

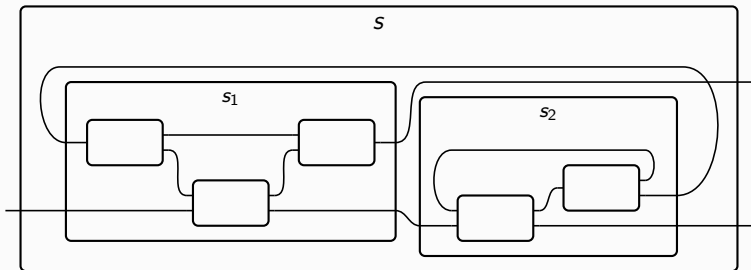
Dynamic Operads for Evolving Organizations

Brandon T. Shapiro* and David I. Spivak

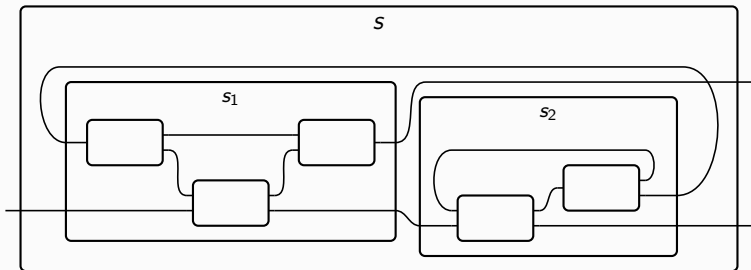
JMM 2023



1 Nested dynamic organizations

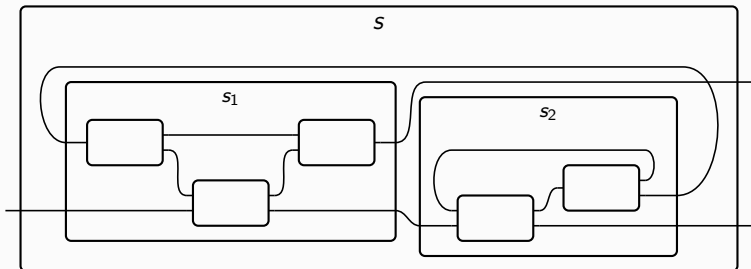


- 1 Nested dynamic organizations
- 2 Organizations: polynomials and wiring diagrams



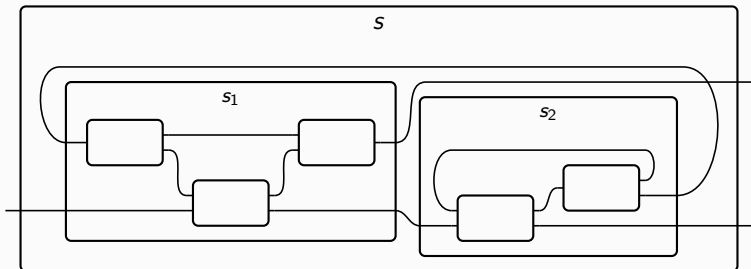
Outline

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- 2 Organizations: polynomials and wiring diagrams
- 3 Dynamics: polynomial coalgebras



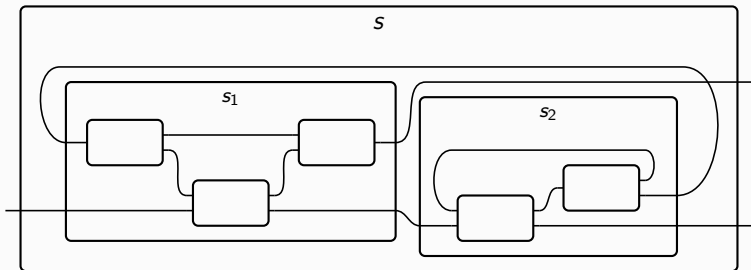
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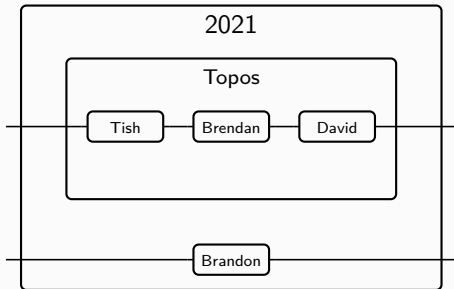


Nested dynamic organizations

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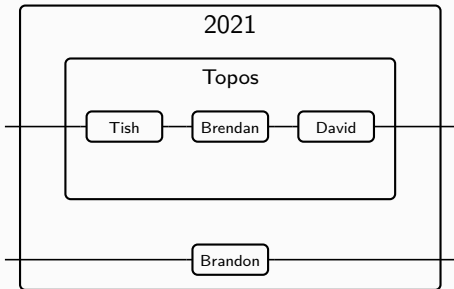
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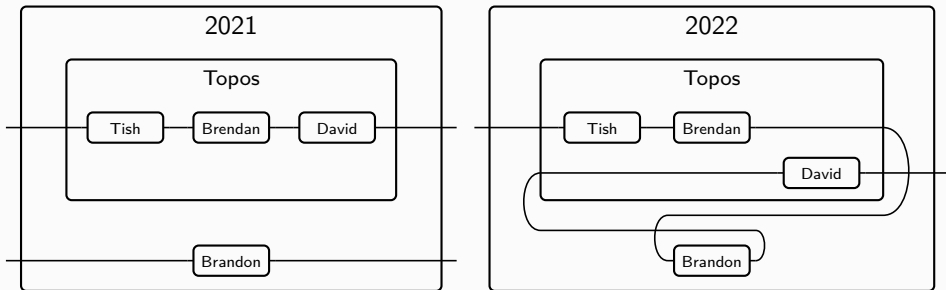
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(Not an accurate representation of Topos Institute's internal structure)

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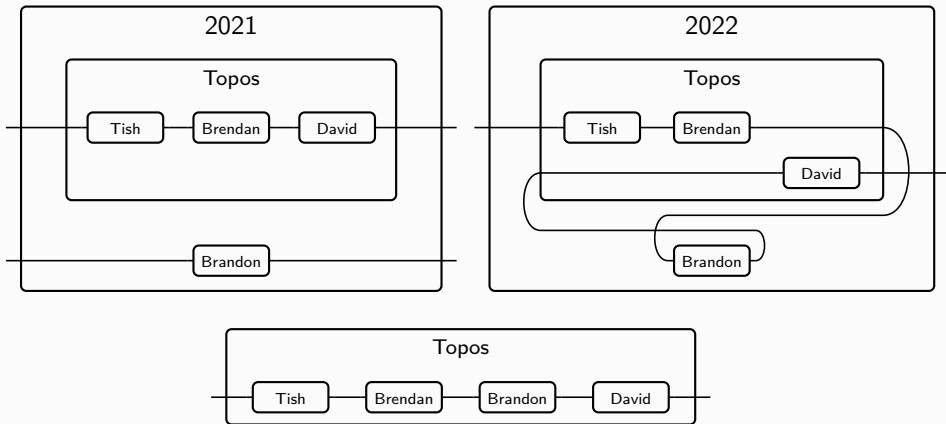
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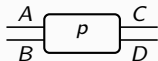
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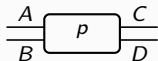
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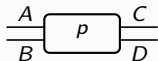
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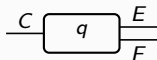
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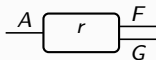
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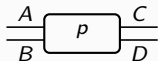
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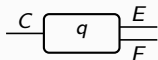
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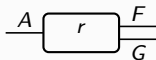
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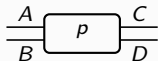


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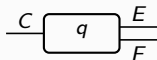
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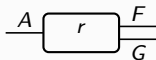
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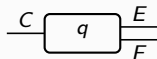
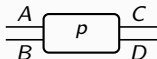
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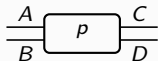
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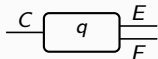
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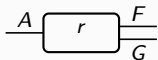
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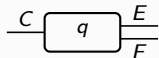
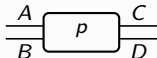
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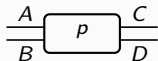


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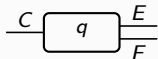
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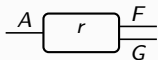
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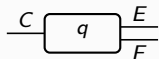
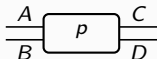
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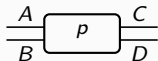
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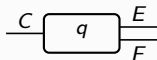
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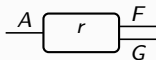
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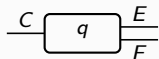
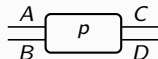
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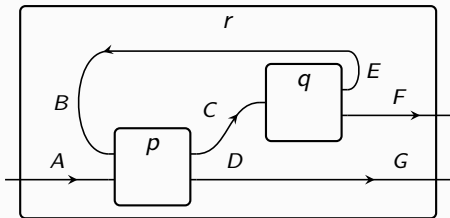
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Dynamics: polynomial coalgebras

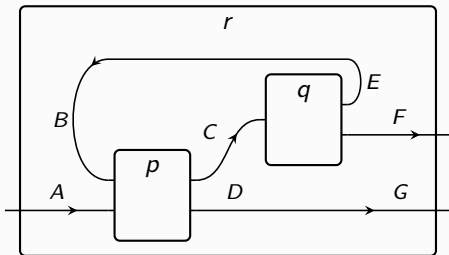
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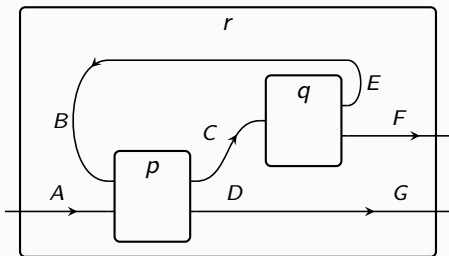
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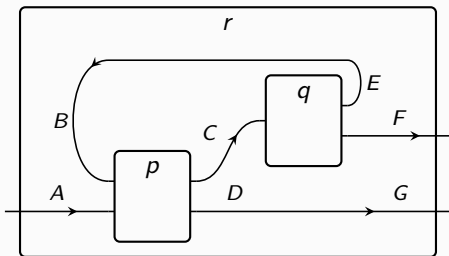
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Nesting: operad structure

- An operad S consists of sets S_n of n -ary operations for all $n \in \mathbb{N}$ with compatible unit and composition operations

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for all n , such that η and μ respect wirings and rewirings

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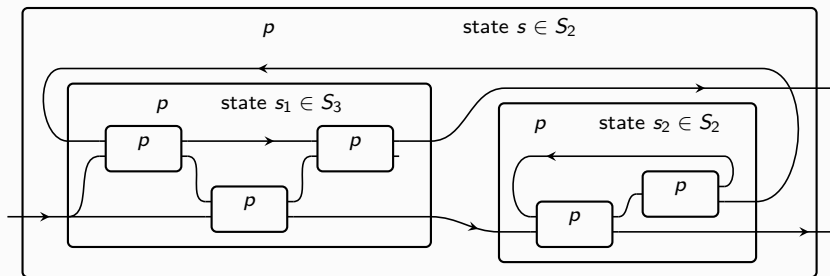
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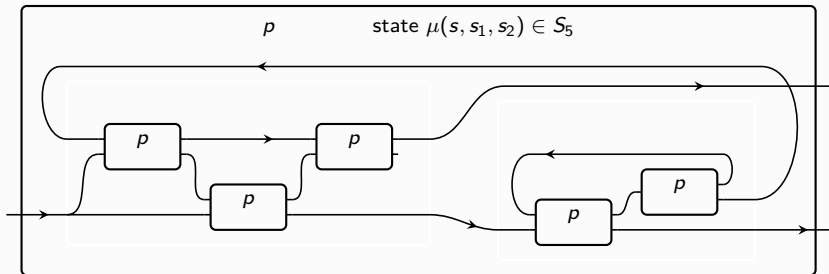
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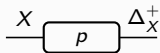
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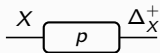
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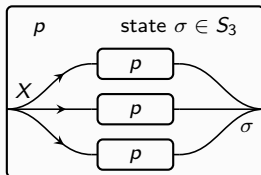
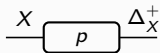
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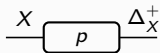
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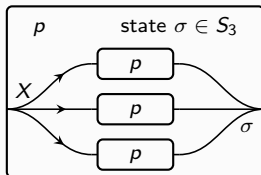


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- The rewiring $(\Delta_X^+)^n \times X \rightarrow \Delta_n^+$ sends τ^1, \dots, τ^n, x to σ' where



$$\sigma'_i = \frac{\sigma_i \tau_x^i}{\sum_j \sigma_j \tau_x^j}$$



- Brandon T. Shapiro and David I. Spivak, “Dynamic operads, dynamic categories: From deep learning to prediction markets” arXiv:2205.03906
- Matteo Capucci, Riu Rodriguez Sakamoto, Brandon T. Shapiro, and David I. Spivak, “A dynamic monoidal category for strategic games” Topos Institute Blog
- Sophie Libkind and David I. Spivak, “When you light up, I light up: A dynamical monoidal category of Hebbian learners” Topos Institute Blog

Thanks!