

# Optimal Religion

An Optimality Theoretical model for (Jewish) rituals

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# Overview

- Introduction to Optimality Theory
- Problems with current models to rituals (Whitehouse; McCauley and Lawson)
- Propose a model for the dynamics of the rituals
- Summary

# *Typologies in different disciplines*

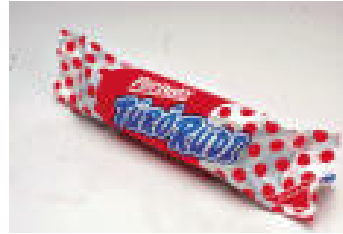
Research steps in most disciplines (in yours, too?):



- Collect your data:
- Systematize your data and create typologies:
- Create a model describing your typology:  
a deeper “understanding” of the phenomenon



# *Optimality Theory* for buying chocolate (1)



You may prefer one or the other → **customer typology**

- Quality?
- Quantity?
- Price?

## Optimality Theory for buying chocolate (2)

	Quality	Quantity	Price
Mars	excellent	55 g	0.50 EUR
Túró Rudi	excellent	30 g	0.30 EUR
Côte d'Or	good	200 g	1.40 EUR
Milka	medium	200 g	1.20 EUR

- Quality  $\gg$  Quantity  $\gg$  Price  $\rightarrow$  Mars
- Quality  $\gg$  Price  $\gg$  Quantity  $\rightarrow$  Túró Rudi
- Price  $\gg$  Quantity  $\gg$  Quality  $\rightarrow$  Túró Rudi
- Quantity  $\gg$  Quality  $\gg$  Price  $\rightarrow$  Côte d'Or
- Quantity  $\gg$  Price  $\gg$  Quality  $\rightarrow$  Milka
- Thus, *Optimality Theory* accounts for customer typology

# *Optimality Theory* in linguistics (1)

Language typology:

Example: where is the **stressed syllable** in the word?

- Stress on the **first** syllable (e.g. Hungarian, Danish, Afrikaans, Latvian, Arawak, Sami, etc.)
- Stress on the **last** syllable (e.g. Aramaic, Guarani, Mazatec, etc.)
- Stress on the **penultimate** syllable (e.g. Mohawk, Albanian, Chumash, Chamorro, etc.)
- (Etc. - ignore)
- **No** language with stress always on the **second** syllable.

## *Optimality Theory* in linguistics (2)

Let's use the following constraints:

- *Early*: the stress must occur as **early** as possible in the word
- *Late*: the stress must occur as **late** as possible in the word
- *No-Final*: the last syllable must not be stressed

# Optimality Theory in linguistics (3)

(s = stressed syllable, u = unstressed syllable)

4-syllable word	<i>Early</i>	<i>Late</i>	<i>No-Final</i>
s.u.u.u	good	worst	good
u.s.u.u	medium	bad	good
u.u.s.u	bad	medium	good
u.u.u.s	worst	good	bad

- *Early* ≫ *Late* ≫ *No-Final* → s.u.u.u (word initial stress)



# Optimality Theory in linguistics (3)

(s = stressed syllable, u = unstressed syllable)

4-syllable word	<i>Late</i>	<i>Early</i>	<i>No-Final</i>
s.u.u.u	worst	good	good
u.s.u.u	bad	medium	good
u.u.s.u	medium	bad	good
u.u.u.s	good	worst	bad

- *Early* ≫ *Late* ≫ *No-Final* → s.u.u.u (word initial stress)
- *Late* ≫ *Early* ≫ *No-Final* → u.u.u.s (word final stress)

# Optimality Theory in linguistics (3)

(s = stressed syllable, u = unstressed syllable)

4-syllable word	<i>No-Final</i>	<i>Late</i>	<i>Early</i>
s.u.u.u	good	worst	good
u.s.u.u	good	bad	medium
u.u.s.u	good	medium	bad
u.u.u.s	bad	good	worst

- *Early* ≫ *Late* ≫ *No-Final* → s.u.u.u (word initial stress)
- *Late* ≫ *Early* ≫ *No-Final* → u.u.u.s (word final stress)
- *No-Final* ≫ *Late* ≫ *Early* → u.u.s.u (penultimate stress)
- No ranking yields u.s.u.u: systematic lack in the predicted typology  
Indeed, now language with stress always on the second syllable

# *Optimality Theory (OT): an overview*

Alan Prince and Paul Smolensky, 1993

- **Candidates:** initially, all possibilities compete
- **Constraints:**
  - Best candidates survive the constraint
  - Worse-than-best candidates are filtered out
- Different **rankings** (hierarchies) yield different winners
- Therefore: OT is a model for typology  
(customer typology / language typology)

# Cognitive models for rituals (1)

Two modes of religiosity (since Max Weber...)

Whitehouse (1995, based on Pomio Kivung in Dadul):

**Doctrinal mode**

*repetitive, routinized*

*semantic memory*

etc. p. 197.

**Imagistic more**

*periodic*

*episodic memory*

# Cognitive models for rituals (2)

McCauley and Lawson (2002):

- Ritual = action
- Action representation system
  - Act, Agent, Patient, Instrument, Recipient, Circumstances (time, place, direction,...), etc.

Cf. thematic (theta) roles in linguistics

# Cognitive models for rituals (3)

Which factor predicts better **emotional arousal / sensory pageantry** of rituals?

- *Ritual Frequency Hypothesis*: frequency
  - Frequent = low arousal (else, too expensive)
  - Rare = high arousal (in order to remember, flashbulb)
- *Ritual Frequency Hypothesis*:
  - special agent = high arousal
  - special patient / instrument = low arousal

# Judaism

- Main stream Judaism: unbalanced system to the extreme. Tedium effect, splinter group with special agent rituals: Hasidism?
- Problem: the McCauley-Lawson model is inappropriate to rabbinic Judaism (lack of *enabling rituals!*)
- Longer discussion of certain rituals, if time permits and if there is interest (Whitehouse, 2004:410)
- Modern and folkloristic forms of Judaism might differ

# Remarks

- Use McCauley-Lawson model without referring to *special patient, special instrument rituals*.
- Rather: presence or absence of *special agent rituals*.
- This way, it works for Judaism.
- *Special patient, special instrument rituals* is too long + lacks recipients, special locations, etc.
- **Problem**: no exact model of dynamics.



# Optimality Theory for rituals (1)

Person  $X$  is “supposed to” / “able to” perform action  $y$ .

**Given:** a set of possible forms of action  $y$ :  $\{y_1, y_2, \dots\}$ .

**Question:** which one to choose?

*Constraints* determine the choice, including  $X$ 's own interests, as well as factors related to other agents.

Religious rituals: some agents are superhuman ones.

CSR research project: derive constraints driving religious actions from constraints determining secular actions.

Goal of a research project in the cognitive science of Judaism: describe the relevant constraints in Judaism.

# Optimality Theory for rituals (2)

**Goal:** model dynamics

(NB: new model w.r.t. written version.)

Universal constraints driving the events in Dadul:

Set of candidates:

$$\left\{ (h, g) \mid h \in \{0, 1, 2, \dots, N\}, g \in \{0, 1\} \right\}$$

Namely: human can offer a sacrifice whose price is between 0 and  $N$  (time, energy, health, resources,...). Gods can answer the sacrifice or not.

# Optimality Theory for rituals (3)

Constraints used by the fellow agent (SH in our case):

- For all  $z > 0$ :  $DG_z$ : don't give for less than  $z$

$$DG_z(h, g) = \begin{cases} 1 & \text{if } h < z \text{ and } g = 1 \\ 0 & \text{else} \end{cases}$$

- MB: make business

$$MB(h, g) = \begin{cases} 1 & \text{if } g = 0 \\ 0 & \text{if } g = 1 \end{cases}$$

NB: can MB be derived from other principles?

# Optimality Theory for rituals (4)

Humans are learning the supposed grammar driving the gods' behaviour. The goal of the humans is to pay the minimum price  $p$  for which gods still answer the sacrifice.

$$DG_1 \gg DG_2 \gg \dots \gg DG_z \gg \dots$$

Humans offer price  $p$ . Will gods accept the offer?

If  $MB \gg DG_{p+1}$

	DG <sub>1</sub>	DG <sub>2</sub>	...	MB	...	DG <sub>p+1</sub>
$(p, g = 0)$	0	0 ...		1!	...	0
$\rightarrow (p, g = 1)$	0	0 ...		0	...	1

# Optimality Theory for rituals (5)

Humans are learning the supposed grammar driving the gods' behaviour. The goal of the humans is to pay the minimum price  $p$  for which gods still answer the sacrifice.

$$DG_1 \gg DG_2 \gg \dots \gg DG_z \gg \dots$$

Humans offer price  $p$ . Will gods accept the offer?

If  $DG_{p+1} \gg MB$

	DG <sub>1</sub>	DG <sub>2</sub>	...	DG <sub>p+1</sub>	...	MB
☞ $(h = p, g = 0)$	0	0 ...		0	...	1
$(h = p, g = 1)$	0	0 ...		1!	...	0

# Optimality Theory for rituals (6)

If  $MB \gg DG_{p+1}$

	DG <sub>1</sub>	DG <sub>2</sub>	...	MB	...	DG <sub>p+1</sub>
$(p, g = 0)$	0	0 ...		1!	...	0
☞ $(p, g = 1)$	0	0 ...		0	...	1

Bruce Tesar's *Error Driven Constraint Demotion Algorithm*: humans offer sacrifice with price  $p$ , and expect gods answer the sacrifice ( $g = 1$ ). But they don't. Hence, *learn* that MB must be demoted below  $DG_{p+1}$ .

## Optimality Theory for rituals (7)

By repeating the algorithm, finally we learn that  $DG_{N+1} \gg MB$ . Then, humans predict only candidate  $(p = N + 1, g = 1)$  win, but  $N$  is upper limit of payable price. Then, break down.

**Conclusion:** we have described the dynamics of run away and break down of the splinter group.

# Optimality Theory for rituals (9)

“Anti-splinter group development” (“secularization”),  
if argument is found to promote MB:

$(p, g = 1)$  is optimal even for lower  $p$ 's.

Alternatively: we don't know if  $g = 0$  or  $g = 1$ , but exactly the same happens for all  $p$ 's. Then: employ  $p$  as low as possible (economy on the human side, cf. article).

Future work: combine constraints on the human side with constraints on the gods' side.



# Optimality Theory for rituals (10)

What is the dynamics that creates attractor positions?

If no argument found either to promote or to demote MB.

Possible arguments from

- Direct personal experience
- Randomized personal experience
- Theology

Future work: include these into the model.

# Summary

- Introduction to Optimality Theory (both connectionist and symbol manipulating approaches exist)
- *McCauley and Lawson's model*: Thematic roles of actions - hard to interpret for Judaism
- *McCauley and Lawson's model*: no exact dynamics given - proposed dynamics using *Error Driven Constraint Demotion Algorithm*

Thank you for your attention!



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