

Twisted Cohomotopy implies M-Theory anomaly cancellation

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Open problem:

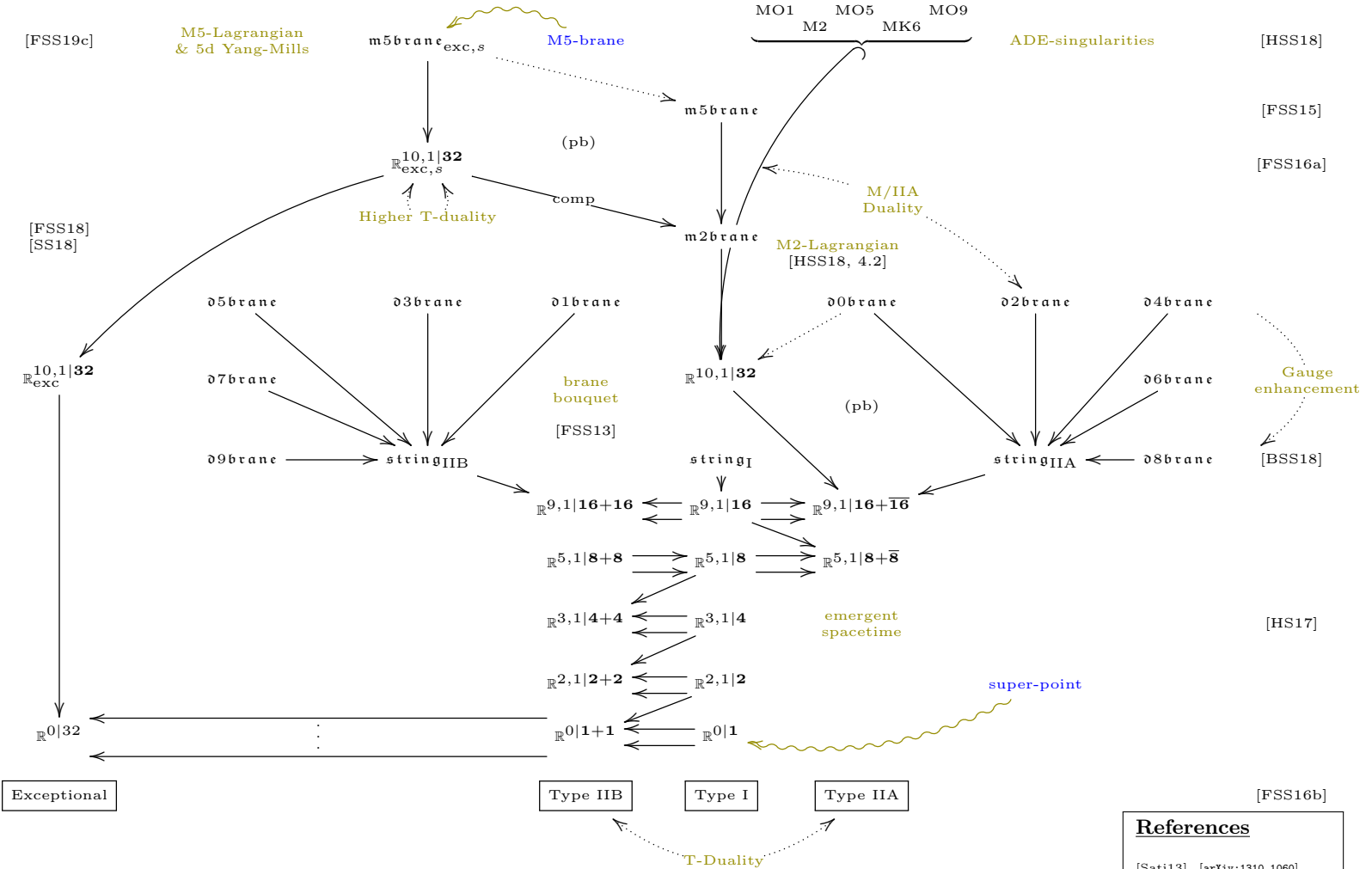
We still have no fundamental formulation of “M-theory” – the hypothetical theory of which 11-dimensional supergravity and the five string theories are all special limiting cases. Work on formulating the **fundamental principles underlying M-theory** has noticeably waned. [. . .]. Regrettably, it is a problem the community seems to have put aside – temporarily. But, ultimately, Physical Mathematics must return to this grand issue.

(Moore '14: “Physical Mathematics and the Future”)

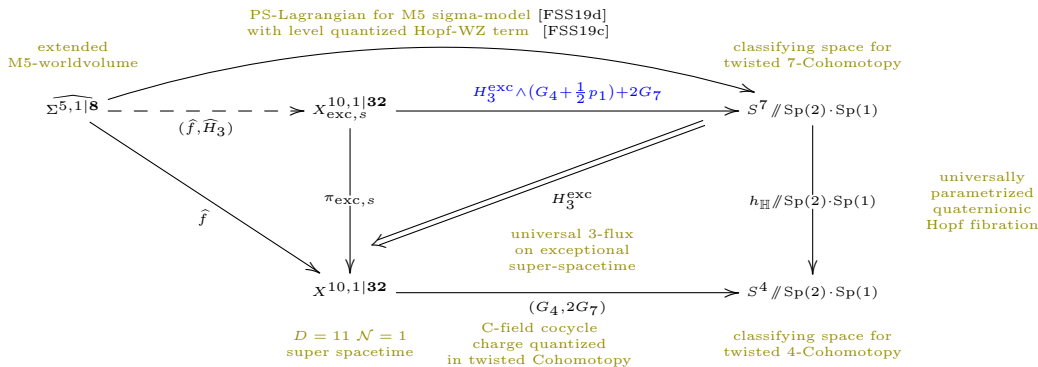
First principles [FSS19a]:

physics	mathematics
gauge principle	homotopy theory
& Pauli exclusion principle	super-geometry
= super homotopy theory	

Theorem 1: In rational super homotopy theory, the following bouquet of universal invariant higher central extensions emerges from the superpoint:



Here the super cocycle classifying the $m5brane_{exc,s}$ -extension comes out as follows:



Hence in *rational* super homotopy theory the C-field emerges charge-quantized in twisted Cohomotopy.

Hypothesis H [Sati13, FSS19b]: *The C-field is charge-quantized in actual twisted Cohomotopy.*

Theorem 2 [FSS19b, FSS19c]: *Hypothesis H implies list of M-theory anomaly cancellation conditions including: 1) half-integrally shifted C-field flux quantization, 2) C-field/M2-tadpole cancellation.*

References

- [Sati13] [arXiv:1310.1060]
- [FSS13] [arXiv:1308.5264]
- [FSS15] [arXiv:1506.07557]
- [FSS16a] [arXiv:1606.03206]
- [FSS16b] [arXiv:1611.06536]
- [HS17] [arXiv:1702.01774]
- [FSS18] [arXiv:1803.05634]
- [SS18] [arXiv:1805.00233]
- [HSS18] [arXiv:1805.05987]
- [BSS18] [arXiv:1806.01115]
- [JSSW19] arXiv:1903.02807
- [FSS19a] arXiv:1903.02834
- [FSS19b] arXiv:1904.10207
- [FSS19c] arXiv:1906.07417
- [FSS19d] [in preparation]