Optimal Religion
An Optimality Theoretical model for (Jewish) rituals

Tamás Bíró
Groningen, NL / Budapest, H
birot@let.rug.nl
biro.tamas@hebraisztika.hu

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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)

<table>
<thead>
<tr>
<th>Quality</th>
<th>Quantity</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mars</td>
<td>excellent</td>
<td>55 g</td>
</tr>
<tr>
<td>Túró Rudi</td>
<td>excellent</td>
<td>30 g</td>
</tr>
<tr>
<td>Côte d’Or</td>
<td>good</td>
<td>200 g</td>
</tr>
<tr>
<td>Milka</td>
<td>medium</td>
<td>200 g</td>
</tr>
</tbody>
</table>

- Quality ≫ Quantity ≫ Price → Mars
- Quality ≫ Price ≫ Quantity → Túró Rudi
- Price ≫ Quantity ≫ Quality → Túró Rudi
- Quantity ≫ Quality ≫ Price → Côte d’Or
- Quantity ≫ Price ≫ Quality → 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, Chu-mash, 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)

<table>
<thead>
<tr>
<th>4-syllable word</th>
<th>Early</th>
<th>Late</th>
<th>No-Final</th>
</tr>
</thead>
<tbody>
<tr>
<td>s.u.u.u</td>
<td>good</td>
<td>worst</td>
<td>good</td>
</tr>
<tr>
<td>u.s.u.u</td>
<td>medium</td>
<td>bad</td>
<td>good</td>
</tr>
<tr>
<td>u.u.s.u</td>
<td>bad</td>
<td>medium</td>
<td>good</td>
</tr>
<tr>
<td>u.u.u.s</td>
<td>worst</td>
<td>good</td>
<td>bad</td>
</tr>
</tbody>
</table>

- Early $\gg$ Late $\gg$ No-Final $\rightarrow$ s.u.u.u (word initial stress)
Optimality Theory in linguistics (3)

(s = stressed syllable, u = unstressed syllable)

<table>
<thead>
<tr>
<th>4-syllable word</th>
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<th>Early</th>
<th>No-Final</th>
</tr>
</thead>
<tbody>
<tr>
<td>s.u.u.u.u</td>
<td>worst</td>
<td>good</td>
<td>good</td>
</tr>
<tr>
<td>u.s.u.u.u</td>
<td>bad</td>
<td>medium</td>
<td>good</td>
</tr>
<tr>
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<td>medium</td>
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- Early $\gg$ Late $\gg$ No-Final $\rightarrow$ s.u.u.u (word initial stress)
- Late $\gg$ Early $\gg$ No-Final $\rightarrow$ u.u.u.s (word final stress)
Optimality Theory in linguistics (3)

(s = stressed syllable, u = unstressed syllable)

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<td>u.u.u.s</td>
<td>bad</td>
<td>good</td>
<td>worst</td>
</tr>
</tbody>
</table>

- *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

Imagistic more

repetitive, routinized

periodic

semantic memory

episodic memory

e tc. p. 197.
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 $y$: $\{y_1, y_2, \ldots\}$.

**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:

\[
\left\{ (h, g) \mid h \in \{0, 1, 2, \ldots, N\}, g \in \{0, 1\} \right\}
\]

Namely: human can offer a sacrifice whose price is between 0 and \( N \) (time, energy, health, resources,\ldots). Gods can answer the sacrifice or not.
Optimality Theory for rituals (3)

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

• For all $z > 0$: $\text{DG}_z$: don’t give for less than $z$

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

• $\text{MB}$: make business

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

NB: can $\text{MB}$ 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.

$$\text{DG}_1 \gg \text{DG}_2 \gg \ldots \gg \text{DG}_z \gg \ldots$$

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

If $\text{MB} \gg \text{DG}_{p+1}$

<table>
<thead>
<tr>
<th></th>
<th>DG$_1$</th>
<th>DG$_2$</th>
<th>...</th>
<th>MB</th>
<th>...</th>
<th>DG$_{p+1}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$(p, g = 0)$</td>
<td>0</td>
<td>0</td>
<td>...</td>
<td>1!</td>
<td>...</td>
<td>0</td>
</tr>
<tr>
<td>$(p, g = 1)$</td>
<td>0</td>
<td>0</td>
<td>...</td>
<td>0</td>
<td>...</td>
<td>1</td>
</tr>
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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.

$$\text{DG}_1 \gg \text{DG}_2 \gg \ldots \gg \text{DG}_z \gg \ldots$$

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

If $\text{DG}_{p+1} \gg \text{MB}$

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<tr>
<th></th>
<th>$\text{DG}_1$</th>
<th>$\text{DG}_2$</th>
<th>$\ldots$</th>
<th>$\text{DG}_{p+1}$</th>
<th>$\ldots$</th>
<th>$\text{MB}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$(h = p, g = 0)$</td>
<td>0</td>
<td>0</td>
<td>$\ldots$</td>
<td>0</td>
<td>$\ldots$</td>
<td>1</td>
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<td>$\ldots$</td>
<td>1!</td>
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Optimality Theory for rituals (6)

If $\text{MB} \gg \text{DG}_{p+1}$

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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 $\text{DG}_{p+1}$.
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.
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!