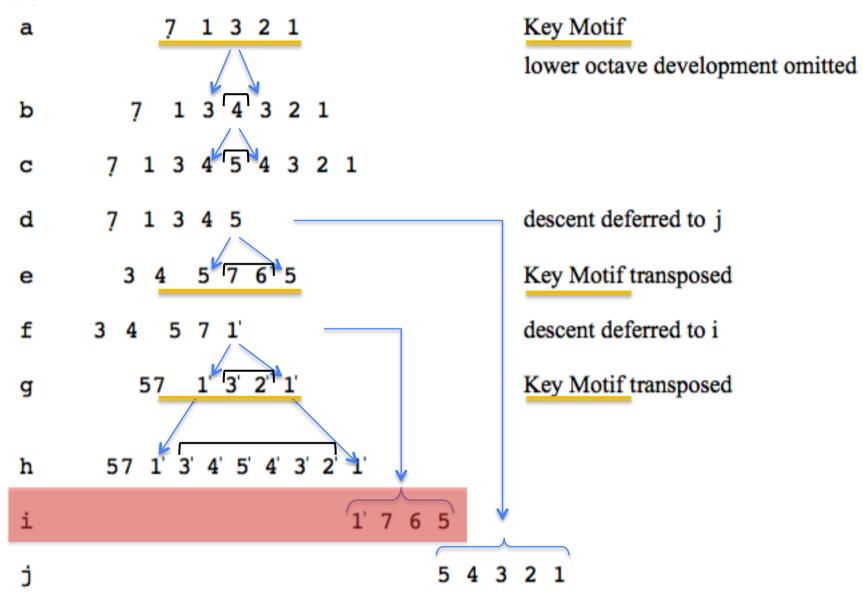


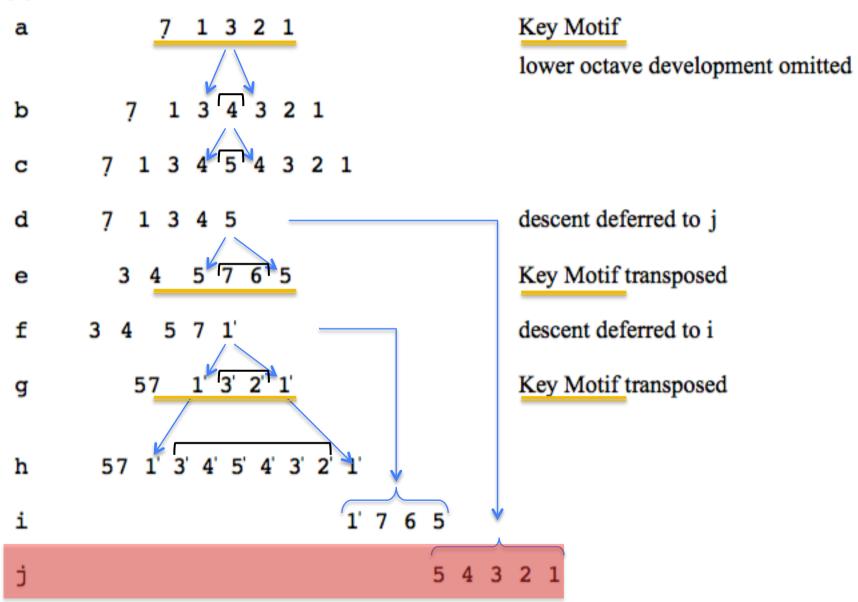


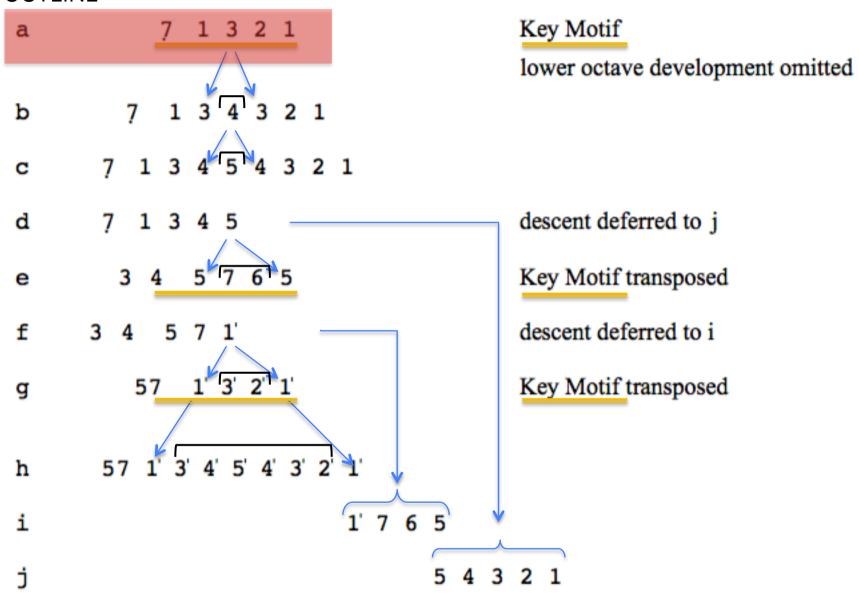








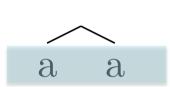


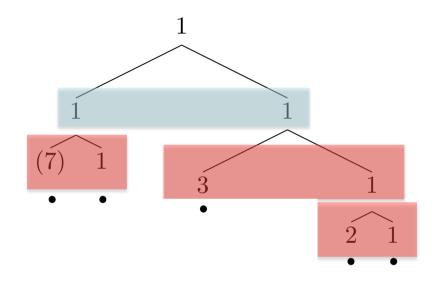


# Recursive rule application (MR)

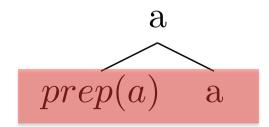
## Prolongation:

a





## Preparation:



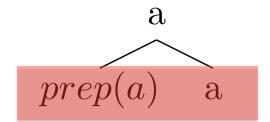
# Recursive rule application (MR)

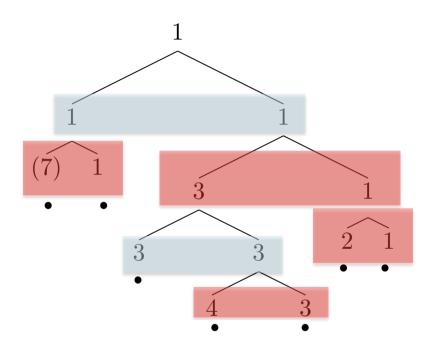
## Prolongation:





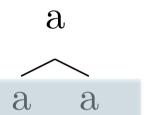
## Preparation:



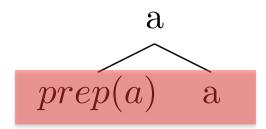


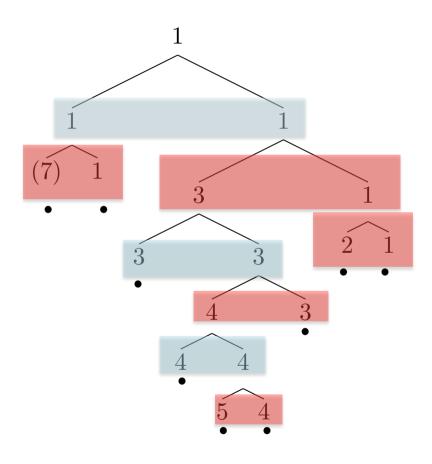
# Recursive rule application (MR)

## Prolongation:



## Preparation:





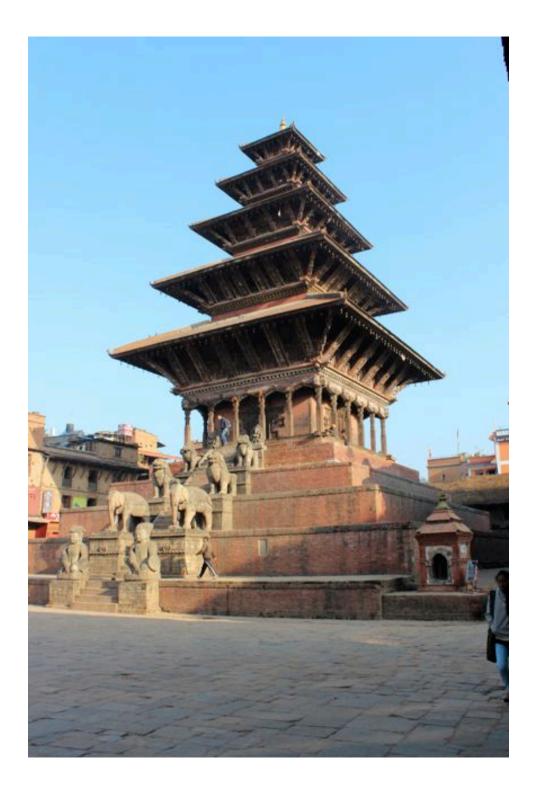
# Recursion in ālāp

## Conclusions:

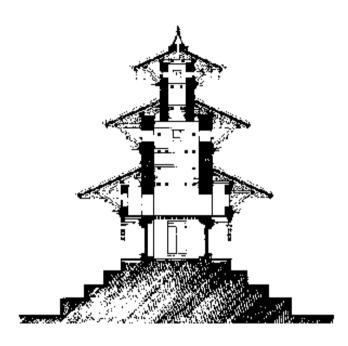
- the structure of ālāp is intrinsically recursive
- ālāp can accommodate multiple levels of recursion
- 2 rules can be applied recursively to generate the structure of ālāp

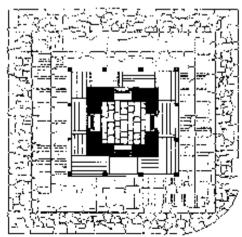
# Recursion as a South Asian cultural model





Nepalese temples as 3-dimensional maṇḍalas



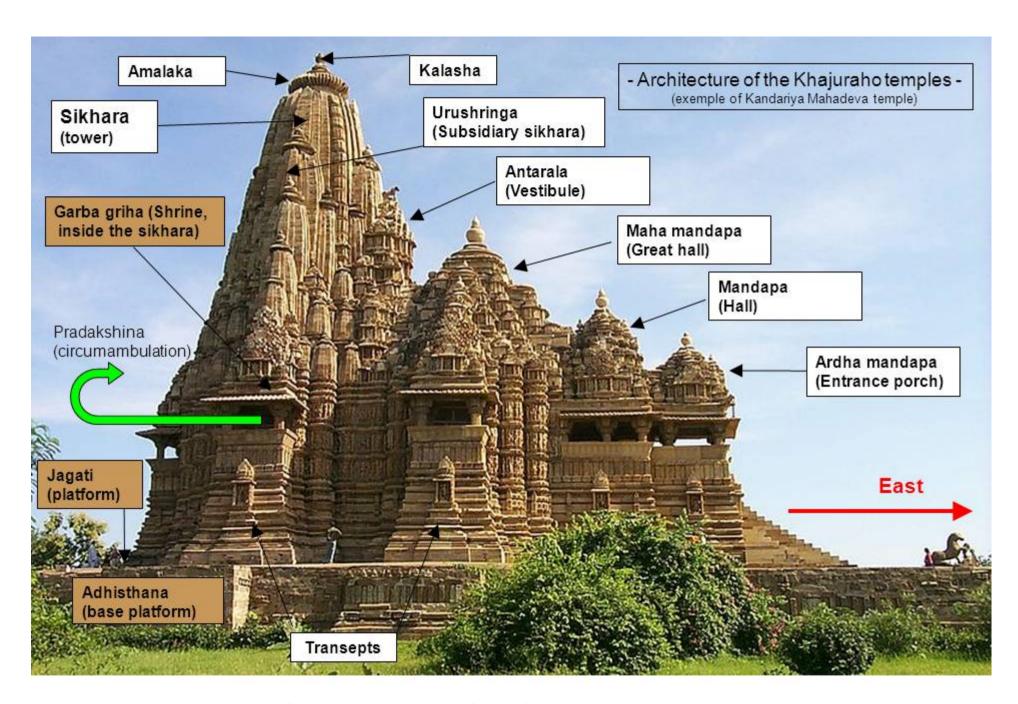




Recursion in S. Indian temple architecture

"Form composed of smaller replicas of itself" C. Branfoot

Ekambareśvara Temple, Kanchipuram



Form composed of smaller replicas of itself

# Connecting analysis and culture: cognitive models and "flow"





Dāphā group, Dattātreya temple, Bhaktapur (2012)







# "Flow"

- Flow refers to a state of heightened concentration, when one is so intent on the activity at hand that all other thoughts, concerns and distractions disappear and the actor is fully in the present. The experience actually leads to a feeling of timelessness, or being out of normal time, and to feelings of transcending one's normal self. Regardless of how intense the activity is ... people find flow experience restful and liberating, because the problems and aspects of ourselves that sometimes get in our way from reaching a clear, open state of mind disappear during intense concentration.
  - Turino, T. Music as social life (2008: 4)



# Lokapañca

#### Lokapañca

Language: Newari with Sanskrit loanwords.

Rāg: Pāje

Tāl: Cāli [= Cvakh]

#### Verse 1:

A: Respected sirs all, sing bhajans regularly.

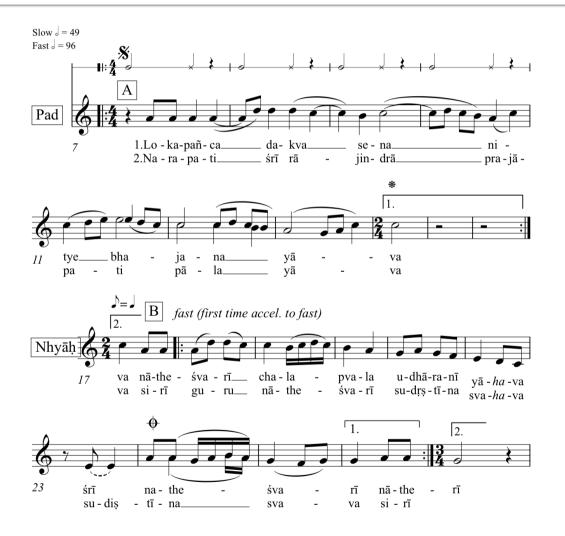
B: Thou, [Goddess] Nātheśvarī, please save us.

#### Verse 2:

A: The Lord of Men, Śrī Rājendra, Lord of Progeny, please nourish us.

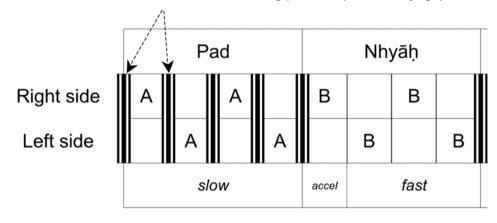
B: Venerable teacher, Nātheśvarī, please look on us with good fortune.

# Lokapañca





instrumental ending patterns (khĩ tvāllhāyegu)



# Lokapañca

