

Schemas Theory

<http://schematheory.net>

Part Three **Foundational Mathematical** **Categories**

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Systems Science Foundations for Systems Engineering Practice

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Foundational Mathematical Categories

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What is Synthesis?

- Synthesis is only understood by our ability to comprehend order.
- There are only so many kinds of fundamental Order in Mathematics
- The fundamental kinds of order take us back to the foundational mathematical categories that underlie all comprehension of order

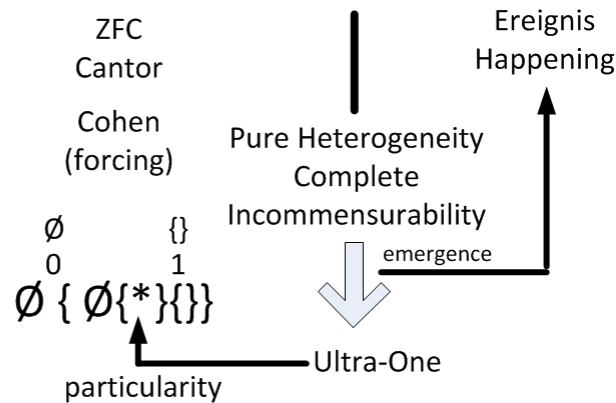
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Badiou Being & Event

Ontology = Set Theory + Multiple + Event



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Problem

- Badiou does not recognize that there are other possible foundations for mathematics other than Sets, for instance, Mass
- What are the possible foundations of Mathematics?

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Solution

Neither Foundationalism
nor Anti-Foundationalism

– But Afoundationalism

- Collect known possible foundations for Mathematics based on Philosophical Principles

Set	Interpenetration
Mass	Singularities
Multiple	Mereology
Hologram	Spacetime

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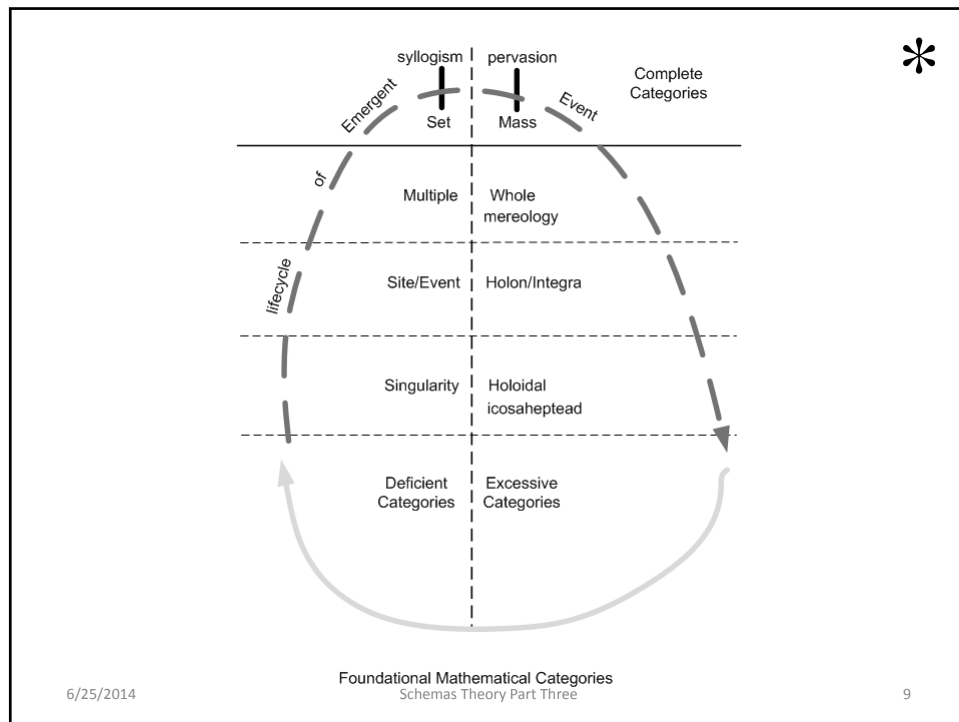
Definition: Foundational Mathematical Categories

- Set of Categories that are the foundation for mathematics.
- Includes Singularity, Site/Event, Multiple, Set, Mass, Whole, Holon/Integra, Holoidal, and Singular categories.
- Set and Mass are inverse duals. Other categories are either degenerate or excessive in relation to these to central categories.
- Three of these Categories (Set, Multiple, Event) are identified by Badiou in Being and Event. The others are added by the author based on rival claims for the basis of mathematics, and on the Set/Mass duality.
- Foundational Mathematical Categories are organized based on the Philosophical Principles of Peirce and Fuller

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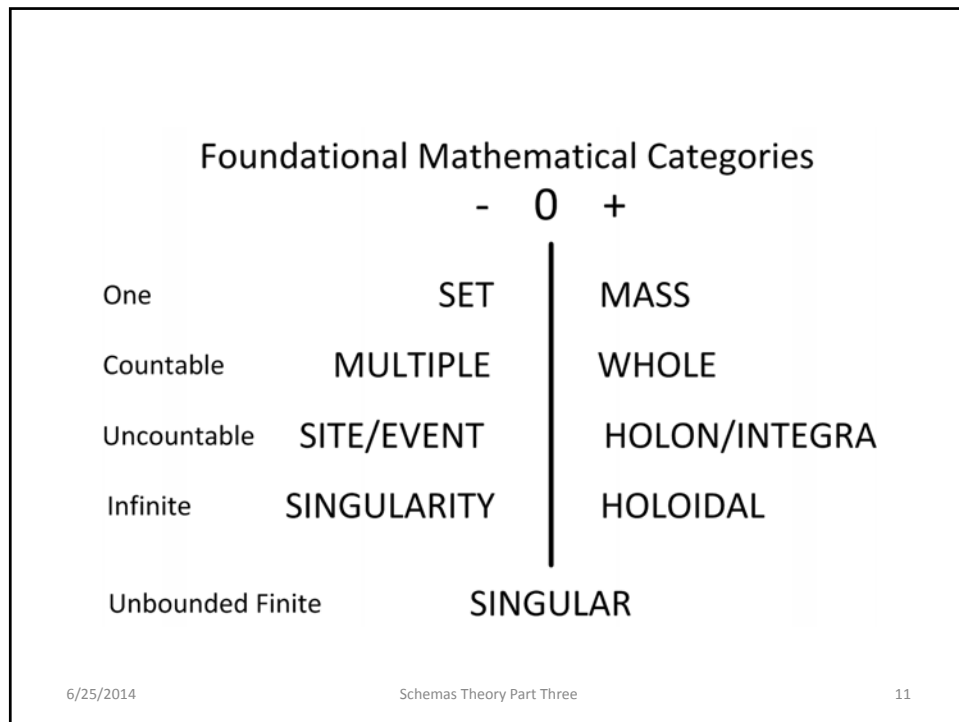
Matching up foundations with principles

Negany	Imaginary	Singularity	Hypercomplex
Zeroth	Emptiness/Void	Site/Event	Topology
First	Isolata	Multiple	Groupoids
Second	Relata	Set	Algebra
Third	Continua	Mass	Geometry
Fourth	Synergy	Whole	Mereology
Fifth	Integrity	Holon	Category Theory
Sixth	Poise	Holoid	Type Theory
Seventh	Singular	Singular	N-Category Theory

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Afoundational

- Mathematics exists in a separate 'platonic' realm isolated from things that are prior to anything that might exist
- It is not affected by the accidents of existence of things
- So that realm of pure existence is untouchable
- Thus we cannot use it as a foundation
- It is only a reference

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Gödel

- Gödel => Arithmetic is undecidable
- Cannot decide if a given statement is inside or outside the envelope produced by the Peano Axioms
- Gödel statements, if included, specify emergent properties of the system
- Gödel statements, if excluded, specify de-emergent properties of the meta-system

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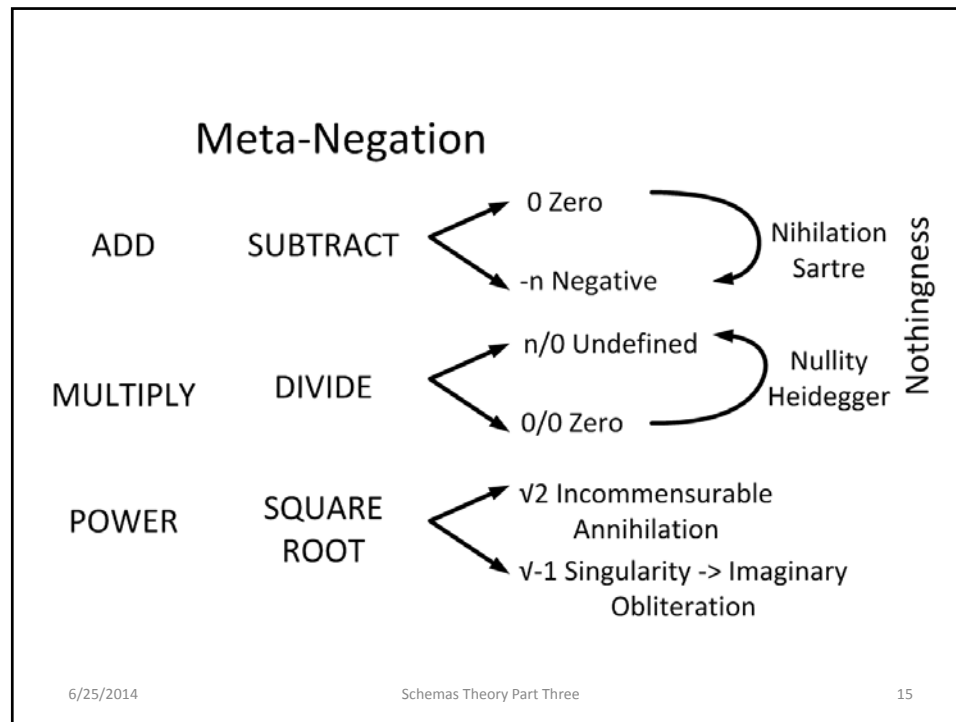
Meta- Negation

<u>Being</u>	<u>Non-Being</u>	
Pure	Nothing	} Nothingness -> Nullity
Process	Nihilation	
Hyper	Annihilation	
Wild	Obliteration	
Ultra	Annulment	

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Emergence through Negation

- The negation of operations in Arithmetic produces new emergent numbers
- These new numbers become more and more radical negations that step up the meta-levels of Being
- Thus we get Emergence of New numbers plus radicalization of negation (together) flowing from Arithmetic
- This is unlike the dialectic of Hegel which essentially is a repetition of the same

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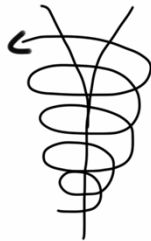
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Dimensional Singularities



singularity



vortex



domain wall



singular

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Hyper-complex algebras unfold from the singularity of $V-1$

- Real
- Complex - lose unity of conjugate
- Quaternions - lose the commutative property
- Octonions - lose the associative property
- Sedenions - lose the division Property
- Infinity of less and less interesting algebras

Produced via the Caley-Dickson process

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Site / Event

- Local version of spacetime has 'domain walls' between spaces of different properties
- Thus differentiated into
Void / Emptiness
inside / outside
- Full of virtual particles

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Topology differentiates spacetime locally

- Fundamental differentiation of space based on open neighborhoods of points
- Topological differentiation of all n-dimensional spaces that are determinate except in the fourth dimension
- Fourth Dimension has infinite 'fake' topologies
- Matroids represent the minimal topologies of each dimension

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Multiple

- Pure Heterogeneity
- Pure Incommensurability
- as Background for the 'Event' of the arising of the Ultra-One
- which is a singularity of Ultra Being
- as a mark in existence between:

Void / Emptiness

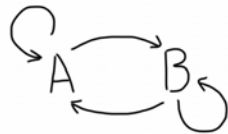
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Groupoid

- Nihilistic opposite of multiple
- Equivalence or identity relations

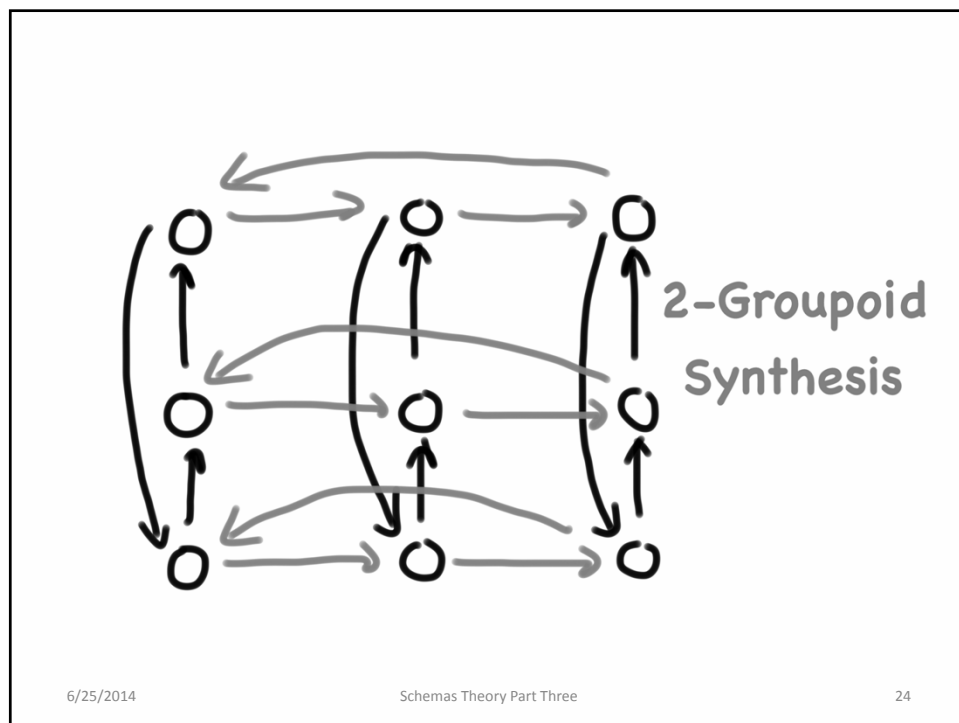
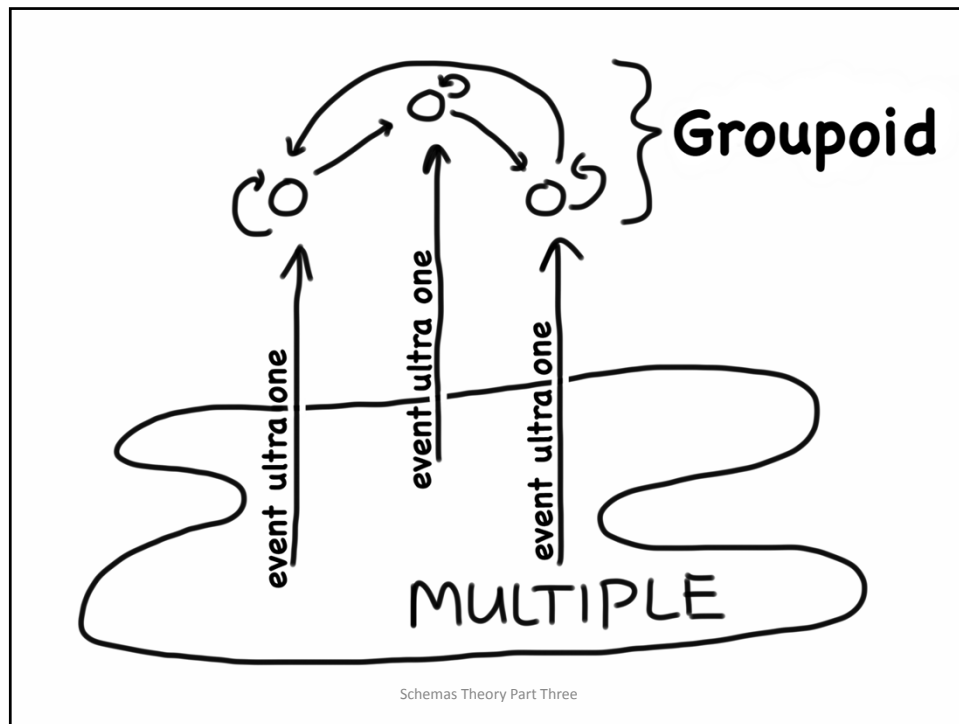


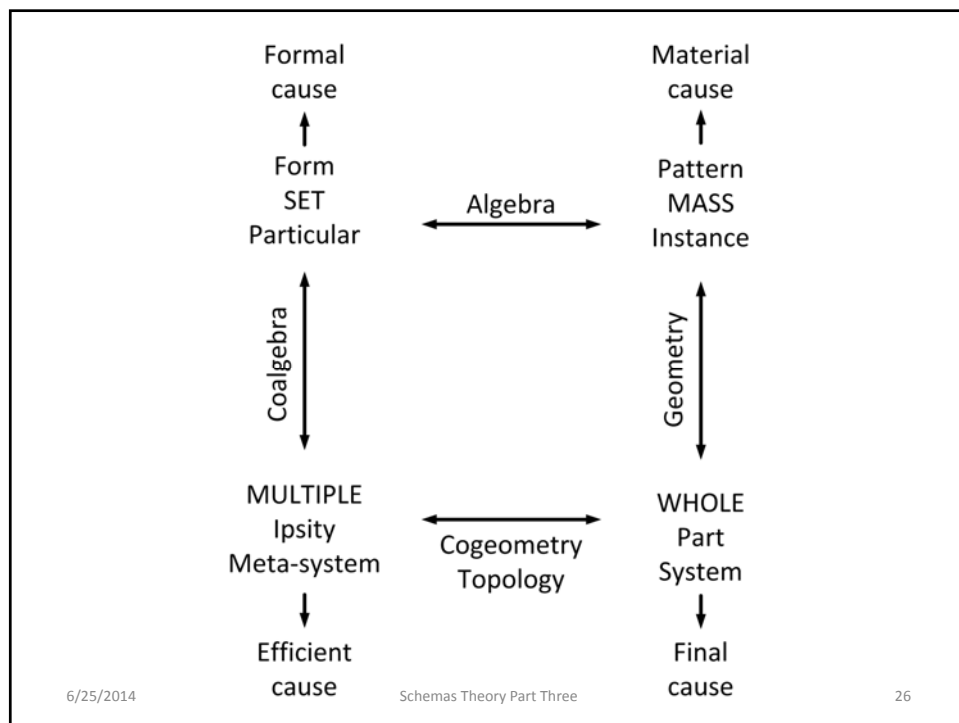
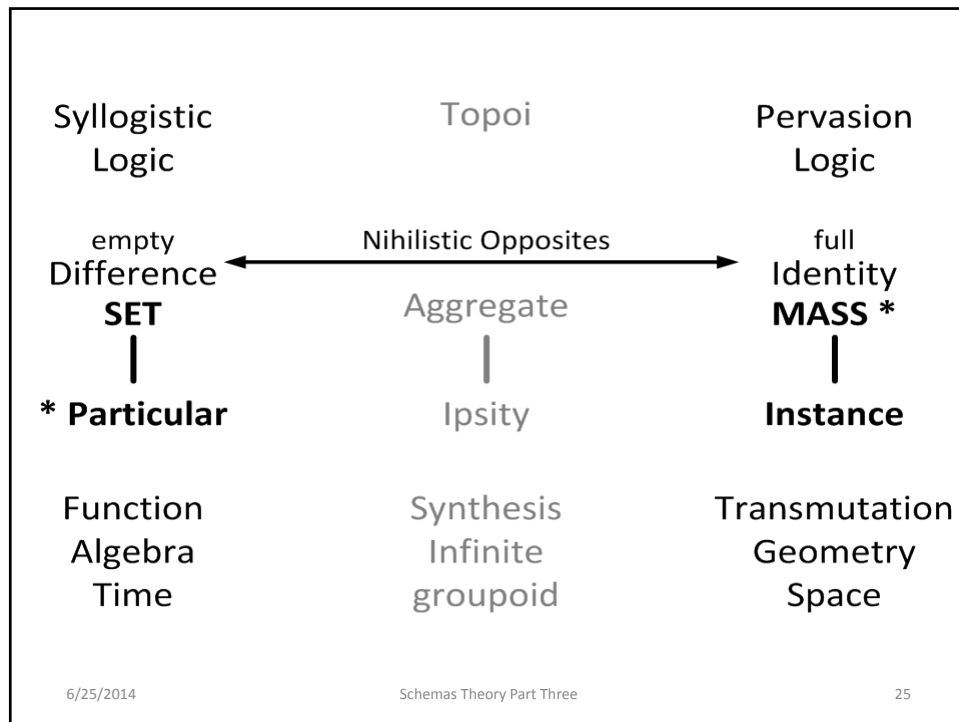
- For ipsities in aggregates of multiple
- Categories over arrows rather than sets
- Represented as paths
- 2-groupoids (paths of paths) form syntheses

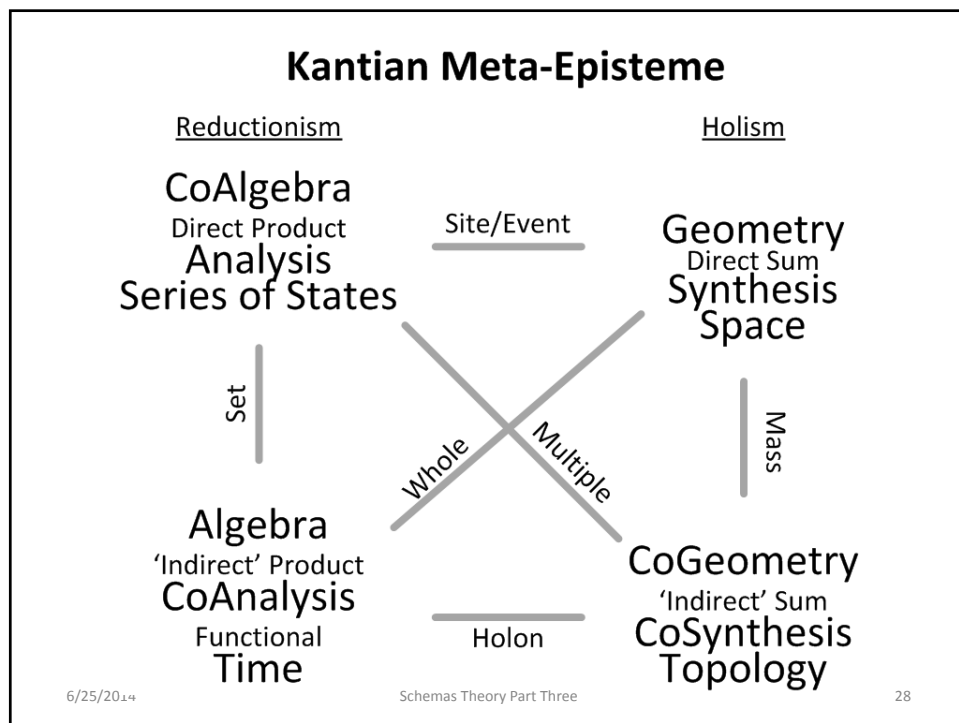
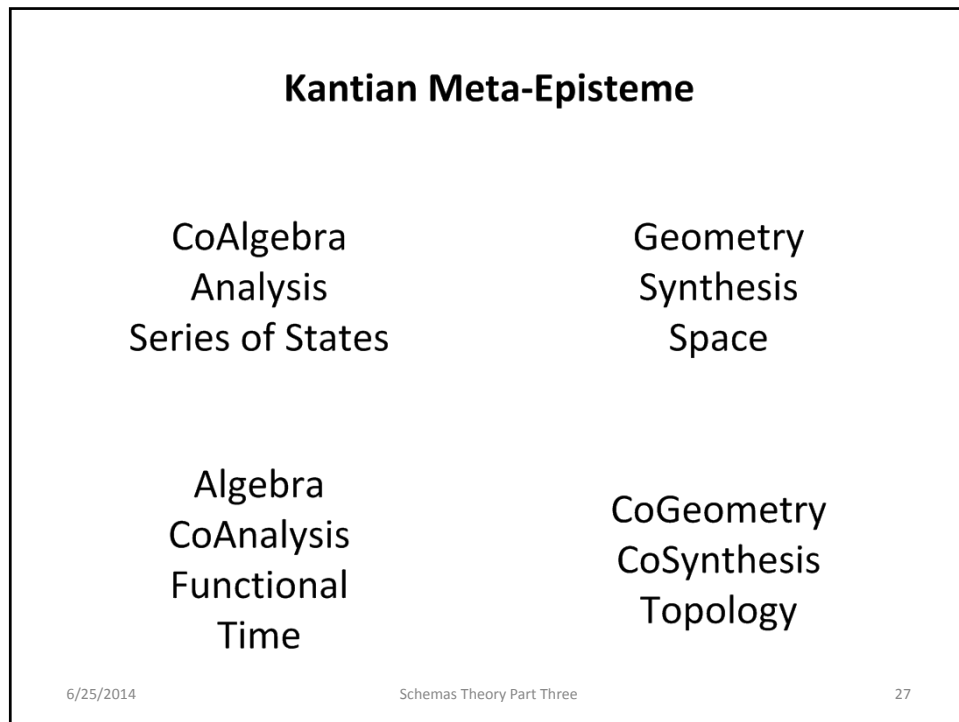
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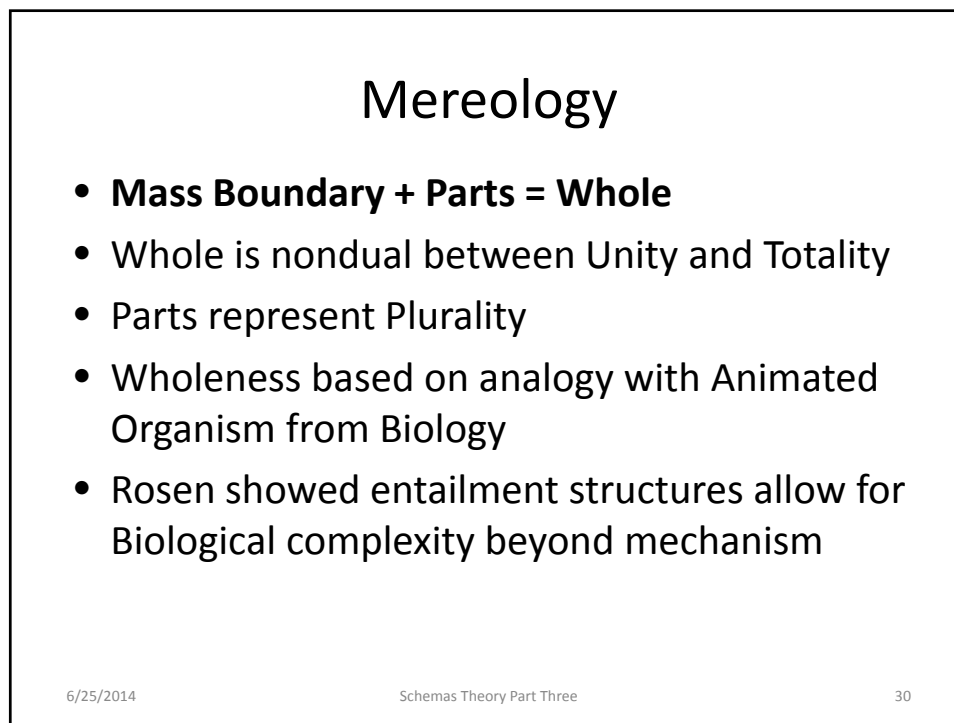
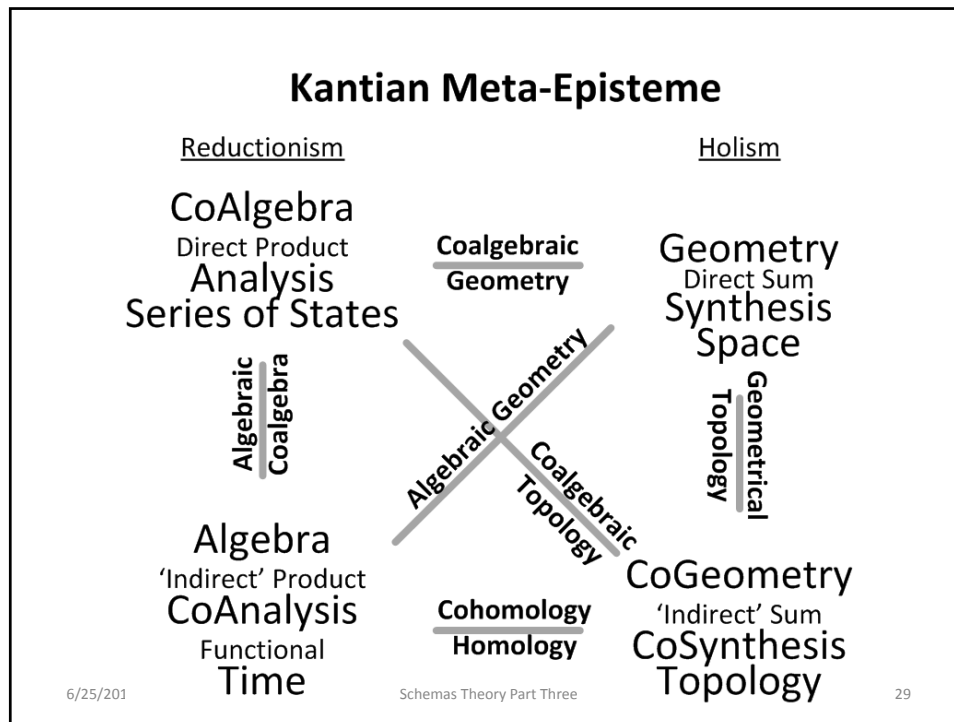
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Koestler

- Holon both part and whole at the same time
Like organ in body
- Holons exhibit integrity where different kinds of parts support each other
- Special Systems are Holons

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Special Systems

- System – Whole greater than the sum of parts
 - Special System – Whole exactly equal to sum of parts
- Meta-system – Whole less than sum of parts

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Special Systems

- Meta-system
 - Reflexive Social Special System
 - Autopoietic Symbiotic Special System
 - Dissipative Ordering Special System
- System

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Intertwining

- Ultra Being
 - Meta-System
- Wild Being
 - Reflexive Social Special System
- Hyper Being
 - Autopoietic Symbiotic Special System
- Process Being
 - Dissipative Ordering Special System
- Pure Being
 - System
- Ultra Being

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	Aliquot sequences	Examples
Meta-system	lacking	Divisors add up to less than the original number
Reflexive Social	sociable	<div> <div> 12496 14288 15472 14536 14264 </div> <div> 1264460 1547860 1727636 1305184 </div> <div> Mostly four but also 5, 28, 9 and other sets </div> </div>
Autopoietic Symbiotic	perfect	6, 28, 496 rare
Dissipative Ordering	amicable	(220,284) fairly common
System	excessive	Divisors add up to more than the original number

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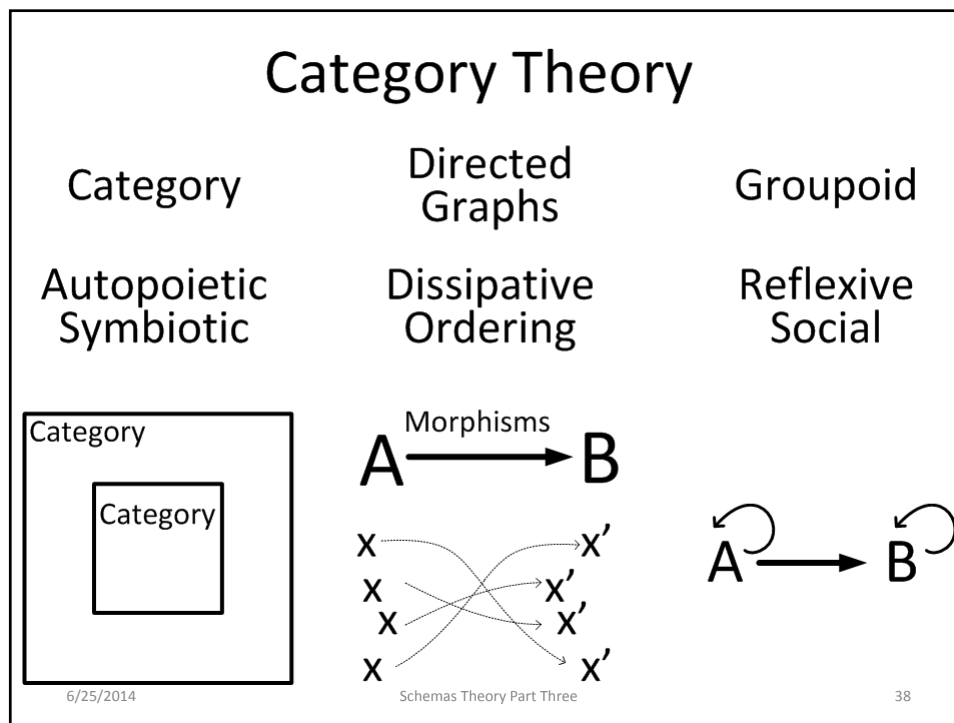
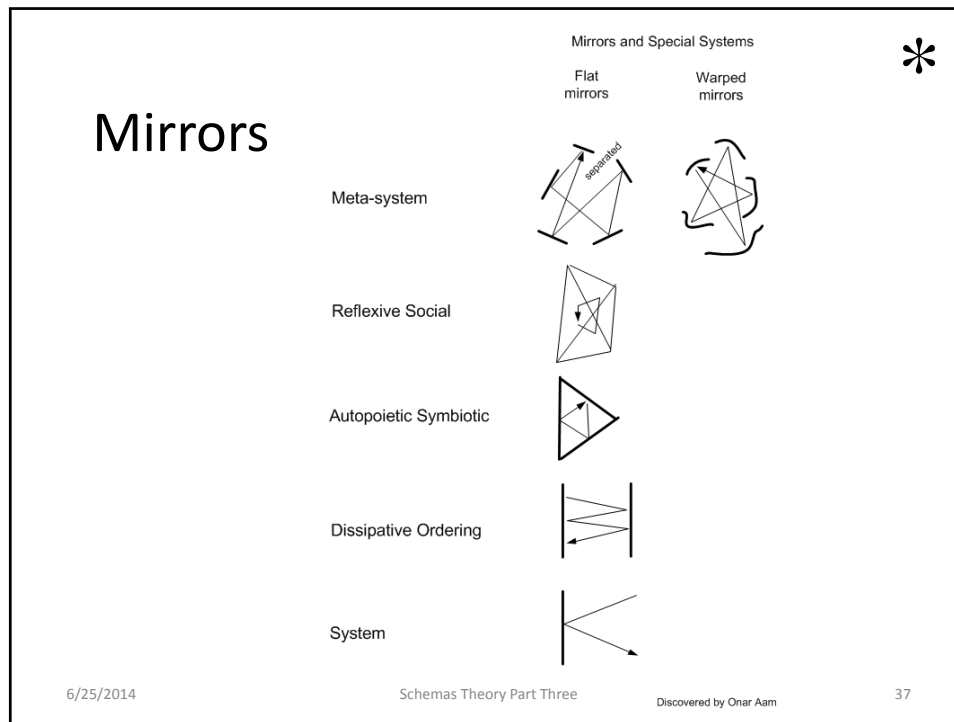
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	<u>Number</u>	<u>Imaginary</u>	<u>Surface</u>	<u>Wave</u>
Meta-System	Deficient	Sedenion	Projective Plane	Medium
Reflexive Social	Sociable	Octonion	Hyper-Kleinian	Super-breather
Autopoietic Symbiotic	Perfect	Quaternion	Kleinian Bottle	Breather
Dissipative Ordering	Amicable	Complex	Mobius Strip	Soliton
System	Excessive	Real	Orientable	Normal Wave

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Category Theory <-> Holons

- Structure independent of elements
- Emphasizes relations
- Meta-structure aligned with Special Systems
- Equivalent to
 - Groupoids
 - Directional Graphs
- Supra-Rational
 - Parts are wholes
 - Wholes are parts
- Supervenient relation between wholes and parts
- Emergent by loss of properties
- Harmonic through conjunction
- Integral by fitting together perfectly despite difference

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Holoid

- Coined by George Leonard in The Silent Pulse
- Holograms where parts reflect whole

From their position in the whole
- Representation of interpenetration
- Aczel Non-wellfounded Sets
 - Russell's Rule Set cannot be a member of itself
 - Holoidal Rule Set cannot directly be a member of itself

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Type Theory <-> Holoidal

- Ramified Type Theory avoids paradox
- Produces structure of Meta-levels
- If Types at meta-levels are members of themselves indirectly (through other types) then this is a model of emptiness/void as interpenetration, which is a model of existence

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Singular

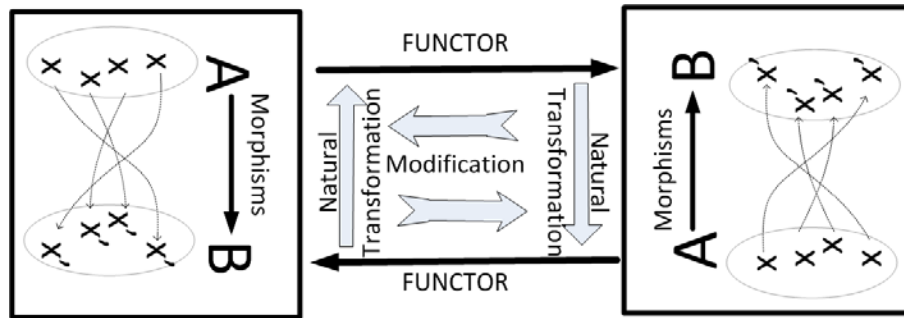
- Unique non-bounded finitude
 - Spacetime -> Kosmos
 - World
- Examples
 - Surface of Sphere
 - Non-orientable surface without boundary
 - Kleinian Bottle in fourth dimension

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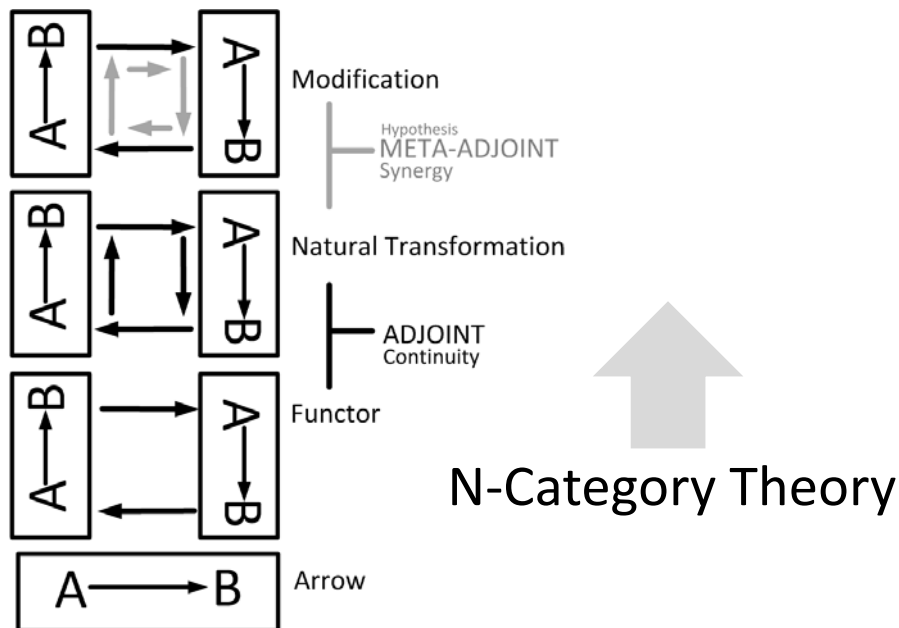
Morphism Levels



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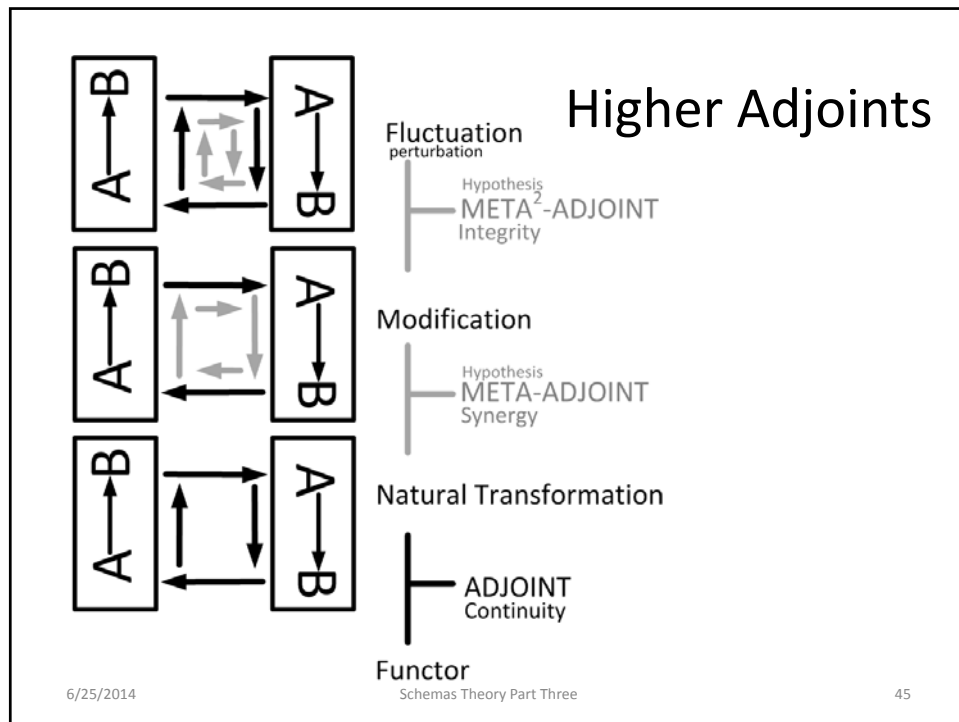
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Proposed Theorem

Singular has structure of N-category Theory

Therefore, it gets universal natural properties for free

Three-Dimensional Platonic Solids



Icosa-Dodeca-hedron
1-12-30-20-1



Octahedron-Cube
1-6-12-8-1



Tetrahedron
1-4-6-4-1

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Four-Dimensional Platonic Solids



120cell-600cell
1-600-1200-720-120-1



24cell
1-24-96-96-24-1



8cell-16cell
1-16-32-24-8-1

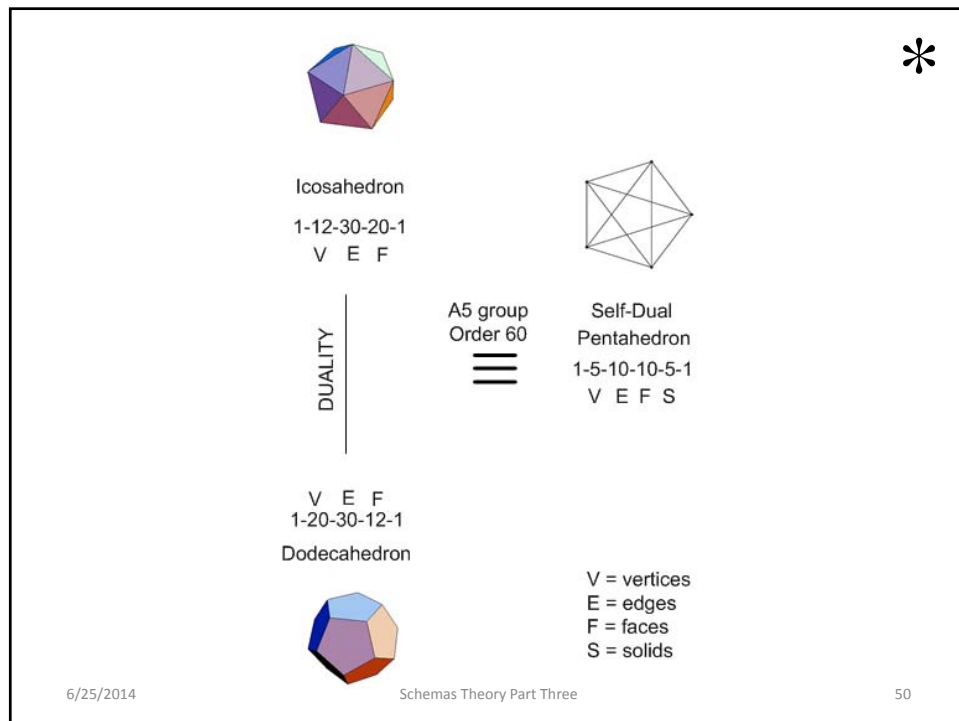
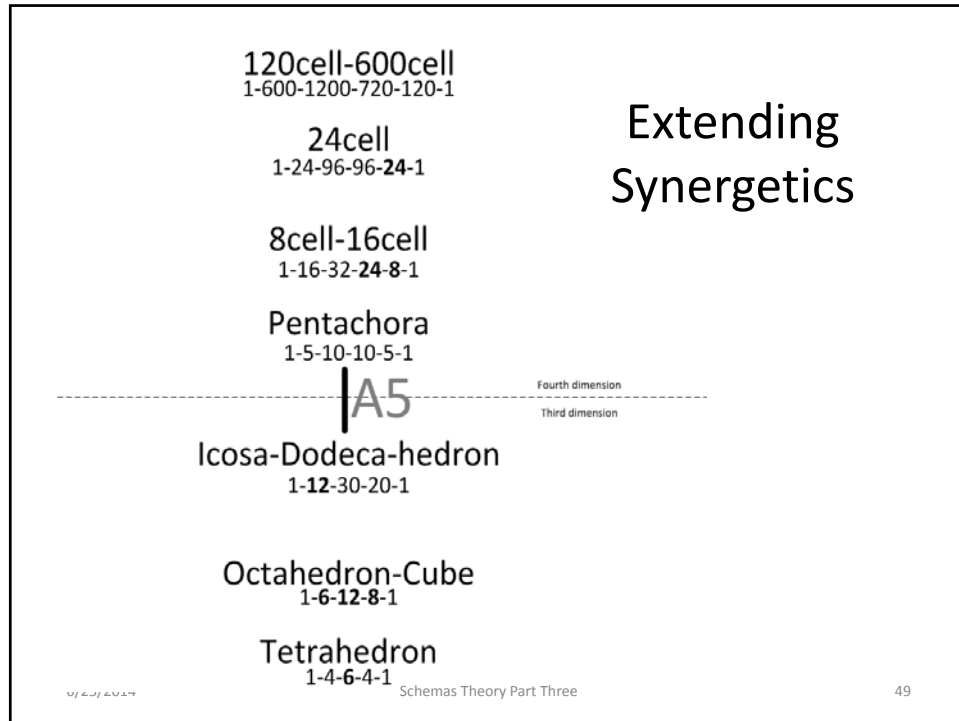


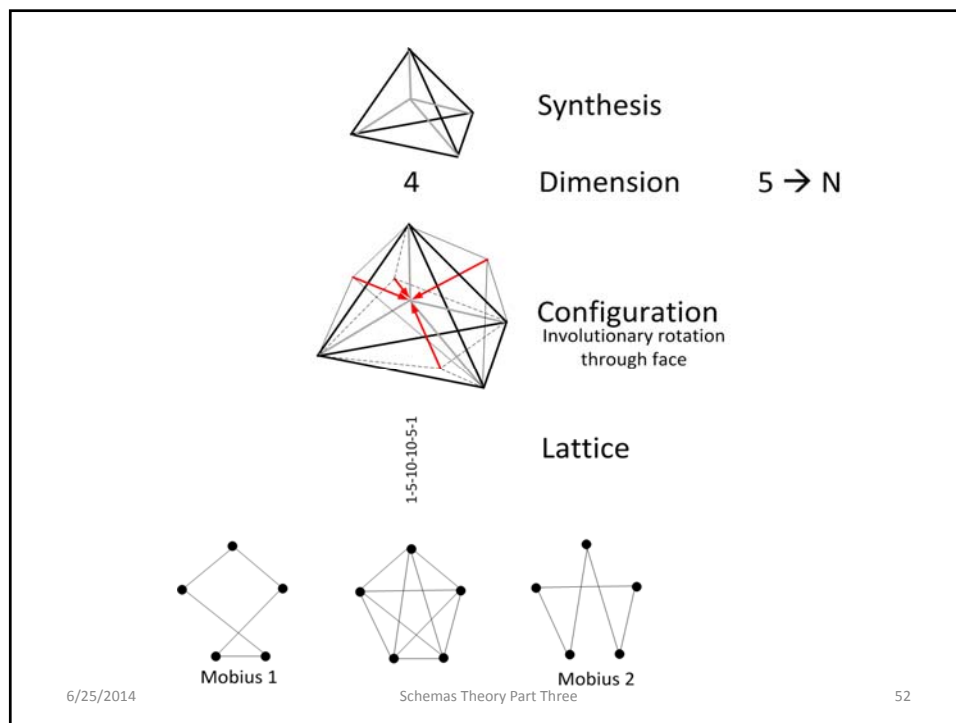
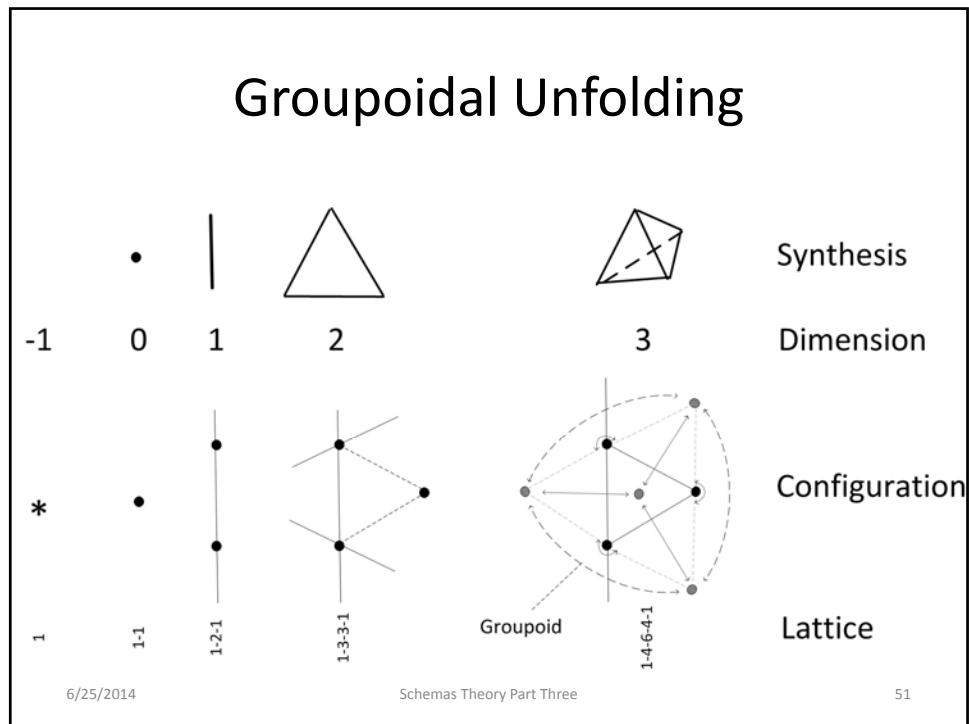
Pentachora
1-5-10-10-5-1

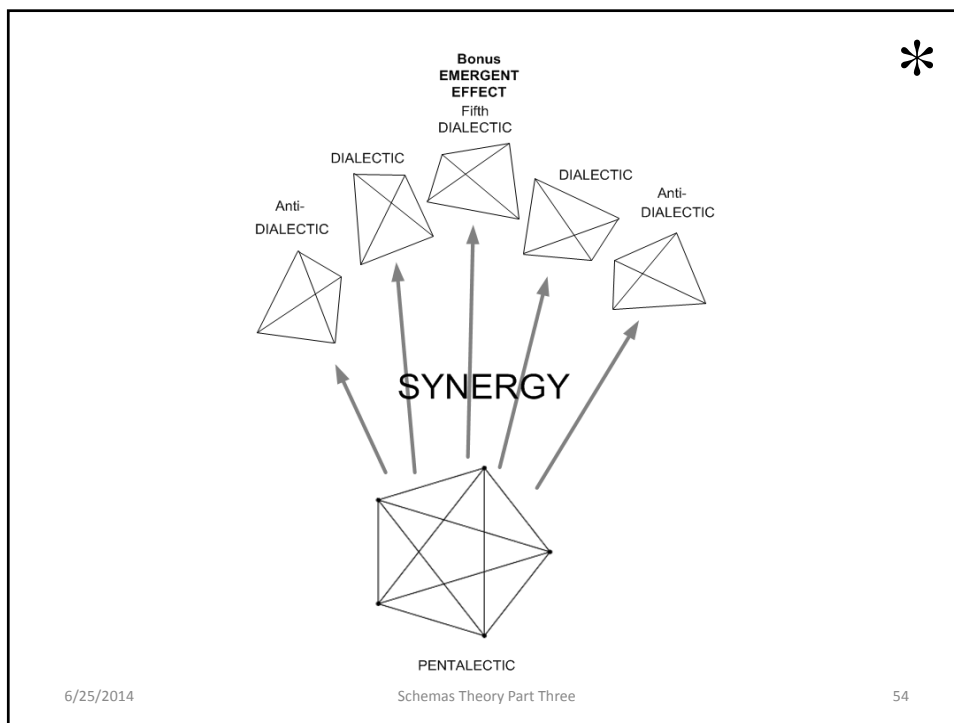
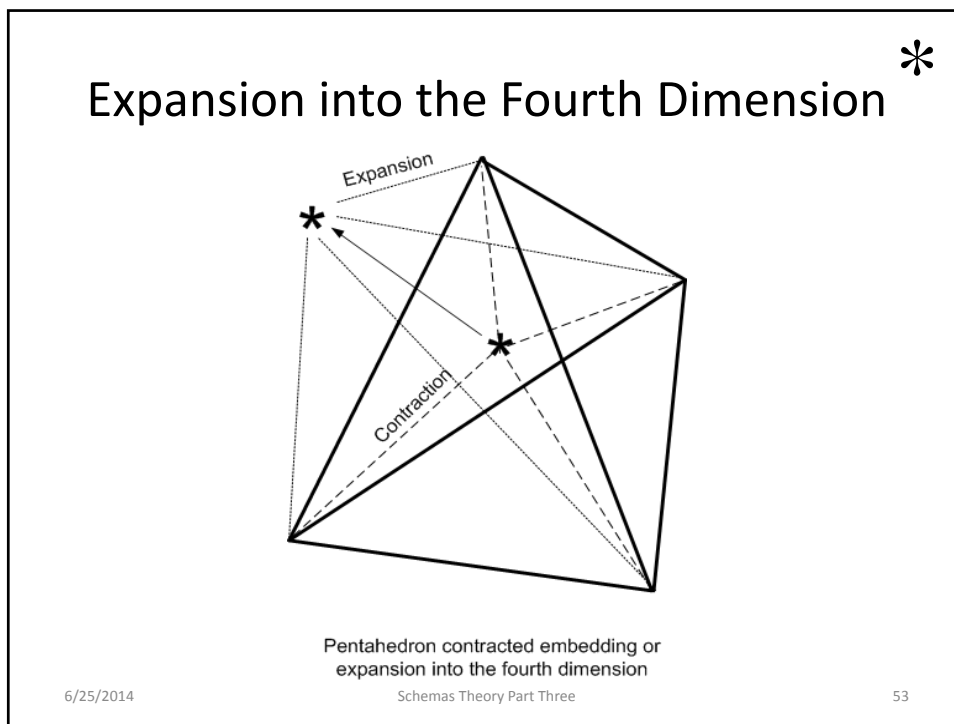
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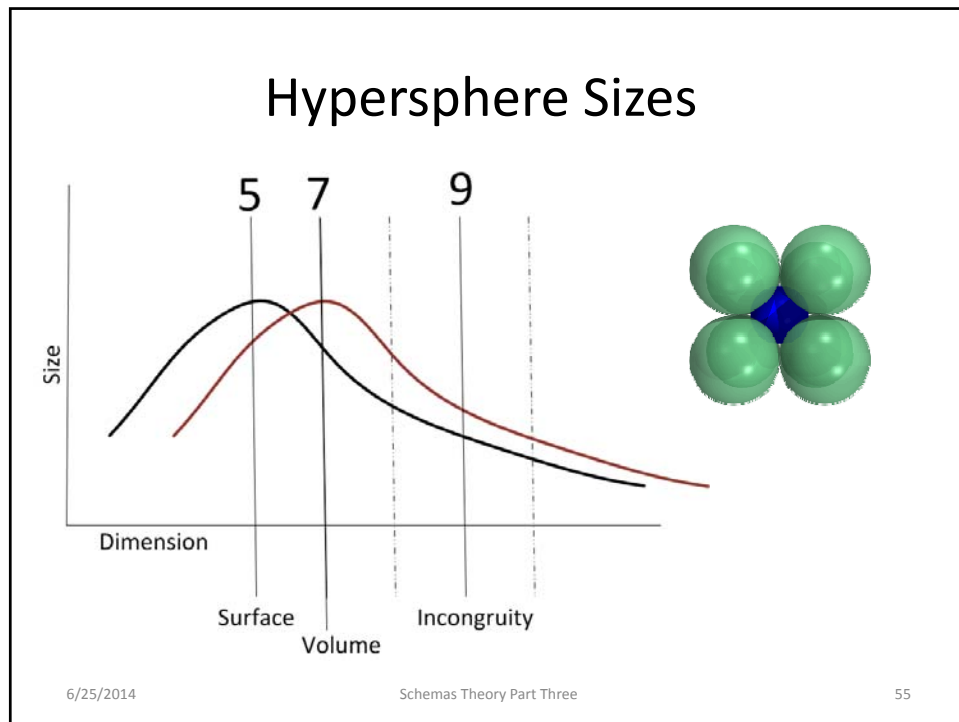
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Design Space

First Class	Second Morphism	comments
5 Subtlety	Fluctuation (perturbation)	individual differences
4 Refinement	Modulation	gender differences
3 Stuff - Qualia	Natural Transformation	species
2 Structure - Spectra	Functor	between categories
1 Property - Range	Arrow	within categories
0 Individual name and type	Function	between elements

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Relation to X-lectics

5 Subtlety	Insight	Pentalectic
4 Refinement	Concept Essence Perspective Design	Quadralectic
3 Stuff - Qualia	constraints on content = essence	Trialectic
2 Structure - Spectra	Possible Values	Dialectic
1 Property - Range	Attribute	Monolectic
0 Individual	thing	entities

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