## Simulation 1: Cognitive attraction vs. social learning biases

Vojtěch Kaše ([Vojtech.kase@gmail.com](mailto:Vojtech.kase@gmail.com))

June 26, 2014

## Environment and theoretical framework

The environment consists from a set of communities being modeled with reference to the Greco-Roman social institution of *voluntary associations* (see Kloppenborg & Wilson, 1996; Harland, 2003). The formation of voluntary associations represented a common strategy for building social identity in the fluid Hellenistic world where the traditional social links were weakened. This led to mythic experimentation with religious ideas and practices, including various versions of the Judeo-Christian representations. Therefore, it was often argued that early Christian communities should be seen in the same framework (McCready, 1996; Wilken, 2003).

Communal periodical meals represented a central practice in the social life of these associations and early Christian associations apparently were no exception in this respect. Communal meals including singing of hymns, praying to gods, reading from popular books or discussing sophisticated philosophical issues were situated on continuum between “secular” and “religious” domain and were subject of processes of ritualization. All these aspects formed *social* and *cognitive appeal* of given practices which could be decisive for cultural survival of those practices or even of the associations conducting them.

In the center of attention of my research proposal is the question *how does happen that in the context of early Christian periodical communal meals emerged and was successful the belief in the supernatural quality of the consumed meal elements*. Apparently, it was a result of the meal context and its conceptualization on the on hand and ritual procedure related to these elements before the meal on the other (especially the prayers or blessings pronounced over them, but not only). From the extant literary sources we are informed about huge plurality concerning this issue (*concerning the sources, see the table of pre-coded variables on the poster, downloadable under this* [*link*](https://www.academia.edu/attachments/34024269/download_file?st=MTQwMzcwMDg2Nyw0Ni4zOS4xNzEuOTAsMzc2ODky&s=work_strip&ct=MTQwMzcwMDg4MCwzNzY4OTI%3D), *and my actual research proposal for more information*).

The first simulation does not take these individual features of the meal practices and their different combinations into consideration. It just manipulates with an abstract value of their cognitive attraction as a whole[[1]](#footnote-1) and distributes it among the practices conducted in individual communities.

It is important here that a cognitive processing of a ritual practice consists at least from mental representing of its two basic building blocks:

1. ritual practice’s action structure (agent, patient, action itself and related instruments), causal connections, and conceptualizations of its components with reference to supernatural agents;
2. conceptualization of intended supernatural outcome of it (supernatural efficacy) (*see illustration of related cognitive ritual theories on the poster*);

The optimal relationship of these two building blocks constitutes cognitive attraction of given ritual. In the case of frequently repeated collective rituals, if this relationship is balanced, the participants should be motivated to do the ritual in the same way over time and the associations practicing it should be less opened to adopt a new practice. On the contrary, where this balance is missing (the practice is too much or too little ritualized or the outcome is too small or too big with relation to it) the openness to adopt an innovation should be higher. This is the only entry for the cognitive attraction into the model: it does not consider the role of cognitive attraction in the decision making of an association because the imagined participants are not aware of it at the first view (it has an effect on them only over a time).

## Hypothesis

The goal of this simulation is just to evaluate relative importance of the cognitive attraction understood in the way described above in comparison to the role of social learning biases in horizontal and vertical cultural transmission (i.e. the process of *cultural dynamics*). It aims to test following null hypothesis and data-related prediction corresponding to it:

**H0 – Social learning biases’ hypothesis:** *For a successful cultural transmission of the belief in ritual efficacy of a practiced ritual there is crucial the authority of person, text or community who invented it, regardless its cognitive features.*

**P0 – Prediction of the social learning biases’ hypothesis**: *The belief in the special quality of the meal elements was culturally successful due to the authority of person, text or community who invented it, regardless its cognitive features.*

The dual-inheritance theorists paid a lot of attention to the role of social learning biases in cultural transmission. In this simulation the prestige bias is implemented. The question for detailed analysis here is to evaluate how strong it has to be to outweigh the effect of cognitive attraction in given model.

## Simulations description

Key variable here is “cognitive attraction” (A) of a given “practice”. In this simulation, value of cognitive attraction of practices (turtles in our NetLogo model) is distributed randomly among “associations” (patches in our NetLogo model) on the scale 0-10 where A=0 means the most cognitively attractive practice. (It is represented by 0 because in the future versions of the simulation the scale will be broadened also to include the minus values.). The associations are here completely static elements.

Another variable is called the “openness to innovation” (O). It specifies the role of cognitive attraction of a ritual practice in an association over time. If the cognitive attraction of given practice is low, then openness to innovation is increasing more dramatically over time (linearly in this model). For instance, if a practice has the ascribed cognitive attraction “10” (maximal value, minimal attraction), then openness to innovation increases for 0.1 for every tick until it reaches 1, from when its value is stable.

Openness to innovation is proportional to probability to adopt an innovation (p = O / 10): for instance, openness to innovation O=.1 is linked with probability p=.01 to adopt a new practice, openness to innovation O=1 (maximal value) is linked with probability p=0.1 to adopt a new practice. When the probability condition is fulfilled, the selected strategy to adopt new practice follows.

The openness to innovation is weakened by the “rigidity effect” over time. Rigidity effect aims to reflect the motivation of ritual participants to conduct the practice in the same/traditional way over time, regardless its cognitive attraction. But, when the rigidity is present, the curve of the openness to innovation is changing with dependence on the cognitive attraction value.

When an association comes to a decision to adopt a new practice in a tick, it chooses it from the one of the 8 neighboring associations. It follows here the behavioral strategy of the whole simulation run. The strategies determine how seriously it takes into consideration the prestige variable.

The prestige variable with values 0, 1, 2, 3 is distributed randomly among all associations with specified proportion (1 - 25% of associations, 2 - 12%, 3 - 3% and 0 for the rest). With dependence on the behavioral strategy, prestige influences potential of an association to “infect” neighboring associations by its own practice.

First strategy (prestige\_influence: none) completely ignores prestige of neighboring associations in the process of new practice adoption: The association chooses one of them randomly, regardless of the prestige value of associations conducting them. On the contrary, in the case of the last strategy (prestige influence\_absolute) the association adopts the practice of the most prestige neighboring association. The other strategies specify the probability proportion with which they take the prestige of given associations into consideration. High\_prestige\_closeness means that an association does not adopt practice from an association with lower prestige.

Another agents are called “prophets”. They spent random time in an association on the range from 5 to *n* weeks before they move into the one of the neighboring associations. The maximal duration of their stay is specified by the slider. They represent the institution of the so called wandering charismatics, which are often discussed in early Christian scholarship. They bear a practice of certain value of attraction with them which is stable in the current simulation. If a prophet is present in an association in the moment of its new practice adoption, the association automatically adopts practice of the prophet.

The simulation has been coded by Tomáš Hampejs and Vojtěch Kaše. Other ideas and more realistic functions (exponential and parabolic instead of linear) for implementation are planned soon.

## Bibliography

Alikin, V. A. (2010). *The Earliest History of the Christian Gathering: Origin, Development and Content of the Christian Gathering in the First to Third Centuries*. Leiden: Brill.

Bradshaw, P. F. (2004). *Eucharistic Origins*. Oxford - New York: Oxford University Press.

Harland, P. (2013). *Associations, Synagogues, and Congregations: Claiming a place in ancient Mediterranean society*. Minnealpolis: Fortress Press.

Kloppenborg, J. S., & Wilson, S. G. (Eds.). (1996). *Voluntary associations in the Graeco-Roman world*. London - New York: Routledge.

McCauley, R. N., & Lawson, E. T. (2002). *Bringing Ritual to Mind: Psychological Foundations of Cultural Forms*. Cambridge: Cambridge University Press.

McCready, W. O. (1996). Ekklésia and Voluntary Associations. In J. S. Kloppenborg & S. G. Wilson (Eds.), *Voluntary Associations in Graeco-Roman World* (pp. 59–83). London - New York: Routledge.

McGowan, A. B. (1999). *Ascetic Eucharists: Food and drink in early Christian ritual meals*. Oxford - New York: Clarendon Press - Oxford University Press.

Wilken, R. L. (2003). *The Christians as the Romans Saw Them* (2nd ed.). New Haven - London: Yale University Press.

1. See McCauley & Lawson, 2002 for using this term in frequently repeated collective ritual context. [↑](#footnote-ref-1)